

August 19, 2019

Mr. Michael Erickson  
Chief of Environmental Compliance  
U.S. Army Corps of Engineers, Walla Walla District  
ATTN: CENWW-PPL-C - Rapid Response EA  
201 North 3rd Avenue  
Walla Walla, WA 99362-1876

Dear Mr. Erickson:

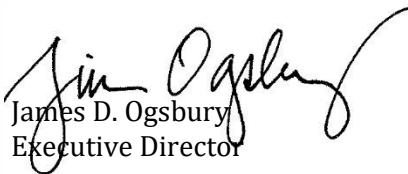
Thank you for the opportunity to provide comments on the Finding of No Significant Impact and Environmental Assessment for the aquatic invasive mussel control rapid response plan for the Columbia River Basin. Attached please find two Western Governors' items related to aquatic invasive species control:

- Western Governors' Association (WGA) Policy Resolution 2019-06, *Biosecurity and Invasive Species Management*; and
- the Western Governors' Biosecurity and Invasive Species Initiative Special Report.

As you develop the rapid response plan, I ask that you consider Western Governors' policies and priorities with respect to this issue. Of particular interest is section B-12 of WGA Policy Resolution 2019-06, which articulates the Governors' thoughts on the importance of early detection and rapid response for invasive species in freshwater systems.

Please contact me if you have any questions or require further information. In the meantime, with warm regards and best wishes, I am

Respectfully,



James D. Ogsbury  
Executive Director

Attachments



## Policy Resolution 2019-06

### Biosecurity and Invasive Species Management

#### A. **BACKGROUND**

1. Per Executive Order 13751, “invasive species” means “with regard to a particular ecosystem, a non-native organism whose introduction causes or is likely to cause economic or environmental harm or harm to human, animal, or plant health.” This definition can include aquatic and terrestrial plants and animals, forest and agricultural pests, and pathogens.
2. The 2017-2027 Hawai’i Interagency Biosecurity Plan defines biosecurity as “the set of measures taken to manage the risk from invasive species to the economy, environment, and health and lifestyle of the people.” This includes pre-border measures, border measures, post-border measures, and measures that increase public awareness about invasive species.
3. The Plant Protection Act of 2000 (Pub. L. 106–224) defines “biological control” (biocontrol) as the use of biological control organisms as an “enemy, antagonist, or competitor used to control a plant pest or noxious weed.” When used properly, biocontrol can be an effective tool in efforts to manage and eradicate invasive species.
4. States have different definitions of biosecurity, biological control and invasive species. They also may use regulatory and nonregulatory terms that are related to, but not synonymous with, the term invasive species, including pest, nuisance species, noxious weed, and injurious wildlife.
5. Invasive species have substantial negative effects on ecosystems, economies, and communities in the West. Studies have found that invasive species cost the U.S. more than \$120 billion every year, and the National Wildlife Federation estimates that 42 percent of threatened or endangered species are at risk due to invasive species. Invasive annual grasses such as cheatgrass, medusahead, fountain grass, and ventenata pose a major threat to western rangelands by increasing the risk of wildfire, outcompeting native grasses, and diminishing soil and water quality. Aquatic nuisance species, including invasive quagga and zebra mussels, decrease water quantity and quality, impair native wildlife, harm hydroelectric and irrigation systems, and can impede maritime transport by fouling vessel hulls. Invasive pathogens affect human health and welfare, and invasive species, such as mosquitoes, can vector human diseases. Invasive species damage multiple types of environments, from virgin forests to urban tree canopies. Invasive species harm a wide variety of economies dependent on natural resources, including agriculture, ranching, tourism, energy production and transmission, and forest products. Invasive species threaten many native plants central to western life and the cultures of Native Americans, Native Hawai’ians, Alaska Natives, and other indigenous peoples.

6. The spread of invasive species results from a combination of human activities, susceptibility of invaded environments, climate change, biology of the invading species, and dispersal. These characteristics are not dictated by geopolitical boundaries, but rather by ecosystem-level factors, which cross state and national borders. Scientists, private landowners, and state and federal land managers across the West have expressed the need to develop a more aggressive and cohesive strategy for invasive species management that includes prevention, monitoring, control, and eradication.
7. The impacts of invasive species on natural resources and human health and welfare are similar in scope and intensity to the threats posed by wildfire. Wildfire management on federal, state, tribal, and local land is coordinated through a sophisticated planning and response network, which includes the National Interagency Fire Center (NIFC).
8. Many invasive species were introduced, or their distribution was expanded, due to inadequate federal and state regulations dealing with interstate transport, international trade and interstate commerce, and a lack of communication and coordination between land management agencies.
9. Early Detection and Rapid Response (EDRR) is a coordinated set of actions to find and eradicate potential invasive species in a specific location before they spread and cause harm. The Incident Command System (ICS) is a management system designed to enable effective and efficient incident management, including invasive species rapid response, by integrating a combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure.
10. In the West, biosecurity and invasive species management is the responsibility of a wide network of state, federal, and local agencies. Federal agencies manage invasive species on federal lands and waters under a complex system of mandates and authorities.
11. Cooperative agreements, grants, and procurement contracts between federal agencies and state and local invasive species management authorities are effective in establishing structured partnerships for collaborative invasive species management. The use of cooperative agreements lessens the burden on local federal land managers, while increasing the efficiency of invasive species management programs utilizing local collaborative goal setting. Additionally, cooperative agreements simplify project-based contracting utilizing the authorities of state and local government agencies. This can be extremely useful, especially where infestations extend across multiple landownerships or EDRR is the management objective.
12. Good Neighbor Authority (GNA) allows states to enter into agreements with the U.S. Forest Service (USFS) or Bureau of Land Management (BLM) permitting them to perform various land management activities on federal lands. These tools have been successfully used by forest and rangeland managers to achieve various land management objectives across federal, state and local government, and privately-owned lands
13. U.S. Department of Agriculture (USDA) regulation of interstate movement of commodities via airlines is focused on the protection of agricultural industries in the contiguous United States. This is particularly evident in Hawai'i, where baggage destined for the U.S. mainland is subject to federal inspection, while baggage moving from the mainland to Hawai'i is not.

14. Environmental DNA (eDNA) is DNA present in an environmental sample, as differentiated from traditional sampling of DNA directly from an intact organism. eDNA frequently is thought of as DNA in tissue and cells that have been shed by an organism but can also refer to DNA within an intact organism, if that organism is collected in the environmental sample. eDNA can be used to detect a wide range of organisms, including those that are endangered or invasive, and be used for both research and monitoring purposes.
15. The West includes a number of highly important seaports on the U.S. mainland and across the Pacific region. Maritime vessels represent a primary pathway for the movement of aquatic invasive species. With the passage of the Vessel Incidental Discharge Act in 2018, regulations regarding ballast water and other discharges are centralized under Section 312 of the Clean Water Act with the Environmental Protection Agency setting environmental standards, the U.S. Coast Guard (USCG) setting vessel requirements to meet those standards, and the USCG and interested states enforcing those requirements.
16. State invasive species councils and invasive plant councils provide policy level direction, planning, and coordination for state-level biosecurity and invasive species prevention and management actions in the West. Councils are led by state agencies, non-profit organizations, industry, private landowners, and public-private partnerships. These groups empower those engaged in the prevention, detection, and eradication of invasive species, and serve as forums for invasive species education, communication, and strategic planning. Invasive species councils can collaborate on regional-level issues and benefit from mechanisms that help them to coordinate and solve cross-boundary, cross-jurisdictional challenges.

**B. GOVERNORS' POLICY STATEMENT**

1. Western Governors support the creation of a Western Invasive Species Council (WISC) to help enhance coordination between existing state invasive species councils, improve communication and collaboration on regional biosecurity and invasive species control efforts, and to advocate for regional needs at the federal level. The WISC should be initially coordinated through the Western Governors' Association and should work to address cross-boundary and cross-jurisdictional challenges identified in this resolution.
2. Western Governors urge Congress and the Administration to support state, territorial, and tribal invasive species prevention, control and management programs and redouble efforts on federal lands. This should be accomplished through accountability and oversight of programs administered by the USDA, the U.S. Department of the Interior, the U.S. Department of Defense, the USCG, and the National Oceanic and Atmospheric Administration. These programs provide valuable services in the detection and elimination of invasive species, as well as coordination, public outreach, and communication.
3. Western Governors support research as needed to provide understanding of invasive species life potential range distribution, and to develop geographically-appropriate control measures. Western Governors urge Congress and the Administration to support much-needed research on biosecurity and invasive species, including programs under the National Institute of Food and Agriculture and to facilitate funding mechanisms that enable land grant universities to conduct research and development of new pesticides. Institutions conducting research on biosecurity, biocontrol and invasive species control methods should look for opportunities to pool funding resources and exchange information across

administrative lines. Invasive species managers and policymakers should be encouraged to develop new decision-making tools and economic analyses, as well as build and improve upon the decision-making tools and analyses currently in use. Invasive species managers should strive to incorporate economic analyses and regional-level, science-based decision-making tools into management decisions.

4. Western Governors strongly encourage expansion and creation of partnerships – such as invasive species councils with representation from local weed and pest districts, conservation districts, county governments, non-profit and industry organizations, local stakeholders, state, island, tribal, federal, regional and international agencies – committed to preventing the spread of invasive species, averting new unauthorized introductions, responding rapidly to new introductions, and working together to find creative regional approaches for protecting and restoring natural, agriculture, power and water conveyance infrastructure, and recreational resources. Federal agencies should build a more sophisticated and centralized biosecurity and invasive species management network, including a National Biosecurity and Invasive Species Management Center based on the model of the NIFC.
5. Congress and the federal government should ensure that invasive species funding, including support for emergency response, is sustainable, flexible and able to be maximized by federal, state and local agencies with pooled resources and collaborative funding mechanisms. Federal funding, cooperative agreements grants, and procurement contracts for state and local biosecurity and invasive species management should be structured in a deliberate and transparent way that allows for the greatest amount of flexibility and long-term planning. When possible, federal agencies should look for collaborative projects and funding opportunities that multiply state resources and support state-led biosecurity and invasive species management projects.
6. Western Governors call upon Congress to promote state-directed programs to combat invasive species. Regional leadership and state-directed programs provide place-based solutions tailored to unique regional or local conditions in land and aquatic ecosystems. The federal role should be one of partnership and policy-making that strengthen states' on-the-ground efforts and mitigates risks associated with the movement of invasive species between states.
7. Federal agencies are encouraged to expand the use of cooperative agreements with state and local governments and should ensure that they are approved in a timely manner and in collaboration with implementing state agencies. Federal agencies can also support invasive species management efforts by encouraging contract recipients to coordinate with state and local invasive species management agencies, regulatory programs, and cooperative weed and invasive species management areas. State invasive species managers should consider using Good Neighbor Authority on USFS and BLM lands for cross-boundary collaborative invasive species control, management and eradication programs.
8. Federal actions should support state biosecurity and invasive species management efforts by ensuring the timely approval of state permits for biosecurity, quarantine, biocontrol, and rapid response actions. Federal agencies should consult with Governors early and substantively regarding biosecurity or invasive species management decisions that affect state resources and state actions.

9. Federal agencies should identify individuals within district and region offices that can be contacted and assist in the planning and implementation of local cross-boundary invasive species management programs.
10. The threats that invasive species pose to western landscapes and communities are serious and should be met with a sophisticated and coordinated response commensurate with the level of their impacts.
11. Prevention is the most efficient and cost-effective method of invasive species management. Effective biosecurity, prevention, and containment methods can mitigate the need for more expensive and burdensome control and eradication programs. Prevention strategies should be coordinated across state, national, and international lines. Federal and state agencies should increase the use of innovative biosecurity prevention and detection programs, including increased use of electronic manifesting in interstate shipments for the purposes of inspection, and the use of canine detection resources.
12. Western Governors support the EDRR framework as a method to limit or eliminate new introductions and existing species expansion. Programs for the control and/or eradication of invasive species must result in more on-the-ground prevention, management and eradication. The ICS should be evaluated for use in instances of fast-spreading invasives and used as part of EDRR; state, federal, and local agencies can opt to practice and implement the ICS as part of rapid response. The Federal Emergency Management Agency can support these efforts by working with western states to create an ICS training module for invasive species rapid response. The Executive Branch can support state-led rapid response programs by: 1) increasing federal funding for state-led aquatic invasive species rapid response programs, including those that provide mechanisms for flexible, long-term support of state early detection rapid response efforts; 2) streamlining federal permitting and approval processes for treatment and management actions for new mussel detections; 3) creating a single federal authority for aquatic invasive species treatment permitting and approval in freshwater systems; and 4) simplifying reporting on new invasive mussel infestations by creating a single federal point of contact for new mussel detections.
13. Federal agencies should support states' effort to identify, study and approve the use of biological control organisms. Federal permitting models should be structured to ensure biocontrol can be utilized by states in a safe and timely manner. Biocontrol research is encouraged at a regional level, with biocontrol research information being encouraged to move freely between institutions and across state lines. Invasive species managers in the West would benefit from the creation of a new, state-of-the-art biological control facility, as well as a collaborative, multi-agency plan for maintaining and staffing new biocontrol facilities at a level that more adequately meets the expanding needs of the region. Furthermore, effective biocontrol, biosecurity, and invasive species research depends upon a highly-skilled workforce. State and federal agencies should collaborate with universities to support programs essential to biosecurity and invasive species management, such as botany, zoology, plant pathology, taxonomy, systematics, and related fields.
14. The containment of invasive quagga and zebra mussels at infested waters in the West depends upon the collaboration and mutual effort of federal, state and local agencies. Many state-led containment programs benefit from federal cooperation and funding, and state and federal agencies should be encouraged to sustain and expand these effective partnerships as necessary. However, to adequately protect the West from the movement of

aquatic invasive species, federal agencies must be able to act as full partners in invasive species containment efforts and must have the funding and authorities necessary to contain invasive species within lands and waters under their jurisdiction. To this end, federal agencies, including the National Park Service and BLM, should be vested with clear authority to manage watercraft upon their departure from infested waterbodies under federal jurisdiction.

