

Using complex models to support biosecurity decisions for aquatic invasive species

AISexplorer

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Overview

Aquatic invasive species (AIS) are one of the greatest threats to preserving Minnesota’s aquatic natural resources. Using a data-driven approach to identify and prioritize waterbodies at high risk of invasion can inform effective and efficient control programmes.

Researchers at the Minnesota Aquatic Invasive Species Research Center (MAISRC) have developed a suite of R and Python models to provide operational decision support across the Minnesota waterway and boater movement networks. These include optimising the placement of watercraft inspection stations at lakes, estimating infestation risk scores for individual lakes, predicting results of different intervention activities, and impacts of collaboration efforts between counties. These models have been embedded in AIS Explorer, an online, user-friendly dashboard and decision support tool for local and state managers.

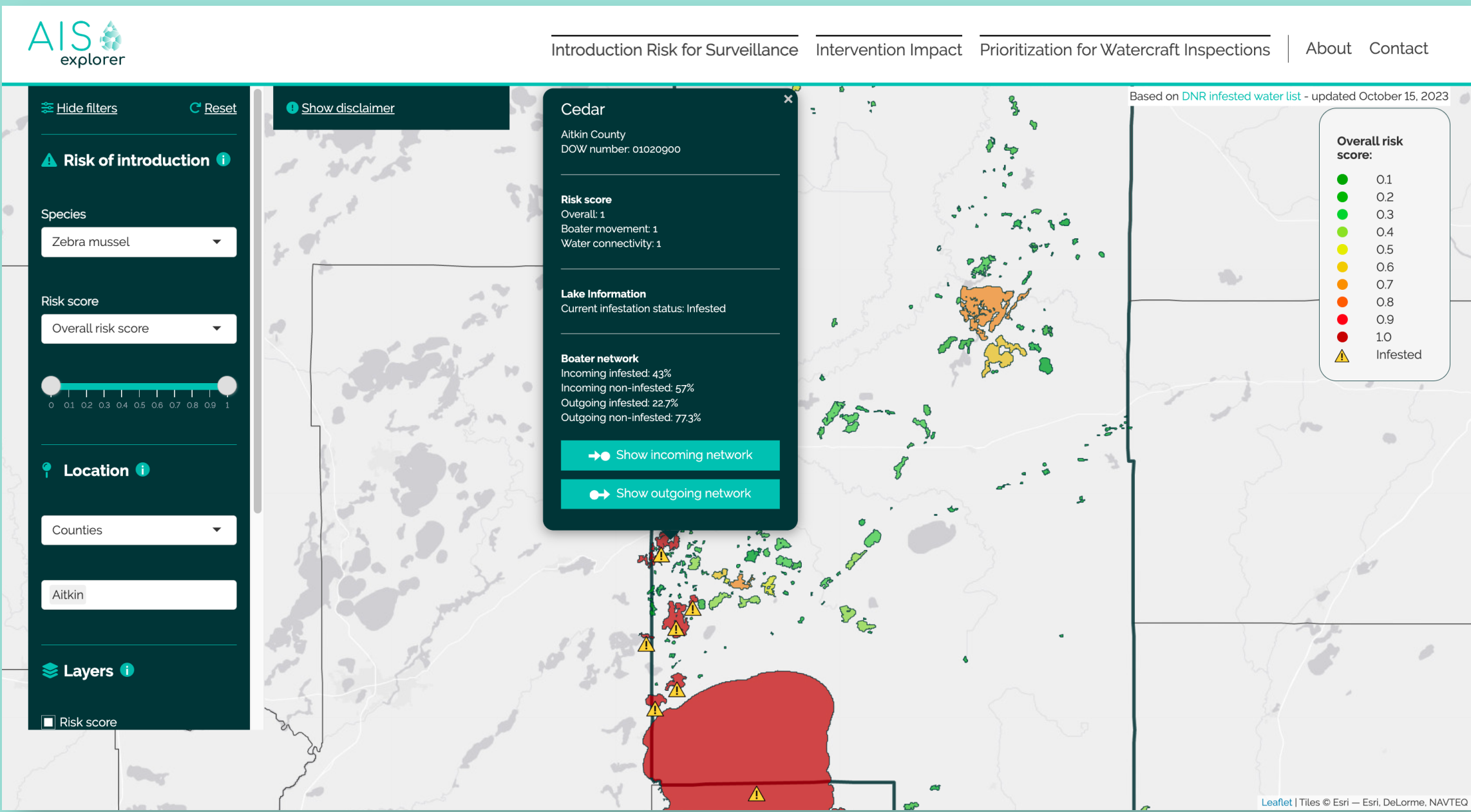


Objective

AIS Explorer was initially deployed in 2020 with two models included and since then has been actively used by county managers and researchers in the state of Minnesota to provide decision support for managing the spread of aquatic invasive species. The objective of this work was to expand on the functionality of the AIS Explorer by including two new models and supporting infrastructure to improve the utility of the application and provide new insights for county managers and decision makers in the state.

