



Montana Invasive Species Council

Key Findings eDNA Science Advisory Panel: A discussion on eDNA technology use in invasive species management

A six-person panel of aquatic invasive species, monitoring and eDNA experts was assembled in April 2018 by the Montana Invasive Species Council (MISC) to evaluate the use of environmental DNA (eDNA) for dreissenid mussel early detection and provide input and guidance to managers regarding its use in Montana.

Key Challenges and Recommendations by Panelists

Challenges

- Lack of standardized protocols
 - Field collection
 - Lab analysis
 - Communication of results (between researchers/labs and managers)
 - Management response
 - Balance of risk and uncertainty
 - Understand the costs of false negatives or false positives to assess risk tolerance
 - Perspective on terms false negatives and false positives
 - Detection threshold of eDNA for false negatives is not known and varies with sampling/analysis methods
 - A limited number of labs are conducting eDNA analysis for early detection of dreissenids and use different protocols
 - No coordinated dreissenid eDNA group to help address gaps and encourage communication
 - Few published peer reviewed studies for dreissenid eDNA
 - Communicating what a “positive” eDNA sample means
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Recommendations

- Develop, refine, and agree upon method/standards with adaptive capacity
 - Decontamination protocols (utilize existing US Fish and Wildlife Service for Asian carp effort)
 - Field collection
 - Lab analysis including Quality Assurance/Quality Control standardization
 - Data reporting requirements and standards
- Develop consistent language (for both within lab and out)
- Develop a communication plan between managers and lab
 - Approach eDNA results as a link in a chain of evidence
 - Clearly define the steps to be taken following a detection. An eDNA detection could result in further sampling or directly lead to a management action, depending on these pre-defined steps
- Coordinate across western partners and cross-border partners via the suggested avenues
 - Coordination among managers: Utilize existing venue of Western Regional Panel on ANS and/or Western Governors Association
 - Coordination between managers and researchers: Establish forum to continue conversation
 - Coordination among researchers: Develop a system to share information

- Identify risk tolerance and map management actions for detection scenarios and trends
 - Test assays with round robin process to assist with lab/manager confidence, identify areas for improvement in consistency, and relationship building
 - Gene sequence any positive result to confirm
 - Optimal conditions for eDNA detection is during dreissenid spawning
 - Use eDNA to contribute to the weight of evidence to determine presence of dreissenids
 - Develop/utilize a decision tree that incorporates monitoring results from different methods, likelihood of invasion, etc.
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Suggested parameters of a standard method

- Grab samples are thought to be better than plankton tows, but further evaluation is needed
 - Surface water collection is preferred and is less problematic
 - Bleach best for decontamination (50% solution)
 - Minimize contamination with on-site processing
 - Best to canvas waterbody with smaller samples
 - Standardize assays using markers from different regions of the genome that are suited to answer question of study
 - Use controls in the field and take replicate samples
 - Use qPCR vs. conventional PCR
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Conclusion and Next Steps

The MISC eDNA Science Advisory Panel was a successful step in better understanding the role for eDNA in management of aquatic invasive species for the future. The management of invasive species, specifically dreissenids, presents unique management and political challenges. Clear acknowledgement of gaps and recommendations from the advisory panel provides a path forward for developing this technology into an operational tool that managers are comfortable using for dreissenid monitoring. Action on this issue will require international effort and include both managers and researchers to address gaps and needs in the development of this technology as an early detection tool. This is an issue that affects aquatic invasive species prevention and management beyond the boundaries of Montana, and steps forward will benefit agencies and stakeholders across jurisdictions. MISC will encourage action on these issues, but interested partners nation-wide will need to help push this effort forward.

MISC has identified the following steps to utilize the information from the panel:

- Make all information generated from the scientific advisory panel available to all interested parties
- Encourage the development of open dialog among eDNA dreissenid scientific community to promote further standardization of this tool
- Encourage the completion of a laboratory round-robin project among appropriate partners to promote further standardization of this tool
- Engage the Western Regional Panel on ANS and/or the Western Governors Association to assist in the promotion/implementation of the next steps identified by the panelists
- Continue the discussion regarding the use of eDNA and promote coordination and cooperation as the development of this method moves forward