15. Integrated pest management, biocontrol, outcome-based grazing, and targeted grazing can be effective tools to control the spread of invasive annual grasses. Federal, state, and local agencies should view invasive annual grasses as a regional threat and strive to identify and implement cross-boundary projects to control invasive annual grasses at a regional level. Such projects should include those utilizing alternative management techniques such as outcome-based grazing.
16. Agricultural industries in the Pacific Islands need to be similarly protected from the risk of interstate movement of invasive species as the contiguous U.S. mainland. USDA quarantines and commodity inspections should incorporate the priorities of the West, including non-contiguous states and territorial islands in the western region. This includes maintaining federal quarantines on pests that have not yet reached the West, like the emerald ash borer, and adopting policies that adequately protect Pacific states and territories, such as inspection of baggage moving from the contiguous U.S. to non-contiguous areas.
17. State, federal and local agencies and regional coordinating groups should develop and implement a set of best practices for conducting eDNA monitoring and incorporating positive detection results into rapid response strategies.
18. To effectively prevent, contain, and control invasive species, federal, state and local invasive species managers need federal laws that support on-the-ground action. Western Governors support a states-led review of federal biosecurity and invasive species statutes, including the Lacey Act and the National Invasive Species Act, to evaluate how they support on-the-ground management, identify any gaps in their application, and ensure that their structure and implementation are able to address 21<sup>st</sup> century biosecurity and invasive species challenges. Of particular interest are opportunities to expand the taxonomic scope of the Lacey Act to benefit U.S. biosecurity.
19. As directed by the Vessel Incidental Discharge Act, the U.S. Coast Guard and the Environmental Protection Agency should consult with Western Governors and work closely and collaboratively with states on the implementation of that act to ensure that state and regional aquatic resource protection needs are met across the West and the Pacific. Federal and state partners should collaborate on the development of evidence-based risk assessments and should work together to assess the efficacy of policies and tools that may be used in mitigating the impact of various types of discharges, including hull biofouling. Western Governors believe that protecting the diversity of marine habitats in western states and Pacific territories is best accomplished by working with states that have the greatest knowledge of their ecosystems and invasive risks.
20. Accurate, standardized, and accessible geospatial data is essential to biosecurity and invasive species management in the West. Western Governors support efforts to standardize and centralize invasive species occurrence data, streamline the exchange of

data between the nation's major invasive species data aggregators, and increase the accessibility of data to federal, state, and local land and resource managers.

**C. GOVERNORS' MANAGEMENT DIRECTIVE**

1. The Governors direct WGA staff to work with Congressional committees of jurisdiction, the Executive Branch, and other entities, where appropriate, to achieve the objectives of this resolution.
2. Furthermore, the Governors direct WGA staff to consult with the Staff Advisory Council regarding its efforts to realize the objectives of this resolution and to keep the Governors apprised of its progress in this regard.

*Western Governors enact new policy resolutions and amend existing resolutions on a bi-annual basis. Please consult [westgov.org/resolutions](http://westgov.org/resolutions) for the most current copy of a resolution and a list of all current WGA policy resolutions.*





SPECIAL REPORT

# Biosecurity and Invasive Species Initiative

The Chairman's Initiative of Hawai'i Governor David Ige

2019



WESTERN  
GOVERNORS'  
ASSOCIATION

# Dear Friends and Colleagues,

Life in the West is built on our unique landscapes: our natural resources, our agricultural production, and our communities. The West is a region of great diversity, from the dense rainforests of the Pacific Islands to the sprawling sagebrush sea of the Great Basin and beyond. A respect for, and reliance on, our natural environment gives meaning to western life and shape to the western character. The diversity of these resources forms the breadth of western culture and fuels some of our most important economic sectors, such as agriculture, ranching, recreation, and tourism.

But the natural resources that define life in the West are under attack: Invasive species, including plants, animals, and pathogens, pose a significant threat to the western experience. Every day, populations of invasive species such as fire ants, fire-prone grasses, saltcedar, and tree-boring beetles expand into new territory, damaging and degrading native ecosystems. New invasive species are transported across borders daily, with each invader bringing the potential for permanent harm to the region.

The damage done by invasive species is real, and their impacts on western ecosystems, economies and communities can be staggering. According to the National Wildlife Federation, approximately 42 percent of threatened or endangered species are at risk due to invasive species. The West has more federally-listed threatened and endangered species than any other region of the U.S. One study estimates that invasive species costs the U.S. more than \$120 billion every year. A single species, the red imported fire ant (*Solenopsis invicta*), costs the mainland U.S. billions of dollars in economic damage each year and would cost Hawai'i hundreds of millions of dollars annually if it were to be introduced into the state.

These invaders also threaten our culture. Here in Hawai'i, Rapid 'Ōhi'a Death, an invasive forest pathogen, continues to diminish populations of the native 'Ōhi'a, a tree at the heart of Hawai'i's culture and a foundational species of our native forests. This is a story familiar throughout the West, as multi-generational ranching communities face pressure from non-native annual grasses and Native American communities reliant on native salmon are negatively affected by aquatic nuisance species.

We are not helpless in the face of these invasions. Biosecurity – measures taken to manage the risk from invasive species to economies, environments, health and lifestyles – is an essential element in the fight against invasive species. Throughout the West, a network of state, federal, tribal and local biosecurity agencies strive to protect resources from new invading species. Simultaneously, a broad coalition of stakeholders work to monitor, control and eradicate invasive species once they have been established.

My goal in launching the *Western Governors' Biosecurity and Invasive Species Initiative* was to examine the efforts of the West's dedicated biosecurity and invasive species professionals and to identify areas where Western Governors could support and enhance their work. To accomplish this goal, the Western Governors' Association hosted a series of workshops throughout the West, which brought regional leaders together to discuss how invasive species affect life in the region, how established species can be better managed, and how biosecurity practices can be improved to limit new introductions. These workshops were followed by webinars focusing on discrete issues arising from the workshops.

This report's findings, recommendations, best practices and case studies are the culmination of that process. I encourage you to use this document as a bipartisan policy roadmap on the issue and to work with Western Governors as they implement the recommendations through the WGA Working Lands Roundtable and the Western Invasive Species Council.

Thank you for joining me on this journey over the last year. I am grateful for all the hard work and investments made by our state and federal partners, industry, private landowners and non-governmental organizations. I look forward to collaborating on the solutions to one of the most pressing environmental issues of our time.



Sincerely,

A handwritten signature in black ink that reads "David Y. Ige". The signature is written in a cursive, flowing style.

David Y. Ige  
Governor, State of Hawai'i

## Dear Friend of the West,

As national politics have become more polarized – as our federal government has become more dysfunctional – people throughout the country (and of all political stripes) have increasingly looked to states and their governors for bipartisan leadership and solutions to problems facing our nation and region.

Western Governors have risen to that challenge in a big way.

Through the Western Governors' Association, the Governors have developed deliberative policy and generated creative ideas to sustain and develop the economies and environments of the great American West. I commend your attention to their detailed, substantive and policy-rich resolutions on energy, water, forest fires, species conservation, public lands management and a host of other critical resource issues.

Though these detailed resolutions articulate measured and thoughtful principles, Western Governors are men and women of action. As valuable as their policy pronouncements are, the Governors prefer to get things done.

It was with this mentality that WGA Chair and Hawai'i Governor **David Ige** launched the *Western Governors' Biosecurity and Invasive Species Initiative*. The Initiative has mobilized Western Governors to leverage their influence and resources to more aggressively confront the scourge of invasive species. The impacts of invasive species in the West are as pervasive as they are underreported. The spread of noxious weeds threatens ranching communities and fuels wildfires. Invasive species can radically alter habitat, compounding threats to wildlife and endangering species. The competition that non-native species pose to native game impacts hunting and fishing. Industries across the West – including agriculture, forestry and tourism

– are struggling to eradicate, contain and mitigate the insidious impacts of these invaders.

Governor Ige's Initiative builds on a significant body of work executed by the Association in recent years. In 2016, for example, Western Governors formed the WGA Invasive Species Advisory Group, which provides technical assistance to inform our work on this critical issue. In the last year, the Association conducted the WGA Invasive Species Data Management Workshop, which produced new regional guidance for the interagency exchange of invasive species occurrence data. In 2018, WGA published a compendium of the *Top 50 Invasive Species in the West*, a first-of-its-kind regional invasive species prioritization tool. And we continue to work collaboratively with the Department of the Interior to combat the spread of invasive quagga and zebra mussels in the West.

The *Western Governors' Biosecurity and Invasive Species Initiative* represents an even greater commitment of resources and attention to this issue and these ongoing efforts. This report – which communicates specific recommendations and distills information generated by Initiative workshops, webinars and other channels – will help guide WGA's work on invasive species for years to come.

Thank you for your consideration of the report's findings and for your interest in the work of Western Governors.



Appreciatively,

A handwritten signature in black ink that reads "Jim Ogsbury". The signature is fluid and cursive.

Jim Ogsbury  
WGA Executive Director

# EXECUTIVE SUMMARY

The spread of invasive and non-native species affects nearly every aspect of life in the West. As invading species replace native plants and wildlife, the ecosystems, economies and communities that depend on the West's natural resources are damaged and diminished, sometimes permanently. Improving biosecurity and invasive species management practices is essential to protecting the West from new invading species, reducing the effects of established species, and restoring the region's working lands and native ecosystems.

Hawai'i Governor **David Ige**, Chair of the Western Governors' Association, launched the *Biosecurity and Invasive Species Initiative* in July 2018 in response to this challenge. The Initiative focuses on the impacts that nuisance species, pests and pathogens have on ecosystems, forests, rangelands, watersheds and infrastructure in the West, and examines the role that biosecurity plays in addressing these risks.

The *Biosecurity and Invasive Species Initiative* commenced with an exploration of these issues through workshops hosted by Western Governors **Brian Sandoval** in Nevada, **Matt Mead** in Wyoming, **Steve Bullock** in Montana, and **David Ige** in Hawai'i. The workshops, which were livestreamed to reach the widest possible audience, assembled leaders in biosecurity and invasive species management to discuss the challenges that invasive species pose to the West and identify opportunities for Western Governors to address those challenges.

The workshops were followed by webinars that examined discrete issues surrounding invasive species management and control. Webinars examined several topics, including the effects of invasive species on fisheries, the role of conservation districts in invasive species management, and impacts of invasive species on Pacific Islands forests and ecosystems.

This report presents the findings of the Initiative and recommends actions Governors can take to achieve the following goals:



Hawai'i Governor **David Ige** launched the *Biosecurity and Invasive Species Initiative* as his central policy effort as WGA Chair.

**Protect the West from the introduction of new invasive species through enhanced biosecurity practices, preparedness, and planning.** State and federal agencies should develop state and regional level biosecurity plans and utilize new and emerging biosecurity technologies. A regional biocontrol research center should be established, and interagency collaboration on biocontrol research, permitting, and utilization should be improved and streamlined.

**Improve cross-boundary collaboration and coordination for the management of established and emerging invasive species.** State, federal and local agencies should strengthen existing invasive species coordination mechanisms and build new collaborative structures to

improve invasive species management at a regional scale, including a new Western Invasive Species Council. Rapid response practices can be enhanced by expanding the use of the Incident Command System, conducting regular practice exercises, and establishing a federal center dedicated to biosecurity and invasive species management.

**Empower state and federal agencies to manage invasive species by aligning federal laws, regulations, and funding mechanisms with states' needs.** State and federal agencies should have the funding and authorities necessary to effectively manage established and emerging species. Federal statutes and regulations should be structured to provide states greater flexibility with

respect to invasive species funding, permitting, and rapid response. Federal regulations should reflect the broad diversity of habitat types and uses in the West. Where necessary, federal law should make provisions to effectively protect all states, whether their habitats include arctic tundra, rangeland, or tropical forests.

**Support and utilize biosecurity research, technology and planning tools.** Research and innovation are essential components of invasive species management in the West. State and federal agencies should identify and seize opportunities to pool research funds, coordinate the employment of new technology, and develop new monitoring, analytical, and decision-making tools. Enhanced use of electronic manifesting for commodity shipments, detector dogs, in-water vessel cleaning, and other tools can increase our effectiveness in mitigating invasive species impacts.

**Standardize and mobilize invasive species data.** Invasive species managers need access to accurate regional invasive species occurrence data to address invasive species at a landscape scale. However, technological barriers often prevent large amounts of useful invasive species occurrence data from being shared. As part of the Initiative, Western Governors will lead an effort to improve the mechanisms by which interagency invasive species data are standardized, stored and exchanged in the West.

The *Western Governors' Biosecurity and Invasive Species Initiative* has provided a valuable regional forum to examine one of the most pressing natural resource issues in the West. The following report describes WGA's invasive species work in greater detail and will guide the Association's ongoing efforts.

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**Initiative workshops were hosted by, from top, Western Governors Brian Sandoval of Nevada, Matt Mead of Wyoming and Steve Bullock of Montana.**





## BACKGROUND

The effects of invasive species on life in the West are as broad and diverse as the region itself. Nearly every acre of land and body of water is either host to an invading pest or pathogen or at risk of being invaded. The impacts of these invaders are sometimes easily overlooked; at other times they are clear, inescapable and devastating. Invasive species cause substantial cumulative harm to the West's natural and built environments, as well as to the communities and economies that depend upon those environments.