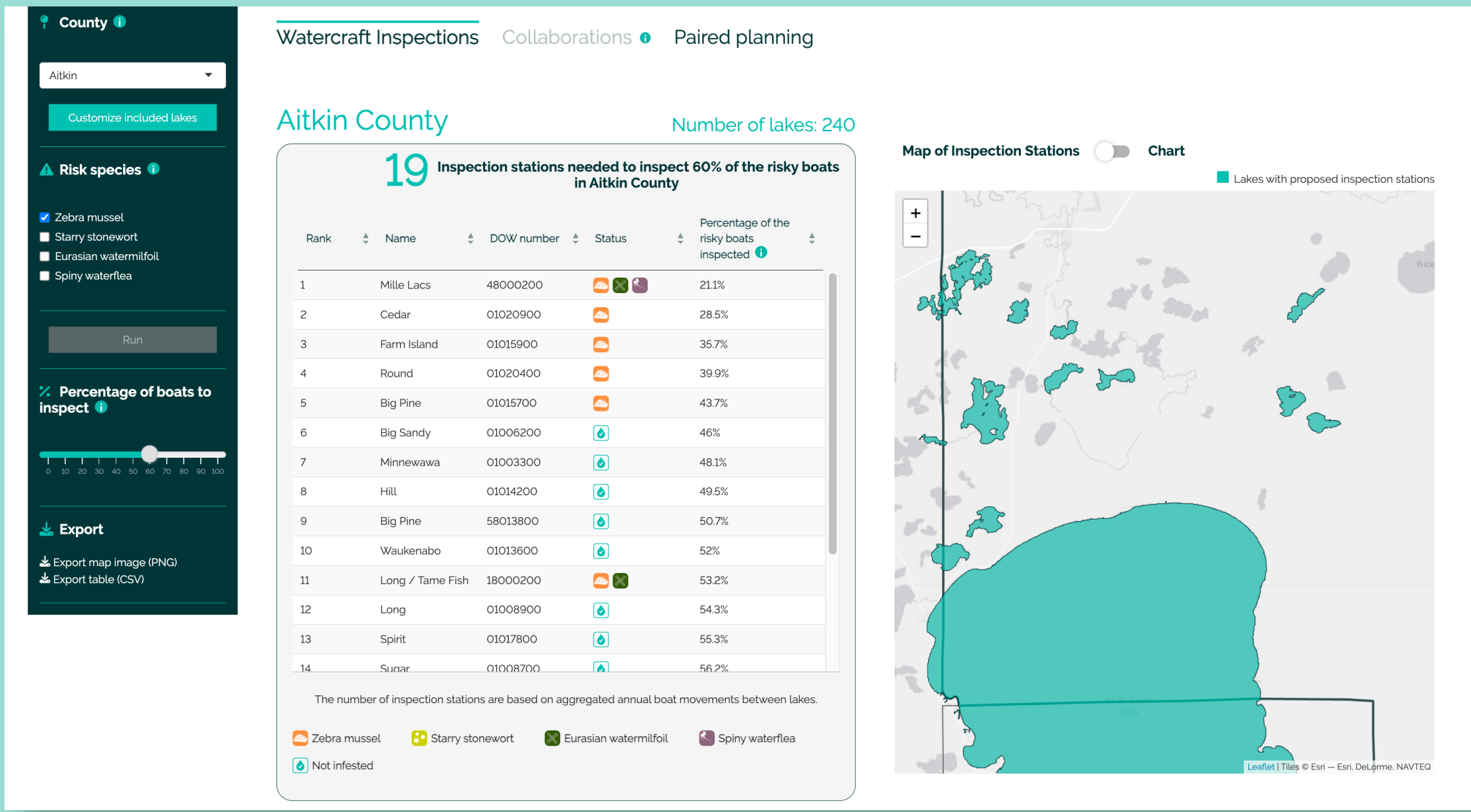
Location

Each of the four models represented in the AIS Explorer use the Minnesota Department of Natural Resources (MNDNR) Infested Waters List (1) as an input to produce the model outputs represented in the AIS Explorer. A pre-processing pipeline was created and deployed using Amazon Web Services (AWS) to automatically pull the latest available infestation data, run these data through each of the models and produce the model outputs, which are then mapped to a dataset of 9,182 uniquely identifiable lakes in the state of Minnesota.



