# Montana Invasive Species Council Science Advisory Panel

**Topic: The use of eDNA for Dreissenid Mussel Early Detection**

**Purpose:** To evaluate the use of environmental DNA (eDNA) for dreissenid mussel early detection and provide input and guidance to managers regarding its use.

**Expected Panel Outcomes:**

- Review the state of the science for the use of eDNA for dreissenid mussel early detection.
- Identify gaps and challenges associated with current eDNA methods (both field and laboratory) related to dreissenid mussel early detection.
- Identify information / efforts that could help address those gaps / challenges.
- Provide input to management agencies on how to approach the use of eDNA for dreissenid early detection.

**Panelists:**

1) Caren Goldberg-Assistant Professor WSU Pullman
   Caren is an ecologist and researcher focusing on detection of rare species using eDNA. Published papers on eDNA: https://scholar.google.com/citations?user=XGutsLEAAAAJ&hl=en

2) John Darling- Senior Research Biologist, in EPA's National Exposure Research Laboratory
   John's research focuses primarily on applying genetic methods to understand the spread of aquatic invasive species in order to better inform risk analysis and the design of effective policy and management strategies. He is also interested in the problem of translating scientific knowledge into appropriate management action.

3) Jim Snider, California Department of Fish and Wildlife. Research Scientist
   Has conducted studies on the accuracy and reliability of Dreissena spp. larvae detection and survivability under different conditions. Also has designed sampling protocols for invasive mussel veligers.

4) Karen Vargas, Nevada Department of Wildlife, AIS Coordinator, retired
   Managed invasive mussels in Lake Mead. Experience with eDNA as a detection tool and applying it to management decisions at Lake Mead

5) Jon Amberg, USGS Research Fish Biologist
   Has been through this process for Asian Carp. Can learn from this experience and apply to invasive mussels.

6) Robert Bajno
   Works as a chemist for Fisheries and Oceans Canada. Lead for Genomics research and development initiative. This research will develop test-case eDNA assays or tests that will be able to detect and eventually monitor distribution patterns of organisms of management concern.

**Questions for Panelists:** Questions were compiled from input provided by members of the Montana Invasive Species Council and the eDNA steering committee.

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**Session one: State of the Science**

- What are some examples of using eDNA to successfully manage a biological problem?
- What are the biggest operational challenges associated with eDNA detection for fish species?
- Are there aspects of Asian carp eDNA research / methods that may be extrapolated to early detection of dreissenids?
- How were the political / public implications navigated through the Asian carp eDNA research / monitoring / detection process?
- Have eDNA methods been developed and utilized for non-dreissenid bivalve species? If so, has there been any specific challenges related to detecting bivalves?
- Why are there few peer reviewed publications related to the use of eDNA for dreissenid mussel early detection? Has there been sufficient peer review to justify the use of these methods to make management decisions related to new dreissenid detections?
- Why are there different methods for eDNA dreissenid early detection (lab and field collection methods)? Is there accepted standard methods for eDNA sample collection and analysis? If not, why isn't there an accepted standard method?
- Western states have not widely accepted the use of eDNA as an operational early detection tool for dreissenid mussels. What factors might influence the future use of eDNA as a detection tool?

**Session two: In the Field**

- Are there best practices for sampling location (e.g. shallow vs. deep, near access points, outlets)? Suggested depth to monitor?
- What, if any, standard field cleaning / decontamination protocols for field and lab exist to prevent DNA contamination?
- Can field / lab sample contamination be identified when there is a "positive" result? If yes, how?

**Session three: Analysis**

- Provide context for why there may be variation in molecular markers and how these differences may affect results?
- What molecular markers are currently being used with dreissenid eDNA analysis? Is there any consistency between labs for marker preference? Why or why not?
- Do labs have differing QA/QC methods / protocols for dreissenid mussel eDNA analysis? For qPCR dreissenid mussel eDNA analysis?

**Session four: Interpreting Results**

- What are the criteria utilized to identify a sample "positive" for dreissenid DNA?
- Are there other species in MT waters that could produce positive results? Have all likely species that potentially could cause a false positive been evaluated (bivalves, other mollusks)?
- What, if any, biogeochemicals factors can influence the results of eDNA?
- Is it possible for other species (bluegreen algae, protists, other zooplankton) to cause a false positive?
- Using eDNA methods, what factors can produce false positives and how is that addressed? What additional steps are taken with samples to verify detections are not false positives?
- What is a "weak positive", what does that mean and how should managers respond?
- Using eDNA methods, what factors can produce false negatives and how is that addressed?

**Session five: Management Implications**

- With regards to the use of eDNA for early detection of dreissenids, what are the communication barriers between researchers and managers? What are the communication barriers between managers and the public? Do you have recommendations on ways to overcome those barriers?
- What key criteria do researchers need to demonstrate to managers to allow for eDNA to justifiably be accepted as an operational method for dreissenid early detection? Have these criteria been met with dreissenid eDNA?
- What responsibilities, if any, do researchers have when reporting/explaining results and how those may affect management issues/management implications?
- If a management agency receives "positive" eDNA result, is there a suggested management response to these results?

**Session six: Next Steps**

- What further information is needed to increase the comfort level of managers to more broadly accept eDNA as a dreissenid early detection tool?
- Is it possible to have a national accreditation for eDNA labs? Is it possible to have a lab certification program for labs that conduct eDNA analysis?
- Could researchers develop criteria that could guide managers how to review and evaluate eDNA results? What would be included in a checklist guide that would ensure all factors are assessed and considered to ensure confidence in results?