Global economic losses caused by biological invaders were estimated at more than \$1.4 trillion as far back as 2002.<sup>1</sup> Another study highlighted that, in the U.S., nearly 50,000 foreign species were responsible for \$120 billion in major environmental damages and losses annually.<sup>2</sup> This estimate represents economic losses from environmental damages only; it does not capture substantial control costs or public health impacts. As much as one-fourth of the U.S. agricultural gross national product is lost due to foreign pests<sup>3</sup> and as much as 42 percent of the species on threatened or endangered species lists are at risk primarily because of alien invasive species.<sup>4</sup>

These estimates, however, may not fully reflect the toll of invasive species. Quantifying the effects of invasive species can be challenging because of the complexities of modern economies and the difficulty of monetizing biodiversity and ecosystem service benefits. Not only do invasive species impact local resources, they can combine with other environmental stressors, such as drought or climate change, to further

diminish native ecosystems. These factors contribute to a lack of up-to-date regional-level economic impact studies and risk assessments, an information gap that can hamper land managers' ability to incorporate invasive species impacts into management decisions.

Some invasive species infestations have grown to such an extent that they fundamentally change the landscape. For more than a century, for example, invasive cheatgrass has spread throughout the West. It is now present in every western state and, in some places, has permanently altered ecosystems. As little as one percent of cheatgrass groundcover can double the wildfire risk in an area; by some estimates cheatgrass covers more than 15 percent of the ground in 31 percent of the Great Basin.<sup>5</sup> These conditions contributed to the 2018 Martin Fire, which, at more than 435,000 acres, was the largest wildfire in Nevada's history. In addition to increasing wildfire risk, cheatgrass reduces forage, outcompetes native vegetation, and diminishes habitat for native wildlife, including the greater sage-grouse. In Hawai'i, watershed forests are threatened

by plants including Himalayan ginger, strawberry guava, and miconia. Miconia alone is estimated to cause roughly \$700M in damage annually to Hawai'i's forests.<sup>6</sup>

Aquatic invasive species, such as quagga and zebra mussels, can pose similar landscape-level threats. These invasive mussels arrived in North America in the 1980s, and have since spread to nearly every major waterway in the U.S. They have caused substantial damage to water delivery systems, hydroelectric facilities, agriculture, recreational boating and fishing, and native wildlife. Once established in a waterbody the mussels are expensive to control and virtually impossible to eradicate. The damage to North American power plants and municipal drinking water systems can reach as high as \$1 billion per year.<sup>7</sup> If the mussels spread to the Columbia River Basin — the last major uninfested water system in the continental U.S. — the control costs in the Basin alone could reach \$500 million annually.<sup>8</sup>

Many other pests and pathogens continue to harm western communities.



**A shoe encrusted with invasive mussels vividly illustrates the impact of the rapidly spreading invasive species.**

Since it first emerged in the U.S. in 1999, West Nile virus has infected at least 17,737 people and caused 1,654 deaths.<sup>9</sup> Chronic wasting disease, an emerging infectious disease that is fatal to free-ranging and captive deer and elk, has been discovered in 24 states and continues to spread.<sup>10</sup> In Hawai'i, invasive fungal pathogens are resulting in Rapid 'Ōhi'a Death, a vast die-off of endemic 'Ōhi'a trees that are crucial to Hawai'i's ecosystems and culture. The emerald ash borer has killed hundreds of millions of ash trees in North America and has caused lasting damage to native and urban forests since 2002.<sup>11</sup> In Guam, the coconut rhinoceros beetle caused the native fadang tree, once the most abundant tree in Guam's forest, to be placed on the endangered species list in 2015.<sup>12</sup> The beetle was detected in Hawai'i in 2013 in the area around Pearl Harbor and has been contained to that area thus far. The beetle is now threatening the native coconut palm, a tree central to the environment, economy, and culture of Guam, Hawai'i and other Pacific Islands.

This short list is merely illustrative of the harm that invasive species are causing in the region.

In the West, biosecurity and invasive species management are the responsibility of a large network of state and federal agencies, as well as stakeholders that include industry, non-profit organizations and conservation groups, private landowners and private citizens. Each of these entities operates under a different set of laws, regulations, and authorities. Their capacities vary, as do their incentives, interests and objectives. Such a diverse network offers opportunities to implement creative and flexible biosecurity and invasive species management practices, but its decentralized nature creates challenges in developing and implementing sophisticated regional management strategies.

It is with these challenges in mind that WGA Chairman Hawai'i **Governor David Ige** launched the *Biosecurity and Invasive Species Initiative*. Hawai'i

is often called "the invasive species capital of the world," not only because of the threats that invasive species pose to its native ecosystems, but also due to the groundbreaking and innovative work the state is undertaking to confront these threats. With the Initiative, WGA has drawn on Hawai'i's experience and harnessed Western Governors' unique ability to assemble state and federal experts and a broad group of stakeholders to foster a bipartisan dialogue to improve regional coordination and collaboration to protect the West from invasive species.

Through workshops, webinars, surveys and ongoing dialogue with stakeholders, Western Governors have made genuine progress on this formidable challenge. The Initiative has produced a new set of recommendations, best practices, technical tools, and collaborative frameworks to confront this pressing environmental issue and help preserve the West's natural heritage and resource economies for generations to come.

# FINDINGS AND RECOMMENDATIONS

The *Western Governors' Biosecurity and Invasive Species Initiative* assembled a wide variety of stakeholders over the past year to find new solutions to one of the oldest and most challenging environmental issues in the West. Surveys, workshops and a webinar series elicited a diverse set of perspectives from federal, state, local and tribal governments, researchers, higher education, industry, non-governmental organizations (NGOs) and conservation groups, private landowners and citizens.

The comments, perspectives and opinions expressed by these stakeholders have been synthesized into these findings and recommendations, which are organized into key recommendations. Each recommendation includes steps that Governors, Congress, federal agencies, and regional coordinating groups might take to improve biosecurity and invasive species management practices in the West. Also included are case studies highlighting specific invasive species and their associated management challenges and opportunities.

## RECOMMENDATION:

### Protect the West from the introduction of new invasive species through enhanced biosecurity practices, preparedness and planning.

Biosecurity is the most cost-effective method of invasive species control. Stopping new invading species before they are introduced not only prevents any impacts on economic activities, it also protects natural resources and human health. Federal, state, tribal and local agencies, as well as industry and private landowners, work diligently throughout the West to prevent the introduction of new invasive species. While many of these biosecurity programs work effectively, there is often a lack of communication between state, federal, and local program managers, as well as a lack of regional interagency coordination. Biosecurity managers in the West should develop state and regional biosecurity plans, improve coordination and increase collaborative funding on biosecurity and biocontrol research projects, and increase the development and implementation of new biosecurity technologies.

#### Biosecurity

The set of measures taken to manage the risk from invasive species to economies, environments, and health and quality of life for citizens.

**Improve regional biosecurity planning.** In January 2017, the Hawai'i Invasive Species Council adopted the Hawai'i Interagency Biosecurity Plan: 2017-2027. This plan provides state agencies in Hawai'i with a coordinated path forward to increase support for local agriculture, protect the state's environment, and provide safeguards for the health and lifestyle of Hawai'i's people.

Other western states should consider following the Hawai'i model by developing state-level biosecurity plans. These plans could be used as the foundation to develop a first-of-its-kind biosecurity plan for the western region. Such a plan could help further prevent movement of invasive species by standardizing and regularizing biosecurity practices between state, federal and local governments in the West.

**Increase international collaboration.** The Initiative demonstrated that effective communication and collaboration of biosecurity and invasive species

management across administrative boundaries is an evolving process. Cross-boundary communication presents a challenge to federal, state and local agencies, but the challenge is even greater for international collaboration to address invasive species.

State and federal agencies should examine how they collaborate internationally on biosecurity and invasive species management issues and, when possible, consider developing formal and enduring agreements and communication structures with other countries. Improved international coordination on biosecurity and invasive species management has the potential to increase the effectiveness of monitoring, early detection and rapid response, and control and eradication programs.

**Create regional reciprocity between states for U.S. Department of Agriculture (USDA) baggage inspections.** USDA regulation of interstate movement of airline baggage is focused on the protection of agricultural industries in the contiguous United States. This is particularly evident in Hawai'i, where baggage destined for the U.S. mainland is subject to federal inspection, while baggage moving from the mainland to Hawai'i is not. Agricultural industries in the Pacific Islands need to be similarly



## WORKSHOP

# The Prevention, Control, and Management of Established Species

Lake Tahoe, Nevada (Sept. 17-18, 2018)

The *Biosecurity and Invasive Species Initiative* workshop series kicked off on the shores of Lake Tahoe in Stateline, Nevada. The workshop focused on cross-boundary collaboration and efforts to control, manage, and eradicate established invasive species in Lake Tahoe and throughout the region.

Nevada Governor Brian Sandoval delivered a keynote in which he reminded the audience of what is at stake in the fight against invasive species, asserting that “Invasive species impact nearly every economic sector that depends upon western working lands, and by doing so they can interrupt the very social fabric of the West.”

The Governor added that “invasive species are an underlying cause of many challenges in the West, including the record 2018 wildfire in Nevada that swept across 439,000 acres, in many cases fueled by invasive cheatgrass. That area will now be an area where invasive species will flourish again.”

WGA Executive Director Jim Ogsbury also



**Nevada Gov. Brian Sandoval noted in his keynote that invasive species “can interrupt the very social fabric of the West.”**

spoke and highlighted how “Western Governors are using their convening power and energy to confront the scourge of invasive species. The impacts of invasive species in the West are as pervasive as they are underreported.”

The keynotes were augmented by a series of roundtables over two days moderated by California Secretary for Natural

Resources John Laird. Panelists from state and federal agencies, nonprofits, industry, and academia discussed issues such as: the relationship between invasive species, wildfire, and vegetation management; the economic impacts of invasive species and tourism; and the implementation of new research and technology in invasive species management.

protected from the risk of interstate movement of invasive species. USDA quarantines and airline baggage inspections should incorporate the priorities of non-contiguous states and territorial islands in the western region. This includes maintaining federal quarantines on pests (such as the emerald ash borer) that have not yet reached the West, and adopting policies that adequately protect Pacific states and territories, such as inspection of baggage moving from the contiguous U.S. to non-contiguous areas.

### **Increase use of innovative biosecurity prevention and detection programs.**

Western states should invest in tools and technology that increase the likelihood

of interception and bolster the efforts of limited personnel. The use of electronic manifesting for imported goods allows agricultural inspectors to focus on those commodities designated as high-risk for carrying invasive species. Similarly, the use of detection dogs can greatly enhance interdiction efforts. A pre-departure detection dog program for brown tree snakes on Guam, managed by USDA Wildlife Services, has saved Hawai‘i and the mainland U.S. billions of dollars in damages and can serve as a model for the interdiction of other invasive species.

### **Enhance regional biocontrol**

**coordination.** Biological control (biocontrol) can be an important component of invasive species control

**Biological Control** (biocontrol) is the reduction of pest populations by natural enemies (predators, parasites or diseases).

and integrated pest management strategies. Effective biological control is only possible through thorough and deliberate research, as well as effective interstate and federal-state communication and collaboration. Federal decisions related to the use of biocontrol should only be made after federal agencies engage in substantive consultation with implementing state agencies. The effectiveness and utilization of this important management tool could be improved by:

- **Creating a regional biocontrol research center.** For invasive species that have established beyond land managers' ability to conduct manual removal, biological control represents the most cost-effective, and often only, option for large-scale mitigation of invasive species. Invasive species do not recognize state boundaries, and neither should research and control efforts. Invasive species managers in the West would benefit from the creation of a new, state-of-the-art biological control facility, as well as a collaborative, multi-agency plan for maintaining and staffing new biocontrol facilities at a level that more adequately meets the expanding needs of the region.

- **Establishing an interagency working group to improve coordination and increase information exchange for biocontrol research, permitting and utilization.** As part of the Western Invasive Species Council (see below), Western Governors will convene a working group to explore the status of biological control research, permitting and utilization in the West. This working group comprised of representatives from state and federal agencies, academia, and private industry will examine how stakeholders can better work together to promote the development and utilization of safe and effective biocontrol methods. The working group will also examine how biological control actions are permitted by federal agencies and how states can exercise a more active role in permitting decisions.

## **RECOMMENDATION:**

### **Improve cross-boundary collaboration and coordination for the management of established and emerging invasive species in the West.**

The management of emerging and established invasive species is conducted

**Executive Order 13112** invasive species" means "with regard to a particular ecosystem, a non-native organism whose introduction causes or is likely to cause economic or environmental harm or harm to human, animal, or plant health. States may have different definitions, as well as regulatory and nonregulatory terms that are related to but not synonymous with the term, including pests, noxious weeds and injurious wildlife.

by a large network of public agencies, industry, private entities and NGOs. These entities often work to manage, control or eradicate invasive species for the benefit of specific resources such as wildlife, grazing, water, or hazardous fuel reduction. Many invasive species managers are also restricted, either by statute or by habit, to only implementing invasive species management at the level of their districts, management units, or specific area of geographic responsibility.

Invasive species are often not viewed as the cross-cutting, interdisciplinary resource threat that they truly are. States, federal agencies, regional coordinating groups, and local invasive species managers should manage invasive species at a regional level by improving formal invasive species management coordination mechanisms and developing new and innovative ways to address key aquatic and terrestrial species. They also should utilize existing innovative tools for cross boundary management, such as Good Neighbor Authority and the Incident Command System.