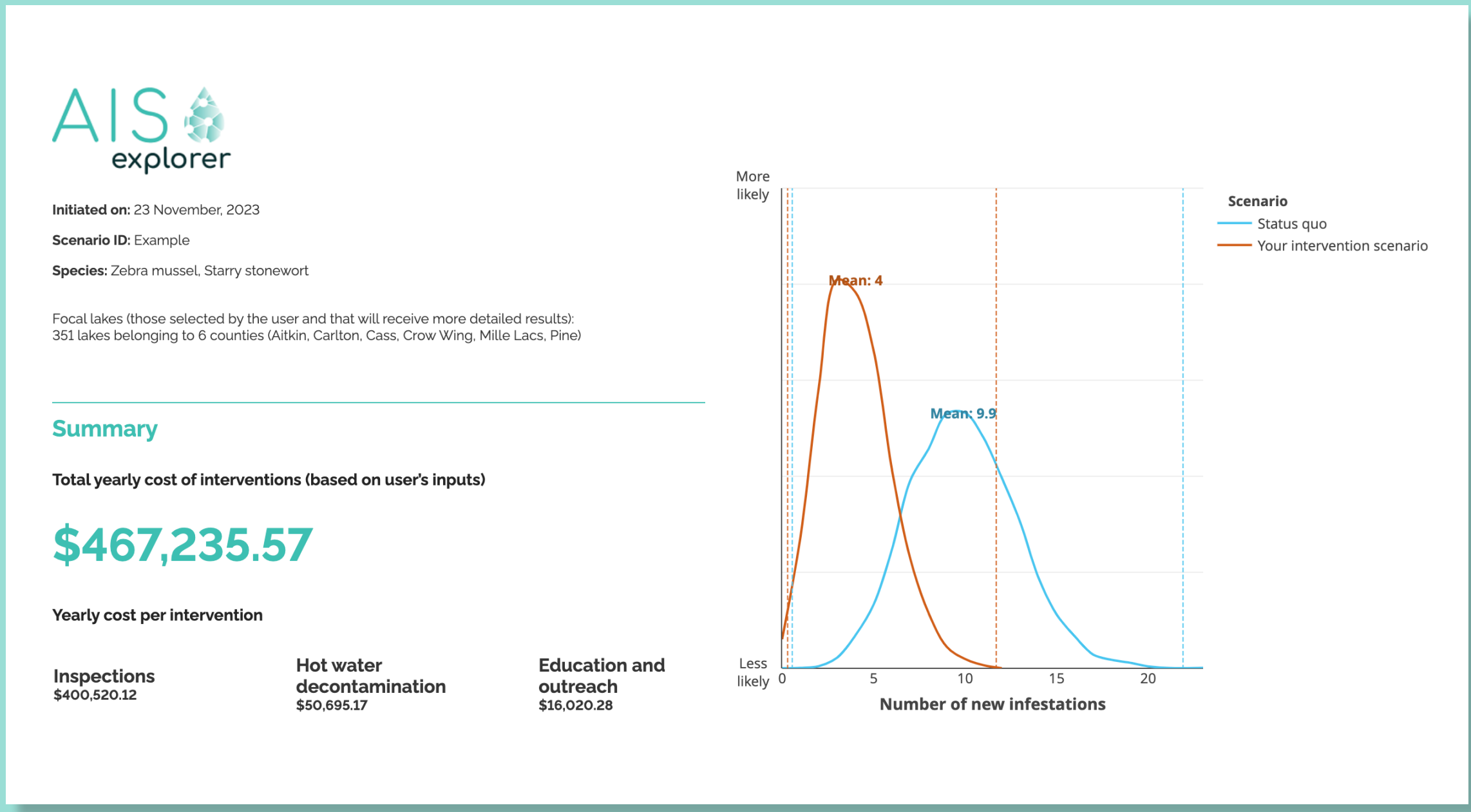
Introduction Risk for Surveillance

This tab presents the risk that a lake becomes infested with a selected Aquatic Invasive Species over a 5-year period. Users can filter the included lakes by county and species of interest or click on a lake for a more detailed view of model results.