State and federal invasive species managers would benefit from the creation of new coordination mechanisms for invasive species policy development, as well as the planning, implementation, and monitoring of regional management actions. To this end, the following coordination instruments should be created:

**Western Invasive Species Council:** State invasive species councils and invasive plant councils provide policy level direction, planning and coordination for state-level biosecurity and invasive species prevention and management actions in the West. Councils are led by state agencies, non-profit organizations, industry, private landowners, and public-private partnerships. These groups empower those engaged in the prevention, detection, and eradication of invasive species, and serve as forums for invasive species education, communication, and strategic planning. Invasive species councils collaborate on regional-level issues and benefit from mechanisms that help coordinate and solve cross-boundary, cross-jurisdictional challenges.

Western Governors support the creation of a **Western Invasive Species Council** (WISC) to enhance coordination among existing state invasive species councils, improve communication and collaboration on regional biosecurity and invasive species control efforts, and to advocate for regional needs at the federal level. The Council should initially be coordinated through the WGA and work to address cross-boundary and cross-jurisdictional challenges identified through the Initiative.

### **A National Biosecurity and Invasive Species Management Center to streamline and centralize federal invasive species management:**

Throughout the Initiative, stakeholders often compared the threats posed by invasive species to the threats posed by wildfire. Like wildfire, invasive species move rapidly once established, can have devastating effects on landscapes and communities, negatively affect public health, and require a sophisticated response from a wide variety of federal, state and local agencies. Although invasive species present a landscape-level threat comparable to wildfire in terms of scope, scale and economic impact, federal coordination mechanisms for biosecurity and invasive species management receive only a fraction

## WORKSHOP

### WGA Working Lands Roundtable: Invasive Species and Restoration

Cheyenne, Wyoming (Oct. 11-12, 2018)

The Initiative's second workshop was conducted as part of WGA's Working Lands Roundtable, an effort to examine crosscutting policy issues and engage a broad coalition of stakeholders to advance WGA Chair Initiatives and other policy priorities. The focus of the event in Cheyenne, Wyoming was on efforts to restore western lands after invasive species infestations have been controlled and eradicated.

In his opening remarks, Wyoming Governor Matt Mead encouraged participants to work within the WGA framework, which "is sincere about finding solutions and doing it in a bipartisan way." He reminded attendees "you are sitting here today involved in a process that will work through the Western Governors and have potential for change in Congress. Time here is well spent because it can make a difference. This is a place where answers can be found. This is not a place where bipartisanship is just a talking point."

USDA Under Secretary for Natural Resources and Environment Jim Hubbard participated in a panel on Restoration Challenges in Fire-affected Landscapes.

of the federal funding of wildfire coordination.

The National Interagency Fire Center (NIFC) in Boise, Idaho, coordinates wildfire response throughout the U.S. Through NIFC, federal, state and local agencies develop regional wildfire preparedness strategies, coordinate wildfire response actions, and pool intelligence gathering and predictive services.

To improve national interagency communication and collaboration on biosecurity and invasive species



**The Working Lands Roundtable attracted regional experts such as Bob Budd of the Wyoming Wildlife and Natural Resource Trust.**

Hubbard observed how collaboration with states is a central component of the new USDA Shared Stewardship Initiative. "The Shared Stewardship notion is that the Forest Service is going to sit down with states through Governors' offices and see what our shared priorities are." The goal "is to have a discussion about where to make investments and, as much as possible, have mutual priorities" for active

management, a National Interagency Biosecurity and Invasive Species Management Center should be created on the model of NIFC. Such a center should act as a nerve center for coordinating invasive species prevention, early detection and rapid response, and eradication efforts. The center should house representatives from all relevant federal land management agencies, as well as interested states, local, and tribal agency representatives.

**Develop new approaches to regional species.** The spread of cheatgrass

management of western forests and rangelands.

The event also included a discussion on best practices and policy tools to help restore native western ecosystems and working lands after invasive species infestations. Additional panels examined rangeland restoration, post-fire restoration, and livestock and wildlife disease management.

and other invasive annual grasses has become a critical threat to healthy western rangelands. These invaders fuel uncharacteristic wildfire, harm watersheds, outcompete native vegetation, and diminish wildlife habitat on a large scale. Similarly, invasive quagga and zebra mussels fundamentally alter infested waterbodies, diminishing water quality and quantity, imperiling native species, and driving up the cost of boating, irrigation and hydroelectric power generation. As an outcome of this initiative, WGA will work with the Western Invasive Species Council to:



- **Work with state, federal and private entities to identify and implement cross-boundary projects to control invasive annual grasses at a regional level.** Such projects should include those using alternative management techniques such as outcome-based grazing.

- **Continue efforts to improve the interagency management of invasive quagga and zebra mussels in the West by hosting a WGA Invasive Mussels Leadership Forum.** The goal of the forum will be to collectively determine common interagency priorities for the prevention and containment of invasive mussels in the West and identify a shared interagency strategy to address these priorities.

**Utilize and expand the Incident Command System.** The Incident Command System (ICS) can be a powerful tool for rapid response to new invasive species introductions. Federal, state and local agencies have increasingly been using ICS for rapid response efforts. Utilization of the system could be improved by the following practices:

- **Increasing state, federal and local interagency preparedness training exercises.** The effective use of ICS depends upon practice and preparedness training by emergency responders in advance of incidents. State, federal, local and tribal agencies can opt to practice and implement the ICS as part of rapid response and strive to prepare for these responses through increased interagency training and preparedness exercises.

- **Creating an aquatic invasive species (AIS) ICS module.** To improve and standardize interagency response to new invasive species introductions, the Federal Emergency Management Agency (FEMA) should work with states to develop a new ICS training module for AIS rapid response.

**Identify and expand use of Good Neighbor Authority.** Good Neighbor Authority (GNA) allows states to enter into cooperative agreements with certain



**Hawai'i Gov. David Ige described his state's battle against invasive species as not only the "right thing" to do but work that makes "economic sense."**

federal agencies permitting them to perform various land management activities on federal lands. These tools have been successfully used by forest and rangeland managers to achieve various management objectives across federal, state and local government, and privately-owned lands. State and federal invasive species managers should learn from these successes and consider using GNA for cross-boundary collaborative invasive species control, management and eradication programs.

**Utilize effective partnerships.** Regional interagency stakeholder groups are key to the success of biosecurity and invasive species management in the West. When possible, policy-makers and invasive species managers should rely on these groups' expertise and collaborative frameworks.

**RECOMMENDATION:**  
**Empower state and federal agencies to manage invasive species.**

State and local agencies – including conservation districts, collaborative weed

management areas, and collaborative invasive species management areas – are key players in the fight against invasive species. These institutions are the tip of the invasive species response spear, providing the resources, local expertise, and on-the-ground results necessary to control the spread of invasive species in the West. These agencies not only manage invasive species on lands and waters under their own jurisdiction, but also often provide direct and indirect support to federal invasive species management programs.

Whenever possible, Congress and the Executive Branch should support the efforts of state and local groups. Federal agencies should recognize the role these groups play in protecting federal resources, and federal funding mechanisms should be structured so that these groups have sustainable, predictable and flexible long-term funding for invasive species management actions. Congress and the Executive Branch should engage in early and substantive consultation on biosecurity and invasive species management decisions that affect state resources.

## WORKSHOP

### Early Detection and Rapid Response

Helena, Montana (Nov. 14, 2018)

The third Initiative workshop focused on efforts to monitor for the introduction of new invasive species and rapidly respond once new infestations are detected. Panels at the event in Helena, Montana, moderated by Invasive Species Action Network Executive Director Leah Elwell, also examined topics like regional collaborative groups for invasive mussel containment, international coordination on feral swine management, and the use of emerging environmental DNA technologies.

In his keynote, Montana Governor Steve Bullock identified invasive species and their associated impacts as one of the “great environmental and economic threats to western landscapes.”

“This is not a local problem, but a global problem, one that can impact virtually every facet of natural resource management,” said Gov. Bullock. “Fortunately, I think that view is starting to change and it’s one that we can continue to broaden through WGA. Land managers, policy makers, and the general public are really working to discuss the broad implications of invasive species on the western landscape.”



**Rayola Jacobsen took part in the Montana workshop, which included a focus on rapid respond to new infestations.**

WGA Executive Director Jim Ogsbury opened the workshop by saying “we are here to drive towards affirmative, positive action. We are here to devise and lay the groundwork for implementation of on-the-ground solutions to the scourge of

invasive species in the West. Because, as we have seen time and again, no one is more capable than Western Governors to approach land management challenges in a methodical, practical, effective and bipartisan way.”

**Examples of effective collaborative and cooperative invasive species management programs include:** the National Fish and Wildlife Foundation’s Pulling Together Initiative; the Natural Resources Conservation Service’s Working Lands for Wildlife Program; the U.S. Fish and Wildlife Service’s Partners for Fish and Wildlife Program; and interagency collaborative programs under the U.S. Forest Service (USFS) State and Private Forestry Program.

Federal agencies should also be provided with the full suite of authorities necessary to control and contain the movement of invasive species in lands and waters under their jurisdiction.

#### **Provide necessary federal authorities.**

The containment of invasive quagga and zebra mussels at infested waters in the West depends on the mutual effort of federal, state and local agencies. Many state-led containment programs benefit from federal cooperation and funding; state and federal agencies should be encouraged to sustain and expand these effective partnerships. However, to adequately protect the West from the

movement of aquatic invasive species, federal agencies must act as full partners in invasive species containment efforts and have the funding and authorities necessary to contain invasive species within lands and waters under their jurisdiction. To this end, federal agencies, including the National Park Service and the Bureau of Land Management, should be vested with clear authority to manage watercraft upon their departure from infested waterbodies under federal jurisdiction.

**Consult with states on biosecurity decisions.** Congress and federal agencies must ensure early and substantive



consultation with states regarding biosecurity and invasive species management decisions that affect state resources, including:

- Federal pest quarantine decisions can affect state ecosystems, economies and public health. USDA's Animal and Plant Health Inspection Service should consider effects on state resources and strive to engage with states in early and substantive consultation when making pest quarantine decisions.
- State and local agencies are leaders in on-the-ground biosecurity and invasive species management. Federal funding, cooperative agreements, grants, and procurement contracts for state and local biosecurity and invasive species management should be structured in a deliberate and transparent way that provides for the greatest amount of flexibility and long-term planning.

**Review federal biosecurity and invasive species statutes.** Federal, state and local invasive species managers need federal laws that support on-the-ground action to prevent, contain and control invasive species. Western Governors encourage the Western Invasive Species Council to lead a state review of federal biosecurity and invasive species statutes — including the Lacey Act, the National Invasive Species Act, and the Nonindigenous Aquatic Nuisance Prevention and Control Act — to evaluate how they support on-the-ground management, identify gaps in their application, and ensure their structure and implementation addresses 21st century biosecurity and invasive species challenges. Of particular interest: opportunities to expand the taxonomic scope of the Lacey Act to benefit U.S. biosecurity.

#### **Utilize cooperative agreements.**

Cooperative agreements, grants and procurement contracts between federal agencies and state and local invasive species management authorities establish structured partnerships for collaborative invasive species management. Cooperative agreements lessen the burden on local federal land managers, while increasing the efficiency of invasive species



**Springer Kaye of the Big Island Invasive Species Committee makes a point during a panel on Integrated Pest Management.**

management programs and enabling local collaborative goal setting. Additionally, these agreements simplify project-based contracting by using the authorities of state and local government agencies. This can be extremely useful where infestations extend across multiple landownerships or the management objective is early detection and rapid response.

Federal agencies should be encouraged to expand the use of cooperative agreements with state and local governments and ensure that they are approved in a timely manner and in collaboration with implementing agencies. Federal agencies can also support invasive species management efforts by encouraging contract recipients to coordinate with state and local invasive species management agencies, regulatory programs, and cooperative weed and invasive species management areas.

#### **Provide collaborative and flexible funding.**

Formal and informal collaborative efforts involving federal, state, local and tribal governments, researchers, higher education, industry, NGOs, conservation groups, and private landowners are a source of place-based expertise and responsive invasive species management actions. Invasive species managers should participate in

The Bureau of Reclamation defines **environmental DNA (eDNA)** as “DNA present in an environmental sample, as differentiated from traditional sampling of DNA directly from an intact organism. eDNA frequently is thought of as DNA in tissue and cells that have been shed by an organism but can also refer to DNA within an intact organism (usually microscopic), if that organism is collected in the environmental sample. For eDNA analysis, samples are collected from the environment and DNA is then extracted from the full sample or some fraction of it.

eDNA assays allow surveillance for the presence of an organism in an environment without having to collect the whole organism itself.. Because the purified eDNA is a mixture representing multiple species and individuals present in the environment, this technique can be used to detect a wide range of organisms, including those that are endangered or invasive, and be used for both research and monitoring purposes.” (source: <https://www.usbr.gov/mussels/docs/eDNA.pdf>)

## WORKSHOP

# Biosecurity and Agriculture

Kohala Coast, Hawai'i (Dec. 9-10, 2018)

The Initiative's final workshop was held on the Kohala Coast of Hawai'i. The event began with a field trip to the Pu'u Wa'awa'a Forest Reserve, where participants learned about the detrimental impacts that invasive species have on watersheds as well as some of the ways that the Hawai'i Department of Lands and Natural Resource is reducing those impacts through invasive species removal, hazard fuel control, and native tree planting.

Hawai'i Gov. David Ige opened the workshop the next day by highlighting his state's significant work to battle invasive species as not only the "right thing," but work that makes "economic sense."

The Governor observed that "too often, we focus on managing and eradicating invasive species once they are established. However, it is more effective and cost-efficient to prevent these harmful invaders from entering our lands in the first place. That is why enhancing border biosecurity is a key component to invasive species management."

Panelists then participated in a discussion of pressing issues related to biosecurity and invasive species



**Jules Kuo of the Hawai'i Department of Natural Resources took part in the panel "Pre-Border Detection and Prevention Strategies."**

management in agriculture, with panels on pre-border prevention and detection strategies, the economic impacts of invasive species on agriculture, and the use of biocontrols.

Moderator John Laird, California Secretary for Natural Resources, offered closing remarks reflecting on the Initiative workshop series. "One goal of the workshops has been to broaden the

conversation about invasive species, their impacts, and the work being done to prevent their movement. By that measure, I feel that these workshops have been an outstanding success. Laird added: "The work of preventing, controlling, and eradicating invasive species will never end, and neither will the work of improving the way that agencies collaborate to address these risks."

inter-agency programs and collaborations that include private landowners and implement cross-boundary biosecurity invasive species management actions. Congress and the Executive Branch should support these programs and ensure that they benefit from long-term, stable and flexible funding that bolsters state, local and private invasive species management efforts.

**Coordinate state and federal aquatic invasive species inspection, decontamination and quarantine programs.** Aquatic invasive species

coordination groups have worked with the National Sea Grant Law Center (See Page 16) to develop a set of best practices for aquatic invasive species containment. These efforts have improved interagency communication and coordination on such containment in the West. Federal agencies should work to promote and implement these best practices in invasive species response efforts.

**Support state-led rapid response programs.** Prevention and containment are the most effective methods to

control the spread of invasive species, particularly invasive quagga and zebra mussels. Once a species is no longer contained, however, state-led rapid response programs represent key efforts to control their spread. Congress and the Executive Branch can support state-led rapid response programs by taking the following steps:

- Increasing federal funding for state-led aquatic invasive species rapid response programs, including those that provide for flexible, long-term support of state early detection rapid response efforts;



## CASE STUDY

# National Sea Grant Law Center

The National Sea Grant Law Center at the University of Mississippi School of Law is a nationally-recognized resource for information on aquatic invasive species (AIS) laws and policies. The Law Center has undertaken extensive research on ballast water management in the Great Lakes and published articles related to genetic biocontrol of invasive species and the impact of climate change on marine invasions.

The Law Center began conducting dreissenid mussel law and policy work in 2012. That year, Oregon Sea Grant, in partnership with the Law Center, U.S. Fish and Wildlife Service, and the Western Regional Panel on Aquatic Nuisance Species, secured funding from the National Sea Grant College Program to support a “Collaborative Learning Workshop for Assistant Attorneys General, Aquatic Invasive Species Coordinators, and Law Enforcement Officials” in Phoenix, Arizona.

To enhance collaborative learning during the Phoenix workshop, and to answer questions state agencies and AIS Coordinators had about authorities for watercraft inspections, decontaminations and quarantine, a team of Law Center staff and law students identified key legal issues that needed to be addressed in the region. Background papers were drafted for workshop attendees, which were further developed into five articles published in the *Arizona Journal of Environmental Law and Policy*. The law review articles covered a range of topics including the Lacey Act, 4th Amendment search and seizure issues, and state privacy laws.

Following the Phoenix workshop, the Law Center, in collaboration with the Association of Fish and Wildlife Agencies

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(AFWA), led efforts to develop a model legal framework for watercraft inspection and decontamination (WID) programs. In April 2014, the Law Center and the AFWA released “Preventing the Spread of Aquatic Invasive Species by Recreational Boats: Model Legislative Provisions & Guidance to Promote Reciprocity among State Watercraft Inspection and Decontamination Programs.” The “Model Regulation for State Watercraft and Inspection Programs” was released in December 2016 and the “Model Memorandum of Understanding [MOU] for Watercraft Inspection and Decontamination Programs” in December 2018. With the publication of the Model MOU, policymakers and regulators now have access to a model legal framework identifying model WID provisions from legislation through implementation.

To assist state natural resource managers and policy-makers in identifying commonalities, differences, and gaps among states, the Law Center undertook a review of each state’s WID laws and regulations to see how each state’s program compared to the authorities set forth in the Model State Legislative Provisions and Model Regulation. This companion report, updated in December 2018, contains a summary of the Law Center findings for all 50 states and detailed state-by-state comparisons

for the 19 states with WID programs. This analysis has provided crucial information in support of state legal reform efforts to address identified gaps. In 2017, for example, 12 states and the Tahoe Regional Planning Commission engaged in legal reform efforts related to their WID programs.

To support this policy work, the Law Center conducts extensive legal research and provides technical assistance

to western state partners. The Law Center maintains a compilation of AIS laws and regulations relevant to WID programs in the western United States. The Law Center prepares summary documents to inform legal reform efforts upon request. For example, in July 2016, the Law Center prepared a memo on state “Clean, Drain, and Dry” provisions and related requirements to inform discussions of the Western Association of Fish and Wildlife Agencies (WAFWA), which subsequently led to WAFWA adopting a resolution on drain plugs and vegetation removal.

The Law Center also conducts and publishes scholarly research related to invasive species. In addition to the law review articles mentioned above, in 2016, Law Center attorneys authored a law review article entitled “Working Together to Combat Invasive Species Threats: Strategies for Facilitating Cooperation between the National Park Service and the States.” This article was included in a special issue of the *Natural Resources Journal* commemorating the 50th Anniversary of the National Park Service. In 2014, the Law Center director contributed a chapter in *Climate Change Impacts on Ocean and Coastal Law: U.S. and International Perspectives* entitled “Confronting the Marine Invasive Species Threat: Practical and Legal Challenges.”



- Streamlining federal permitting and approval processes for treatment and management actions for new mussel detections;
- Creating a single federal authority for aquatic invasive species treatment permitting and approval in freshwater systems;
- Simplifying reporting on new invasive mussel infestations in states by creating a single federal point of contact for new mussel detections.

**Work collaboratively with states to implement the Vessel Incidental Discharge Act.** The U.S. Coast Guard and the Environmental Protection Agency should consult with Western Governors and states on implementation of the Vessel Incidental Discharge Act to ensure aquatic resource protection needs are met across the West and the Pacific. Federal and state partners should collaborate on the development of evidence-based risk assessments and assess the efficacy of policies and tools to mitigate the impact of various discharges, including hull biofouling. Protecting marine habitats in western states and Pacific territories is best accomplished by working with states that have the greatest knowledge of their ecosystems and invasive risks.

**RECOMMENDATION:**  
**Support and utilize new biosecurity research, technology and planning tools.**

Research and technology development are essential components of biosecurity and invasive species management. Emerging technologies may lead to solutions for some of the West’s most intractable challenges. By utilizing new research, technology and planning tools, invasive species managers can dramatically increase the effectiveness and cost-efficiency of invasive species management actions.

State and federal agencies can support



**WGA Executive Director Jim Ogsbury highlighted the Western Governors’ collaboration to “confront the scourge of invasive species.”**

biosecurity and invasive species research by encouraging invasive species workforce development, pooling research funding, and improving biocontrol information exchange. Invasive species managers can implement new research and technology by encouraging the development of modeling, risk-assessment and decision-making tools, as well as improved regional invasive species economic impact analyses.

**Improve and utilize environmental DNA monitoring.** Monitoring environmental DNA (eDNA) can be an effective tool to assess new aquatic invasive species introductions. State, federal and local agencies and regional coordinating groups should develop and implement a set of best practices for conducting eDNA monitoring and incorporating positive detection results into rapid response strategies.

**Encourage biosecurity and invasive species education and workforce development.** Effective biosecurity and invasive species management depends

on a dedicated and highly-skilled workforce. State and federal agencies should collaborate with universities to support programs essential to biosecurity and invasive species management, such as botany, zoology, plant pathology, taxonomy, and systematics.

**Take advantage of new research and technology.** Emerging research and technology can dramatically increase the efficiency and effectiveness of biosecurity and invasive species management actions. When possible, state and federal agencies should evaluate and utilize emerging technologies in areas such as remote sensing and monitoring, unmanned aircraft, use of artificial intelligence for species identification, and the use of innovative targeted grazing practices. Congress should continue to support research as a fundamental component of effective invasive species management.

**Pool research funding.** Institutions conducting research on biosecurity, biocontrol and invasive species control



methods should look for opportunities to pool funding resources and exchange information across administrative lines. By pooling resources, state, federal and private researchers can decrease redundancy and increase the efficiency of research funding. Pests and pathogens that affect wildlife at a regional scale, such as chronic wasting disease and elk hoof disease, present unique threats to western resources that would benefit from pooled resources and collaborative research efforts.

**Encourage the development and use of decision-making tools.** Biosecurity and invasive species decision-making tools help land managers examine invasive species management issues at a regional level and make sound, science-based decisions. Examples of these tools include risk-assessments, modeling programs, and prioritization tools such as the *WGA Top 50 Invasive Species in the West*.

Invasive species managers and policymakers should be encouraged to develop new decision-making tools, as well as build and improve upon the decision-making tools now in use. Invasive species managers should strive to incorporate regional-level, science-based decision-making tools into management decisions.

**Develop and utilize economic assessments.** The costs associated with invasive species management, both in terms of lost economic activity and control costs, are substantial but often poorly understood. Biosecurity and invasive species managers need to understand these costs in order to develop effective prevention and control strategies. Too few regional-level biosecurity and invasive species economic impact studies exist, however, and existing analyses are often too infrequently updated to reflect changing conditions.

State and federal land managers should be encouraged to develop new biosecurity and invasive species economic analysis tools and implement these tools into management decisions. When possible, state and federal

**WGA Top 50 Invasive Species in the West.** Individual states have developed invasive species risk assessments within their boundaries, but previously no such list existed for the entire western region. WGA surveyed invasive species coordinators in its member states and territories to develop the “Top 50 Invasive Species in the West, a first-ever regional prioritization tool.

agencies should pool resources to develop regional-level invasive species economic impact assessments.

**Support National Institute of Food and Agriculture programs.** The USDA National Institute of Food and Agriculture (NIFA) operates several agricultural, biosecurity and biocontrol research programs that facilitate state efforts to prevent the introduction of new invasive species. The programs are focused on detection and diagnostics, regulatory systems support, and development and deployment of new pest management systems and protection technologies.

Among these programs are the Tactical Sciences Initiative, which develops and deploys tools to protect food and agriculture production systems against threats from pests, diseases, contaminants and disasters. Congress and the Executive Branch should continue to support and expand needed research on biosecurity and invasive species, including work accomplished under NIFA such as the Tactical Sciences Initiative.

### **RECOMMENDATION: Standardize and mobilize invasive species data**

High-quality information is essential in the fight against invasive species in the West. Land managers, conservation groups, industry and private landowners need access to accurate, up-to-date regional invasive species occurrence data. Technological barriers often

prevent large amounts of useful invasive species occurrence data from being shared. Western Governors are leading an effort to improve how interagency invasive species data is standardized, stored and exchanged in the West.

**Standardize Invasive Species Data.** On March 14-15, 2018, WGA held a workshop that focused on the interagency management and exchange of invasive species occurrence data in the West. The WGA Invasive Species Data Management Workshop in Denver, Colorado, convened 27 representatives from state and federal agencies, NGOs, industry, and other groups. The goal of the workshop was to develop a set of agreements to improve the reporting, exchange and utilization of invasive species occurrence data by state and federal agencies, invasive species data aggregators, private landowners, industry, and other stakeholders. The workshop outcomes were memorialized in the workshop’s Findings and Recommendations document.

Western Governors encourage all public and private invasive species data managers to consider the findings and recommendations developed at the WGA Invasive Species Data Management Workshop, and to record, store, and exchange invasive species occurrence data using common regional standards and formats whenever possible.

**Mobilize Invasive Species Data.** As an outcome of the Initiative, Western Governors will lead a new “Invasive Species Data Mobilization Campaign” to increase the availability of invasive species occurrence data to all land managers in the West. Through the campaign, WGA will work with federal, state, local and tribal governments, researchers, higher education, industry, NGOs and conservation groups, private landowners and citizens. The goal will be to encourage stakeholders to enter data that is not recorded using a common standard or is not shared or recorded using a common data aggregating platform into existing invasive species data management platforms as described in the Findings and Recommendations document.



# WEBINARS

Giant Salvinia.

## WEBINAR: Biosecurity and Invasive Species Initiative Launch

WGA Chair and Hawai'i Governor **David Ige** highlighted the importance of invasive species management in the West and the Initiative's goals and deliverables. WGA Policy Advisor Bill Whitacre then moderated a discussion with leaders in invasive species data management that showcased the outcomes of the WGA Invasive Species Data Management Workshop, an effort to improve the interagency exchange of invasive species occurrence data in the West.

**Moderator: Bill Whitacre**, WGA Policy Advisor. **Panelists: Chuck Barger**, Associate Director for Invasive Species and Information Technology, University of Georgia; **Pam Fuller**, Program Leader, Nonindigenous Aquatic Species Database, USGS; **Stinger Guala**, Director of Biodiversity Information Serving Our Nation, USGS; **Jamie Reaser**, Executive Director, National Invasive Species Council; **Lori Scott**, Interim President & CEO, NatureServe.