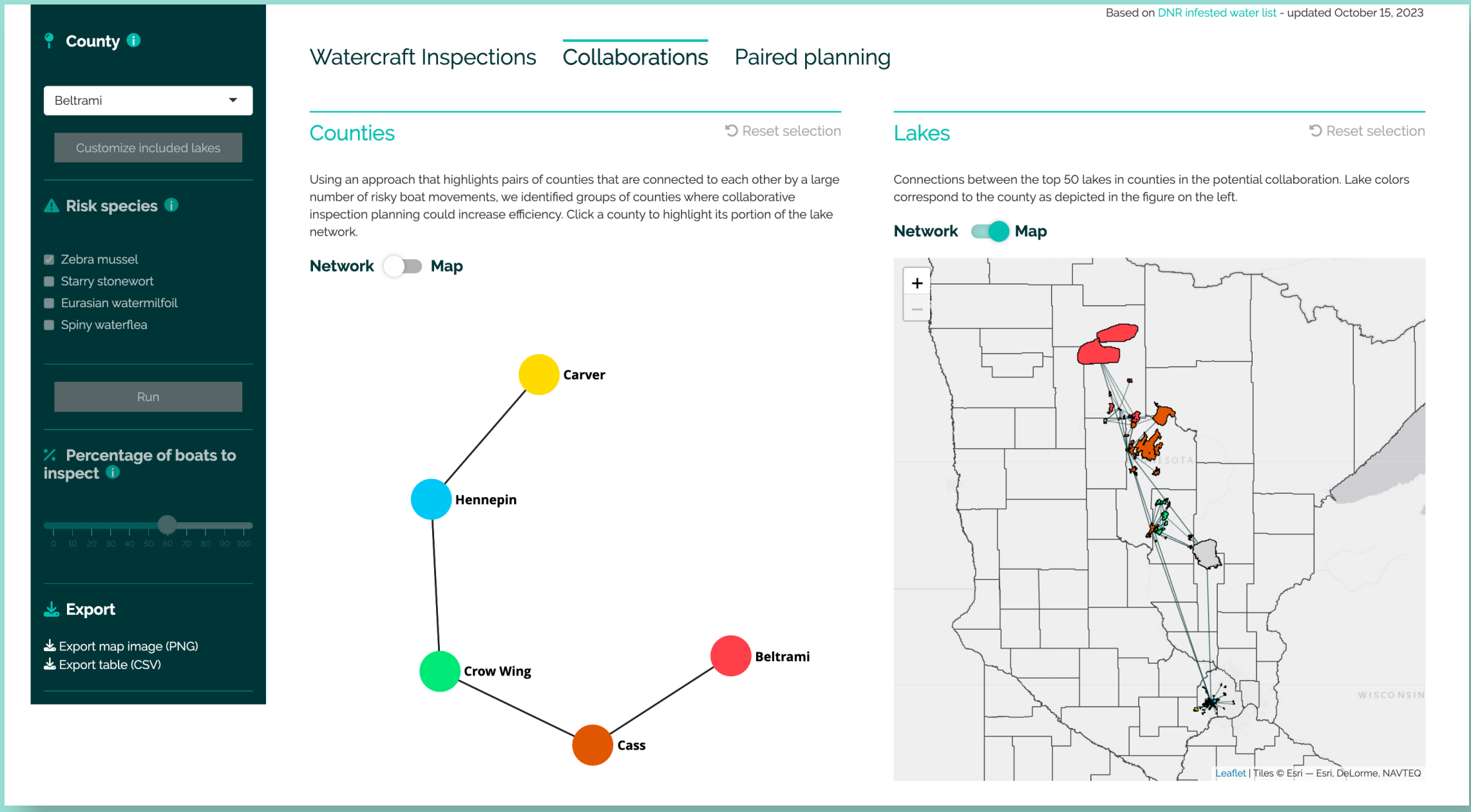
Prioritisation for Watercraft Inspections

This tab allows the users to select a county, risk species, and a management target which describes the percentage of risky boat movements (moving from infested to non-infested waterbody) inspected. The model will return a ranked list of lakes in order of highest (Rank 1) to lowest priority for inspection.



Intervention Impact

This tab allows users to assess the impact of different intervention scenarios on the risk of new infestations. Users can select different levels of effort, effectiveness, and cost to evaluate the outcomes of different intervention plans, which are then sent via email in an interactive HTML report.



Collaborations

Here, users can investigate the connections between lakes in different counties and identify where collaborative inspection planning could increase intervention efficiency.

References and Acknowledgements

1. Minnesota Department of Natural Resources. (2023). Infested Waters List. Retrieved October 15, 2023, from website: <https://www.dnr.state.mn.us/invasives/ais/infested.html>



Future Developments

Staff from the Minnesota Aquatic Invasive Species Research Center (MAISRC) regularly host webinars and training sessions to train stakeholders in the use of the tool. In addition, several new features are in development, including an authentication system and functionality for users to store previous intervention scenarios for later use.