### Comments included:

*"We've developed the Hawai'i Interagency Biosecurity Plan to establish a path forward to a more secure future where Hawai'i is better protected from new invasive species threats, and to better mitigate our current threats."*

**Governor David Ige**

*"All invasive species management is local. When you start telling the story about these problems, you need to make sure that the data is available at a larger level in order to paint an accurate picture of what the problem is and what the next one might be."* **Chuck Barger**

*"We try to provide the national view of aquatic species: where they are, where they have been, and where they're moving. We also keep track of pathway information. We are trying to serve land managers with this information."* **Pam Fuller**

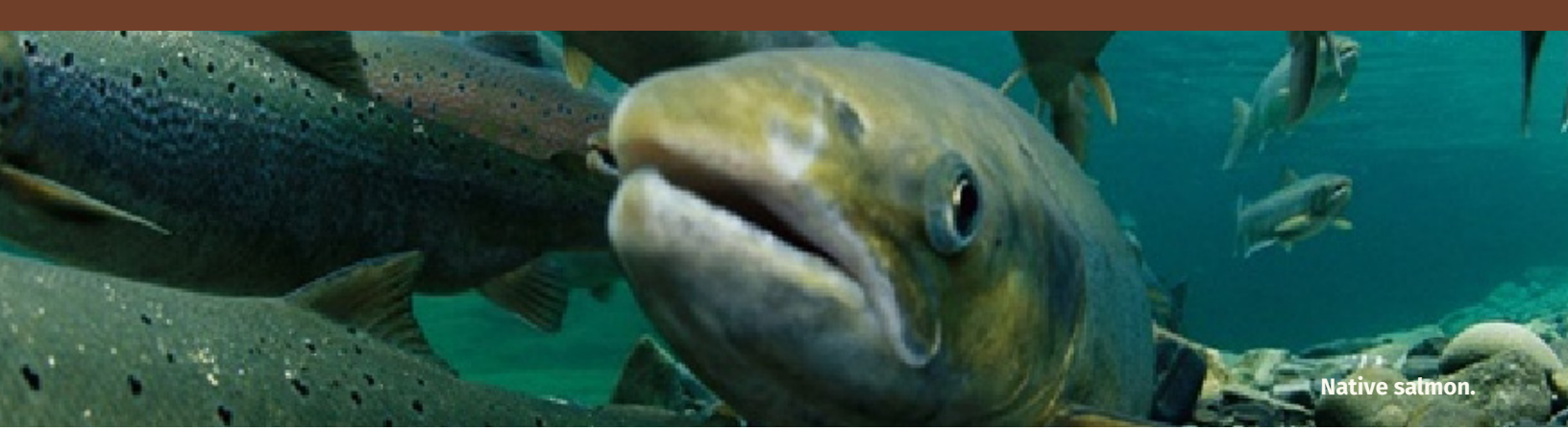
*"BISON (Biodiversity Information Serving Our Nation) is the place to go for a geographically and taxonomically comprehensive overview. That's why the data management piece is important to us; we're trying to do national-scale views of where the deepest problems are in invasive species."* **Stinger Guala**

*"There's a step beyond just sharing the data. There's a necessary collaboration around the development and open access to the decision support tools that move the data in a direction needed by decision-makers, whether in policy or land management."* **Jamie Reaser**

*"In building this integrated system, we're thinking about data standards not only for moving data back and forth, but moving data in a way that doesn't end up ballooning on itself."*

**Lori Scott**





Native salmon.

## WEBINAR: Invasive Species Impacts on Fisheries

Land managers and invasive species experts discussed the impacts of invasive species on fisheries in the Pacific Northwest. Speakers from Washington highlighted the management challenges related to northern pike in the Columbia River Basin. Panelists also discussed the effects of non-native predation of salmon in Alaska.

**Moderator: Justin Bush**, Executive Coordinator with the Washington Invasive Species Council. **Panelists: Joe Maroney**, Director of Fishery and Water Resources, Kalispel Tribe of Indians; **Parker Bradley**, Invasive Species Research Biologist, Alaska Department of Fish & Game; **Laura Robinson**, Program Liaison Coordinator, Northwest Power & Conservation Council.

### Comments included:

*“Predation of northern pike has really wide-reaching impacts. In the Columbia River Basin, over \$1 billion has been invested in salmon recovery over the last two decades. This investment and the progress made towards recovery of those species are directly threatened if northern pike continue to spread downstream of the Columbia River and they begin to prey on salmon and steelhead.”* **Justin Bush**

*“Managers local to the Columbia River Basin need to be concerned about what they’re going to do (about northern pike). It’s better to do something now than to do something later because the costs associated will be significantly less.”*

**Joe Maroney**

*“We have evidence that pike specifically target salmon. When pike are introduced to a new area that also have salmon, often they will target salmonids, and when those populations become depleted or extirpated then they’ll shift their diet over to other species of fish... finally they’ll move on to invertebrates because that is all that is left.”*

**Parker Bradley**

*“Working across jurisdictions allows for really wonderful things like coordination and collaboration, but it can also make reaching an agreement difficult. An invasive species in one state could be a game fish in another.”* **Laura Robinson**

## WEBINAR: Conservation Districts and Invasive Species Management

Representatives from conservation districts in Hawai‘i, Oregon and New Mexico discussed innovative, cross-boundary efforts to manage invasive species. Panelists also highlighted how Natural Resources Conservation Service (NRCS) programs and funding can facilitate invasive species management on private land.

**Moderator: Travis Thomason**, Director Pacific Islands Area, NRCS. **Panelists: Mae Nakahata**, Director, Maui County Soil and Water Conservation District; **Michelle Delepine**, Invasive Species Program Manager, West Multnomah Soil and Water Conservation District; **Lindsey Karr**, WeedWise Specialist, Clackamas Soil and Water Conservation District; **Debbie Hughes**, Executive Director, New Mexico Association of Conservation Districts

### Comments included:

*“I learned from experience that if I wanted to be successful with any conservation program, whether it be federal, state, or local, it needed to be done hand-in-hand with conservation districts.”*

**Travis Thomason**

*“Conservation districts help provide immediate boots on the ground who are aware of local risks. It is important to be able to take immediate action when circumstances change.”*

**Mae Nakahata**

*“Garlic mustard is considered an ecosystem modifier. It has been documented to cause ecosystem imbalance where it becomes established. It is a highly elastic plant that adapts easily to different growing conditions and climate.”* **Michelle Delepine**

*“Conservation district partnerships can help address gaps in management. Invasive weeds don’t pay attention to property lines. Public land managers will often treat a weed only for it to be re-infested by a neighboring property on private land. Conservation districts can step in and work with private landowners to address this challenge.”* **Lindsey Karr**

*“Many of the ranches we work on are checkerboard ranches of private, state and federal land. Being able to use Farm Bill funding on BLM and USFS land has made a huge difference in being able to leverage resources and form partnerships.”*

**Debbie Hughes**



Coconut Rhinoceros Beetle.

## WEBINAR: Innovative Approaches to Addressing Forest Health & Invasive Species in the Pacific Islands

Invasive species can have particularly devastating effects on specialized island ecosystems and economies. Panelists discussed the unique challenges related to invasive species prevention and control in the U.S. Pacific Islands.

**Moderator:** Bill Whitacre, WGA Policy Advisor. **Panelists:** Susan Cordell, Director, Institute of Pacific Islands Forestry, U.S. Forest Service; Pua Michael, Head Forester, Division of Forestry, Palau Bureau of Agriculture; DJ Sene, American Samoa Community College, Agriculture, Community and Natural Resources Division; Chelsa Muna-Brecht, Director, Guam Department of Agriculture

### Comments included:

*“Many island species are highly endemic and have lost their ability to compete with invasive species. These systems are more vulnerable to invasion from the get-go. Once an invasive*

*species becomes established, it can create cascading effects system-wide.”* **Susan Cordell**

*“Our congress passed a ‘Green Fee,’ which is a tax built into the ticket price to come to Palau. The fund helps support marine and terrestrial environments. The funds are working really well, and we are now looking at ways to expand outside of protected areas to prevent invasive species from entering sensitive areas.”* **Pua Michael**

*“Increased funding would be a great help not just for more personnel, but for additional training and workshops with our sister islands and the U.S. mainland. Having other managers or researchers visit American Samoa or other islands to share knowledge and resources would help us to better tackle issues together.”* **DJ Sene**

*“Our top three forest species from 2002 are now facing annihilation from the Coconut Rhinoceros Beetle and Asian Cycad Scale, two invasive species. You need to think about what losing your top three species will do to your landscape, let alone your ecosystem.”* **Chelsa Muna-Brecht**

## WEBINAR: Exploring the State-APHIS Relationship

Panelists focused on how the Animal and Plant Health Inspection Service (APHIS) collaborates with western states to prevent the spread of invasive species. Participants from Hawai'i highlighted the role of state authority in regulating the movement of pests and plants and explored strategies to improve coordination between federal and state regulations. The discussion also included regulations affecting the movement of forest pests in the West.

**Moderator: Bill Whitacre**, WGA Policy Advisor. Panelists: **Andrea Huberty**, Director, Plant Health Programs, Plant Protection and Quarantine, APHIS; **Rob Hauff**, State Protection Forester, Hawaii Dept. of Land & Natural Resources; **Jonathan Ho**, Acting Manager, Plant Quarantine Branch, Hawaii Dept. of Agriculture; **Bob Simpson**, President, Greenwood Global Consulting.



**Emerald Ash Borer.**

### Comments included:

*"Through increased conversations between states and APHIS, agencies have the opportunity to share what their capacities and challenges are in managing biosecurity and pests, and model an example for future efforts."* **Bill Whitacre**

*"Our actions need to be based on risk, and we can only implement the least drastic action that is feasible and adequate to address that risk. We want to make sure we are only stepping into states' issues when there is an extraordinary emergency in front of us."* **Andrea Huberty**

*"The preemption issue we have with the Plant Protection Act is that it requires us to act at both the state and federal level if we are going to protect Hawaii from additional invasions of this pest. Both require information to demonstrate the potential damage caused by additional introductions. This is an especially difficult issue when you're trying to protect an endemic species that only exists on a remote archipelago."*

**Rob Hauff**

*"We are preempted from inspecting foreign commerce. Hawaii has gotten a few pests that were not invasive in their native range, but upon entering Hawai'i they became a pest. The state has the ability to regulate things that aren't necessarily a pest yet, but not necessarily through the Plant Protection Act."* **Jonathan Ho**

*"From European colonization to 1930, over 300 years, America lost only two tree species to invasive species: the American Chestnut and the American Elm. Loss of the Chestnut almost decimated eastern forests. This led to near extinction of the eastern black bear, turkey, and white-tailed deer. Today, 25% of all trees greater than 1-inch in diameter have a great chance of expiring by 2027 due to invasive species. This means that over the next 50 years we are expected to lose over 20 tree species."* **Bob Simpson**

## WEBINAR: Species Distribution Modeling and Scenario Planning

Decision support tools and scenario planning strategies can help land managers plan for and react to uncertain future conditions. Panelists discussed a collaborative effort between the U.S. Geological Survey and National Park Service to develop species distribution models for high-priority invasive plants. Panelists also reported on a research project that pairs scenario planning with quantitative modeling to explore potential effects of climate scenarios and management alternatives on rangelands in South Dakota.

**Moderator: Jeff Morissette**, Science Coordinator with the National Invasive Species Council Secretariat. **Panelists: Terri Hogan**, Invasive Plant Program Manager, National Park Service; **Catherine Jarnevich**, Ecologist, U.S. Geological Survey; **Greg Haubrich**, Noxious Weed Coordinator, Washington Department of Agriculture; and **Brian Miller**, Research Ecologist, U.S. Geological Survey.

### Comments included:

*"I want to look at the issue of private, state, and federal collaboration. People focus on where their mandate mission takes them, which makes a lot of sense, but one of the opportunities that WGA brings through these webinars and future work is to leverage the work that is being done across those various jurisdictions."* **Jeff Morissette**

*"Land managers need tools to help make strategic decisions about where to focus their limited resources to best address invasive plant control."* **Terri Hogan**

*"We used modeling to create maps where cheatgrass may actually be on the landscape. The Forest Service was then able to use the maps to first get funding, and then to guide aerial herbicide application to try to control cheatgrass in the post-burn landscape."*

**Catherine Jarnevich**

*"With the 23 major invasive species in Washington, if we had let them expand to their potential, we would be looking at \$1.3 billion in losses per year and loss of up to 8,000 jobs."* **Greg Haubrich**

*"Something we're able to find with quantitative ecological modeling is being able to identify some tradeoffs. For example, having a lower density of livestock on a landscape may provide a buffer in forage for dry years, but allows for increased growth of cool-season exotic grasses."* **Brian Miller**

# STATE PROGRAMS

## Colorado

Colorado has the largest mandatory watercraft inspection and decontamination station network in the nation. The network prevents the introduction of zebra and quagga mussels, as well as other aquatic invasive species, into the nation's headwaters to protect natural resources and the critical water storage and supply infrastructure necessary for municipal, agricultural and industrial uses.

Following the detection of quagga mussels in Lake Mead more than a decade ago, Colorado quickly implemented a multi-jurisdictional network focused on halting the single largest pathway of invasive mussel spread – recreational watercraft. Education is a cornerstone of the invasive species program, but the state also requires professional inspection and decontamination of all motorized or trailered watercraft entering the state, and those that launch on high-risk waters.

Colorado's robust lake and reservoir sampling and monitoring program exceeds regional standards for early detection monitoring. While states without these kinds of networks continue to detect new invasions of zebra or quagga mussels, Colorado has remained negative for invasive mussel infestations.

The state also developed the Regional WID Data Sharing System, now the main method of communication among inspection stations and managers. The system is now performing watercraft inspection and decontamination in 10 western states, as well as for numerous local governments, national parks, and private industry. It consists of a mobile application for field personnel, a website for managers and a shared database. The system, which sends out real time alerts when infested watercraft are moving into uninfested waters, has directly resulted in more interceptions preventing new invasions.



**Zebra Mussels.** USFWS photo

Colorado has additionally provided leadership by chairing the Western Regional Panel on Aquatic Nuisance Species, the main coordinating body for western aquatic invasive species programs and is focused on the multi-state implementation of the Quagga Zebra Action Plan for Western Waters.

## Hawai'i

The State of Hawai'i adopted its first interagency biosecurity plan in 2017, presenting a comprehensive gap analysis of biosecurity policies, personnel, and infrastructure alongside a 10-year implementation plan of 147 action items to address gaps identified. The Hawai'i model takes a broad view of biosecurity, examining needs in pre-border risk mitigation, border interception, and post-border detection and response.

**Interagency Scope:** The Hawai'i Interagency Biosecurity Plan (HIBP) recognizes that dealing with invasive species is a team effort. Plan development was led by the Hawai'i Department of Agriculture (HDOA) and the Hawai'i Invasive Species

Council (HISC), with input from the Department of Land and Natural Resources (DLNR), Department of Health (DOH), University of Hawai'i (UH), Department of Transportation (DOT) and Department of Business, Economic Development, and Tourism (DBEDT). Critically, plan development included several workshops for industry representatives and members of the public, including farmers, nurseries, air and sea transportation companies, and commodity consolidators.

**Gap Analysis:** The HIBP identified a number of critical policy, infrastructure, and capacity gaps in Hawai'i, including:

- A need for new biocontrol research facilities for both pathogens and insects;
- A need for modern databases for import manifests, ballast water inspections, and data collection to inform risk assessments;
- Policy gaps regarding the regulation of biofouling on vessel hulls;
- Adequate funds and standardized policies for emergency response;



# The 2027 Hawaii Interagency Biosecurity Plan

A shared path forward



- The need for increased operating funds and staffing. While Hawai'i's economy and visitor industry rebounded from the 2008 economic downturn, staff numbers at HDOA, DOH, and other important agencies had not similarly rebounded from a reduction in force.

**Long-term Goals:** The 2027 biosecurity vision described in the HIBP would effectively protect Hawai'i's agriculture, natural resources, economy, and way of life from the risks associated with invasive species. Key components of biosecurity in 2027 include:

- New state and federal biocontrol laboratories, capable of serving regional biocontrol needs;
- Fully implemented electronic manifesting for incoming cargo, allowing for commodity and pathway risk analyses built on interception databases;
- Transitional inspection facilities to allow biosecure agricultural inspections away from busy port areas;
- State policies on ballast water and biofouling allowing for in-water cleaning and standardized reporting;
- Emergency response plans and training based on Incident Command Systems;
- Fully restored DOH Vector Control Branch, doubled capacity for agricultural inspection and pest response.



**Paper manifests for incoming cargo will soon be replaced with electronic manifesting that speeds up import while more effectively directing limited inspection resources.** (photo: HDOA)

**Progress to Date:** Agency staff provide status updates every six months on each of the 147 action items in the HIBP. By January of 2019 half of the action items in the plan had been initiated, primarily those actions that could be completed with existing staff and funding. Remaining years in the implementation window will focus on increasing staff and enhancing facilities. To date:

- DOH Vector Control Branch has been restored;
- Additional positions provided to HDOA for import risk assessments;
- Electronic manifest and import database development in final stages at HDOA;

- UH has added a number of extension agents focusing on the nursery industry;
- Funds provided for biocontrol facility planning, detector dog program restoration, and construction of ungulate exclusion fences;
- Increased funding provided to HISC for interagency project support.

The HIBP and biannual progress reports are available online at <http://dlnr.hawaii.gov/hisc/plans/hibp/>.

## Montana

The Montana Invasive Species Council (MISC) identifies and coordinates independent science advisory panels to inform state efforts based on the current status, trends, and emerging technology related to invasive species management.

Environmental DNA (eDNA) was identified as the first area for further exploration, specific to invasive dreissenid mussels. The use of eDNA to detect the presence of invasive mussel DNA in the environment holds both promise and uncertainty. eDNA technology is evolving rapidly and may in the future surpass traditional methods for efficiency and confidence. However, natural resource managers across the West have struggled with how best to utilize information provided from eDNA results in real-time management applications as well as having confidence in the method and results.

An international panel of six technical experts was assembled to evaluate the value of eDNA for dreissenid mussel early detection and provide guidance to managers regarding its use. The panel also responded to questions related to the state of the science, sampling in the field, lab analysis, interpreting results, and management implications. A workshop attended by MISC members, stakeholders, and partners provided an opportunity for discussion of those questions and answers and for panelists to identify the challenges and formulate recommendations for the use of eDNA.



Panelists agreed on a set of nine recommendations spanning areas such as communications planning, confirmation of results, and appropriate applications of eDNA. WRP has since formed a subcommittee to address the panel recommendations.

## Utah

The Utah Division of Wildlife Resources (UDWR) has worked cooperatively with Arizona Game and Fish Department and the National Park Service since 2013 to conduct watercraft inspection and decontamination activities as part of a containment program for invasive quagga mussels at Lake Powell.

The agencies reported in 2018 that they had inspected nearly 70,000 watercraft destined for other waterbodies, decontaminating nearly 4,500 boats. Lower lake levels and an expanding mussel population resulted in floating adult mussels in the water column -- something not observed previously.

Upon inspection, adult mussels were frequently found in sea strainer devices aboard watercraft, necessitating the quarantine of dozens of boats in Utah and surrounding states. Through collective knowledge and creativity, UDWR was able to rapidly modify and adapt standard inspection and decontamination protocols used throughout the West to combat these new developments.

The changes quickly resulted in improved inspections and decontaminations, a significant decrease in the number of boats found with mussels aboard upon subsequent inspections, and spawned a partnership between UDWR, the Bureau of Reclamation, and the National Park Service to conduct research studies examining the viability of both larval and adult mussels passing through different types of ballast pumps. Study results indicated that adult mussels can easily survive passage through ballast pumps, spurring further research studies and critical analysis of current decontamination protocols.



The Utah Division of Wildlife Resources is working with the Arizona Game and Fish Department and the National Park Service at Lake Powell.

## Washington

Washington's approach to invasive species has five key aspects. The state focuses on collaboration and works with many groups, including tribes, agencies, industry and academia.

**Education:** The state created Washington Pest Watch — a citizen science initiative led by agencies and universities that enables citizens to report sightings, which are delivered immediately to responders.

**Prevention:** There are state boat inspection stations at two Ports of Entry. Increased funding enables the state to keep stations open longer and add a mussel-sniffing dog. To further increase protection, the state created agreements with the National Park Service and a county sheriff's office to give officers the state's authority to inspect boats; arrest drivers for not stopping at the inspection stations; enforce clean, drain, dry requirements; and issue decontamination orders.

### Early Detection and Rapid Response:

The state has created a collaborative to improve readiness for urban forest pests. This collaborative is developing a plan that will clarify response roles between cities and state and federal agencies in protecting Washington's more than 200 cities from invasive insects and infectious diseases that could decimate forests.

**Containment:** To prepare for invasive mussels, Washington is holding a first-in-the-West field exercise with on-the-ground response, containment, watercraft inspection & decontamination, rapid monitoring and assessment, and mock treatment.

**Long-Term Management:** Washington State and Canada created an action plan for European green crab that delivers a coordinated response in the Salish Sea and guides research and management in both jurisdictions. In addition, Washington created a collaborative to address flowering rush by sharing best practices and developing an action plan for basin-wide management.



## ON THE WEB:

Find Initiative resources and join the conversation at [westgov.org](http://westgov.org)

The work of the *Western Governors' Biosecurity and Invasive Species Initiative* focused on the impacts that nuisance species, pests and pathogens have on ecosystems, forests, rangelands, watersheds and infrastructure in the West. The Initiative examined the role that biosecurity plays in addressing these risks and identified emerging issues to develop policy recommendations, best practices and technical tools to address those challenges. To ensure the conversation reached the widest possible audience, WGA launched an online resource that includes videos of all workshops and webinars. We've also created the Initiative Appendix, a document that delivers expanded detail on the conversations at each workshop and webinar.



## WORKSHOPS

WGA hosted four regional Initiative workshops that attracted nearly 300 attendees combined. The workshops were livestreamed via YouTube and Facebook, amassing more than 7,300 views during the Initiative's first year. Workshops were hosted by Western Governors **Brian Sandoval** in Nevada, **Matt Mead** in Wyoming, **Steve Bullock** in Montana and **David Ige** in Hawai'i.

All workshops may be viewed on WGA's website or YouTube Channel.



## WEBINARS

The Initiative was launched with a webinar, hosted by WGA Chair and Hawaii Gov. David Ige, that featured a discussion on how to improve the interagency exchange of invasive species occurrence data. Additional webinars included topics such as "Invasive Species Impacts on Fisheries," "Conservation Districts and Invasive Species Management," "Exploring the State-AHPIS Relationship," "Species Distribution Modeling and Scenario Planning," and "Innovative Approaches to Addressing Forest Health and Invasive Species in the Pacific Islands."

All webinars may be viewed on WGA's website or YouTube Channel.

**BIOSECURITY AND INVASIVE SPECIES INITIATIVE**

**WESTERN GOVERNORS' ASSOCIATION**

**WEBINAR SERIES**

WEDNESDAY, MAY 1, 2019

**Species Distribution Modeling and Scenario Planning**

**MODERATOR:**

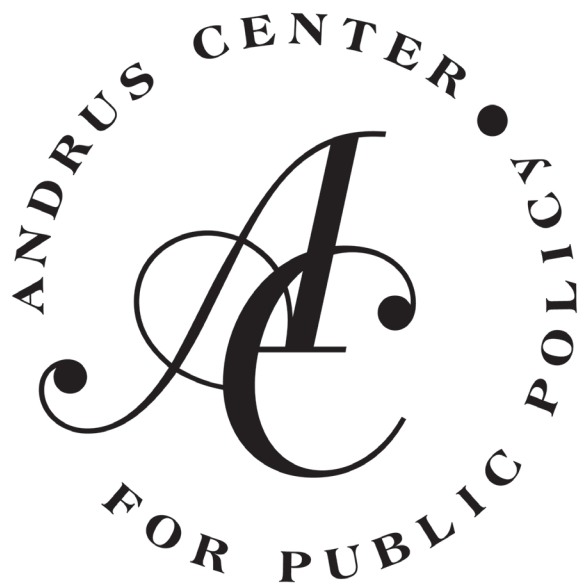
- Jeff Morissette, Chief Scientist, National Invasive Species Council Secretariat

**PANELISTS:**

- Terri Hogan, Invasive Plant Program Manager, National Park Service
- Catherine Jarneveh, Ecologist, U.S. Geological Survey
- Greg Haulrich, Noxious Weed Coordinator, Washington Department of Agriculture
- Brian Miller, Research Ecologist, U.S. Geological Survey

The Western Governors' Association would like to thank the following for their support of the Biosecurity and Invasive Species Initiative

**INITIATIVE SPONSOR**



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# PARTICIPANTS

WGA appreciates the time and effort that workshop panelists provided to the Initiative.

## Panelists and Speakers

### Lake Tahoe, Nevada Workshop, September 17-18, 2018

The Honorable Brian Sandoval, Governor,  
State of Nevada

John Laird, California Secretary for Natural  
Resources, California

Amy Berry, Chief Executive Officer, Tahoe Fund

Meghan Brown, Deputy Administrator-Plant  
Industry, Nevada Department of Agriculture

Nicole Cartwright, Executive Director,  
Tahoe Resource Conservation District

Sudeep Chandra, Associate Professor,  
University of Nevada Reno

Cindy Gustafson, Chief Executive Officer,  
North Lake Tahoe Resort Association

Lisa Heki, Project Leader, Lahontan National  
Fish Hatchery Complex, U.S. Fish and Wildlife  
Service

Karen Jetter, Research Economist, University  
of California Davis, Agricultural Issues Center

Doug Johnson, Executive Director,  
California Invasive Plant Council

John Kabashima, University of California  
Cooperative Extension, Emeritus

Kacey KC, State Forester, State of Nevada

Elizabeth Leger, Associate Professor,  
University of Nevada Reno

Jeff Marsolais, Forest Supervisor, Lake Tahoe  
Basin Management Unit, U.S. Forest Service

Ken Mayer, Fire and Invasive Initiative  
Coordinator, Western Association of Fish  
and Wildlife Agencies

Laura Megill, Aquatic Invasive Species  
Coordinator, Nevada Department of Wildlife

Don Neal, Director of Environmental Services,  
Southern California Edison

Heath Packard, Director of Government &  
Public Relations, Island Conservation

Jesse Patterson, Chief Strategy Officer,  
League to Save Lake Tahoe

Paul Petersen, Fire Management Officer,  
Nevada Bureau of Land Management Office

Roland Quitugua, Extension Biosecurity  
Associate, University of Guam Extension  
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Martha Volkoff, Environmental Program  
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and Wildlife

Dennis Zabaglo, Aquatic Resources Program  
Manager, Tahoe Regional Planning Agency

### Cheyenne, Wyoming, WGA Working Lands Roundtable, October 11-12, 2018

The Honorable Matt Mead, Governor of  
Wyoming

Jim Hubbard, Under Secretary for Natural  
Resources and Environment, U.S. Department  
of Agriculture

Doug Miyamoto, Director, Wyoming  
Department of Agriculture

Willow Bish, Wildlife Biologist,  
Wyoming Game and Fish Department

Bob Budd, Executive Director, Wyoming  
Wildlife and Natural Resource Trust

Bill Crapser, State Forester, State of Wyoming

Jessica Crowder, Policy Director, Western  
Landowners Alliance

Randy Crowl, Manager, Colorado Seed Lab,  
Colorado State University

Daniel Denipah, Forest Development  
Restoration Manager, Santa Clara Pueblo

Curtis Elke, Idaho State Conservationist,  
Natural Resources Conservation Service

Colleen Faber, Environmental Health & Safety  
Supervisor, Anadarko

Mary Farnsworth, Deputy Regional Forester,  
Intermountain Region, U.S. Forest Service

Bobbie Frank, Executive Director, Wyoming  
Association of Conservation Districts

Garth Fuller, Eastern Oregon Manager,  
The Nature Conservancy

Don Hajar, Owner, Pawnee Buttes Seed Inc.

Matt Holloran, Principal, Operational  
Conservation LLC

Camille Hopkins, Wildlife Disease Coordinator,  
Ecosystems Mission Area, U.S. Geological  
Survey

Shara Howie, Program Manager, NatureServe

Gwyn McKee, President, Great Plains Wildlife  
Consulting

Peggy Olwell, Plant Conservation Program  
Lead, Bureau of Land Management

Dave Pellatz, Executive Director, Thunder  
Basin Grassland Prairie Ecosystem Association

Barry Perryman, Professor, University of  
Nevada-Reno

Jolie Pollet, Division Chief, Fire Planning  
and Fuels Management, Bureau of Land  
Management

Lisa Reynolds, Assistant Attorney General,  
State of Colorado

Brenda Richards, Coordinator, Idaho  
Rangeland Conservation Partnership

John Ruhs, Assistant Director, Fire and  
Aviation, Bureau of Land Management

Derek Sebastian, Western Area Sales Manager-  
Vegetation Management, Bayer U.S.

Scott Smith, Deputy Director of External  
Operations, Wyoming Game and Fish  
Department

Tom Spezze, Senior Director of Conservation-  
Western US, National Wild Turkey Federation

Peter Stahl, Professor of Soil Ecology,  
University of Wyoming

Scott Talbott, Director, Wyoming Game  
and Fish Department

Jeremy Maestas, Sagebrush Ecosystem  
Specialist, Natural Resources Conservation  
Service

Michael Miller, Senior Wildlife Veterinarian,  
Colorado Department of Wildlife

Kurt VerCauteren, Feral Swine and Ungulate  
Project Leader, National Wildlife Research  
Center

Noreen Walsh, Director, Mountain-Prairie  
Region, U.S. Fish and Wildlife Service

Jeff Whitney, State Forester, State of Arizona

### Helena, Montana Workshop, November 14, 2018

The Honorable Steve Bullock, Governor,  
State of Montana

Leah Elwell, Executive Director, Invasive  
Species Action Network

Gary Adams, Montana State Plant Health  
Director, U.S. Department of Agriculture-  
Animal and Plant Health Inspection Service

Jon Amberg, Fish Biologist Researcher,  
U.S. Geological Survey

Josh Atwood, Invasive Species Coordinator,  
Hawai'i Invasive Species Council

Hans Bodenhamer, Northern Rocky Mountain  
Grotto

Ryan Brook, Associate Professor, University  
of Saskatchewan

Elizabeth Brown, Invasive Species Coordinator,  
Colorado Parks & Wildlife

Dave Burch, State Weed Coordinator,  
Montana Department of Agriculture

Justin Bush, Executive Coordinator,  
Washington Invasive Species Council

Leigh Greenwood, Forest Health Program  
Director, The Nature Conservancy

Justin Hossfeld, President, Sunlight Ranches

Mike Ielmini, National Invasive Species  
Program Leader, U.S. Forest Service

Rayola Jacobsen, Invasive Species  
Coordinator, Bruneau River & Soil  
Conservation District

Chuck Laudner, Senior Advisor for  
Congressional and Legislative Affairs,  
National Park Service

Jane Mangold, Associate Professor and  
Extension Invasive Plant Specialist,  
Montana State University

Christy Martin, Program Manager & Public  
Information Officer, University of Hawaii-  
Pacific Cooperative Studies Unit,  
Coordinating Group on Alien Pest Species

Brian Mealor, Director and Associate Professor,  
Sheridan Research and Extension Center

Dale Nolte, National Feral Swine Program  
Manager, U.S. Department of Agriculture-  
Animal and Plant Health Inspection Service,  
Wildlife Services

John Steuber, Montana State Director, U.S.  
Department of Agriculture-Animal and Plant  
Health Inspection Service, Wildlife Services

Tahnee Szymanski, Assistant State  
Veterinarian, Montana Department of  
Livestock

Erin Raney, Aquatic Invasive Species  
Coordinator, Arizona Game and Fish  
Department

Helmuth Rogg, Director of Plant Program Area,  
Oregon Department of Agriculture

Steve Tyrrel, Central & Eastern Montana  
Invasive Species Team

John Vore, Game Management Bureau Chief,  
Montana Fish, Wildlife & Parks

Germaine White, Information and Education  
Program Manager, Confederated Salish &  
Kootenai Tribes

Tom Woolf, Aquatic Invasive Species Bureau  
Chief, Montana Fish, Wildlife & Parks

#### **Kohala Coast, Hawai'i, December 9-10, 2018**

The Honorable David Ige, Governor of Hawai'i

John Laird, Secretary for Natural Resources,  
State of California

Josh Atwood, Program Supervisor,  
Hawai'i Invasive Species Council

Patty Baiao, U.S. Program Manager,  
Island Conservation

Matt Baur, Associate Director, Western  
Integrated Pest Management Center

Kimberly Burnett, Associate Specialist,  
University of Hawai'i Economic Research  
Organization

Suzanne Case, Chair, Hawai'i Department  
of Land and Natural Resources

Scott Enright, Chair, Hawai'i Department  
of Agriculture

Josh Fisher, Invasive Species Biologist,  
U.S. Fish & Wildlife Service

Mark Fox, Director of External Affairs,  
The Nature Conservancy, Hawai'i Program

Vernon Harrington, State Plant Health  
Director, U.S. Department of Agriculture-  
Animal and Plant Health Inspection Service

Robert Hauff, State Protection Forester,  
Hawai'i Department of Land & Natural  
Resources

Jonathan Ho, Plant Quarantine Branch  
Manager, Hawai'i Department of Agriculture

Flint Hughes, Ecologist, Institute of Pacific  
Island Forestry, U.S. Forest Service

Tracy Johnson, Research Entomologist,  
Pacific Southwest Research Station,  
U.S. Forest Service

Springer Kaye, Program Manager,  
Big Island Invasive Species Committee

Jules Kuo, Ballast Water and Biofouling  
Coordinator, Division of Aquatic Resources,  
Hawai'i Department of Land & Natural  
Resources

Chris Manfredi, President, Hawai'i Coffee  
Association

Christy Martin, Program Manager & Public  
Information Officer, University of Hawai'i-  
Pacific Cooperative Studies Unit, Coordinating  
Group on Alien Pest Species

Michelle Montgomery, Program Specialist,  
Hawai'i Ant Lab

Darcy Oishi, Biocontrol Section Chief,  
Hawai'i Department of Agriculture

Roland Quitugua, Extension Biosecurity  
Associate, University of Guam Extension  
and Outreach

Joel Price, Biological Control Entomologist,  
Oregon Department of Agriculture

David Smith, Administrator, Division of  
Forestry and Wildlife, Hawai'i Department  
of Land & Natural Resources

Cas Vanderwoude, Research Manager,  
Hawai'i Ant Lab

Warren Watanabe, Executive Director,  
Maui County Farm Bureau

#### **We would also like to thank the groups and organizations who participated in workshops, webinars, and initiative surveys over the past year:**

3 Quarter Circle Land & Water Co. Inc.

A&B Diversified

Ag Association Management Services, Inc.

Alaska Department of Fish and Game

Altar Valley Conservation Alliance

American Samoa Community College

American Samoa Department of Agriculture

Anadarko Petroleum Corporation

Ann Walker Consulting

Aquatic Nuisance Species Task Force

Arizona Department of Forestry and Fire  
Management

Arizona Game and Fish Department

Bayer U.S.

Bear Lake Watch

Big Island Invasive Species Committee

Bonneville Power Administration

Boone and Crockett Club

California Department of Fish and Wildlife

California Invasive Plant Council

California Natural Resources Agency

California State Lands Commission

California State Parks

Cardno

Clackamas Soil and Water Conservation  
District

Colorado Attorney General's Office

Colorado Department of Agriculture

Colorado Department of Wildlife

Colorado Parks and Wildlife

Colorado State University

Confederated Salish & Kootenai Tribes

Council of Western State Foresters/  
Western Forestry Leadership Coalition

Eastern Nevada Landscape Coalition

East-West Center

Ecosystem Research Group, LLC



Edison International	Nevada Department of Conservation and Natural Resources	• Natural Resources Conservation Service
ESRI		• U.S. Forest Service
Fort Belknap Indian Community	Nevada Department of Wildlife	U.S. Department of the Interior
Great Plains Wildlife Consulting	Nevada Division of Forestry	• Bureau of Land Management
Greenwood Global Consulting	Nevada Division of State Lands	• Bureau of Reclamation
Guam Department of Agriculture	Nevada Tahoe Conservation District	• Fish and Wildlife Service
Hawai'i Ant Lab	New Mexico Association of Conservation Districts	• National Park Service
Hawai'i Coffee Association	New Mexico State University	• U.S. Geological Survey
Hawai'i Department of Agriculture	NIC Inc.	University of California Agricultural Issues Center
Hawai'i Department of Land and Natural Resources	North Dakota Game and Fish Department	University of California Cooperative Extension
Hawai'i Invasive Species Council	North Lake Tahoe Resort Association	University of Georgia Center for Invasive Species and Ecosystem Health
Idaho Office of Species Conservation	Northern Rocky Mountain Grotto/Bigfork High School Cave Club	University of Guam
Idaho Rangeland Conservation Partnership	Northwest Power & Conservation Council	University of Guam Cooperative Extension and Outreach
Idaho State Department of Agriculture	Oahu Invasive Species Committee	University of Hawai'i
Integrated Ag Services	Off-Road Business Association	University of Hawai'i at Manoa
Intermountain West Joint Venture	Operational Conservation LLC	University of Hawai'i Economic Research Organization
Invasive Species Action Network	Oregon Department of Agriculture	University of Hawai'i - Pacific Cooperative Studies Unit, Coordinating Group on Alien Pest Species
Island Conservation	Oregon Department of Fish and Wildlife	University of Nevada - Reno
Kauai Invasive Species Committee	Oregon Invasive Species Council	University of Saskatchewan
Laramie County Conservation District	Palau Bureau of Agriculture	University of Wyoming
League to Save Lake Tahoe	Partners for Conservation	Utah State University Extension
Lonesome Pines Land & Cattle Co.	Pawnee Buttes Seed	Washington Invasive Species Council
Maui County Farm Bureau	Placer County	Washington Recreation and Conservation Office
Maui County Soil and Water Conservation District	Research Corporation of the University of Hawai'i	Waterweed Solutions
Maui Invasive Species Committee	RiversEdge West	West Multnomah Soil and Water Conservation District
Montana Department of Agriculture	Rosebud County Weed District	Western Integrated Pest Management Center
Montana Department of Livestock	Ruckelshaus Institute, University of Wyoming	Western Association of Agriculture Experiment Station Directors
Montana Department of Natural Resources and Conservation	Santa Clara Pueblo Forestry	Western Association of Fish and Wildlife Agencies
Montana Department of Transportation	Sonoma Water	Western Landowners Alliance
Montana Fish Wildlife and Parks	Southern California Edison	Working Dogs for Conservation
Montana Invasive Species Council	Sunlight Ranch	Wyoming Association of Conservation Districts
Montana State University	Sustainable Rangelands Roundtable	Wyoming Department of Agriculture
Montana Trout Unlimited	Tahoe Chamber of Commerce	Wyoming Game and Fish Department
National Association of Conservation Districts	Tahoe Fund	Wyoming Reclamation and Restoration Center
National Interagency Fire Center	Tahoe Regional Planning Agency	Wyoming State Forestry Division
National Invasive Species Council Secretariat	Tahoe Resource Conservation District	Wyoming Stock Growers Association
National Oceanic and Atmospheric Administration	The National Audubon Society	Wyoming Wildlife and Natural Resource Trust
National States Geographic Information Council	The Nature Conservancy	Wyoming Wildlife Federation
National Wild Turkey Federation	Thunder Basin Grasslands Prairie Ecosystem Association	
National Wildlife Research Center	U.S. Air Force, Colorado State University - Center for Environmental Management of Military Lands	
NatureServe	U.S. Department of Agriculture	
Nevada Department of Agriculture	• Agricultural Research Service	
	• Animal and Plant Health Inspection Service	



# ENDNOTES

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- <sup>2</sup> Pimentel, D., Zuniga, R., & Morrison, D. (2005). Update on the environmental and economic costs associated with alien-invasive species in the United States. *Ecological economics*, 52(3), 273-288.
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- <sup>6</sup> Burnett, K., Kaiser, B., & Roumasset, J. (2007). Economic lessons from control efforts for an invasive species: *Miconia calvescens* in Hawaii. *Journal of Forest Economics*, 13(2-3), 151-167.
- <sup>7</sup> Connelly, N. A., O'Neill, C. R., Knuth, B. A., & Brown, T. L. (2007). Economic impacts of zebra mussels on drinking water treatment and electric power generation facilities. *Environmental management*, 40(1), 105-112; Pimentel, D. (2005). Aquatic nuisance species in the New York State Canal and Hudson River systems and the Great Lakes Basin: an economic and environmental assessment. *Environmental Management*, 35(5), 692-702.
- <sup>8</sup> <https://www.nwcouncil.org/fish-and-wildlife/fw-independent-advisory-committees/independent-economic-advisory-board/economic-risk-associated-with-the-potential-establishment-of-zebra-and-quagga-mussels-in-the-columbia-river-basin>
- <sup>9</sup> Barrett, A. D. (2014). Economic burden of West Nile virus in the United States. *The American journal of tropical medicine and hygiene*, 90(3), 389.
- <sup>10</sup> Carlson, C. M., Hopkins, M. C., Nguyen, N. T., Richards, B. J., Walsh, D. P., & Walter, W. D. (2018). Chronic Wasting Disease: Status, Science, and Management Support by the US Geological Survey. US Department of the Interior, US Geological Survey.
- <sup>11</sup> <http://www.emeraldashborer.info/>
- <sup>12</sup> <https://cnas-re.uog.edu/crb/>



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