Using eDNA to Track Down Aquatic Invaders:

New Zealand Mud Snails in the Boardman-Ottaway River

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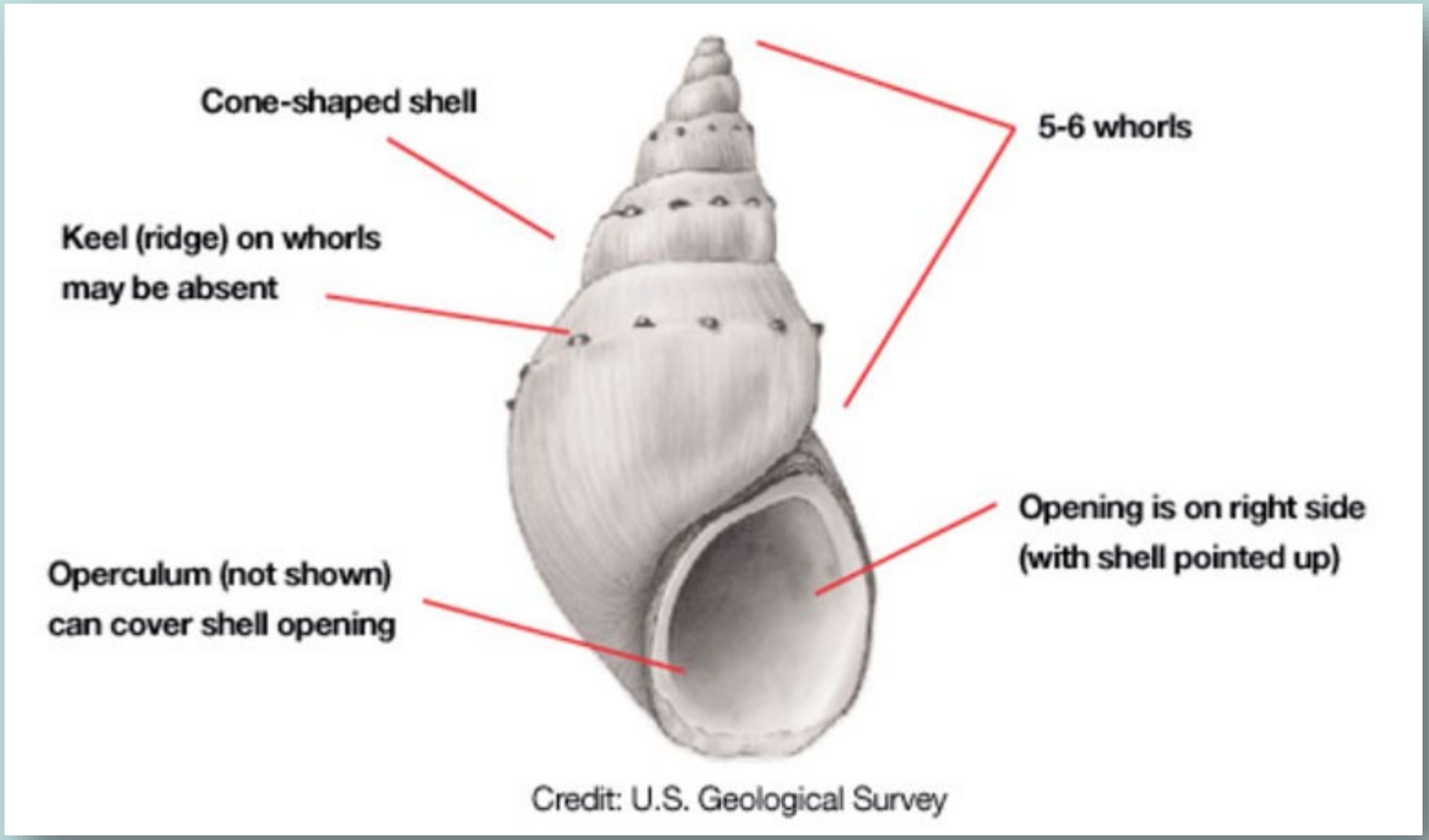
eDNA is one tool in the toolbox

- Widely applicable with a broad range of uses; BUT,
- Still just one tool in the toolbox for aquatic ecology
- Genetic material shed into the environment
- Collected from a variety of matrices:
  - Sediment, water, air, spider webs, etc.

New Zealand Mud Snail

- Very small snail, about 1/8” or 3-4 mm
- Right-side opening
- 5-6 whorls
- Brown/black
- One female may produce a colony of 40 million snails



Global Invader

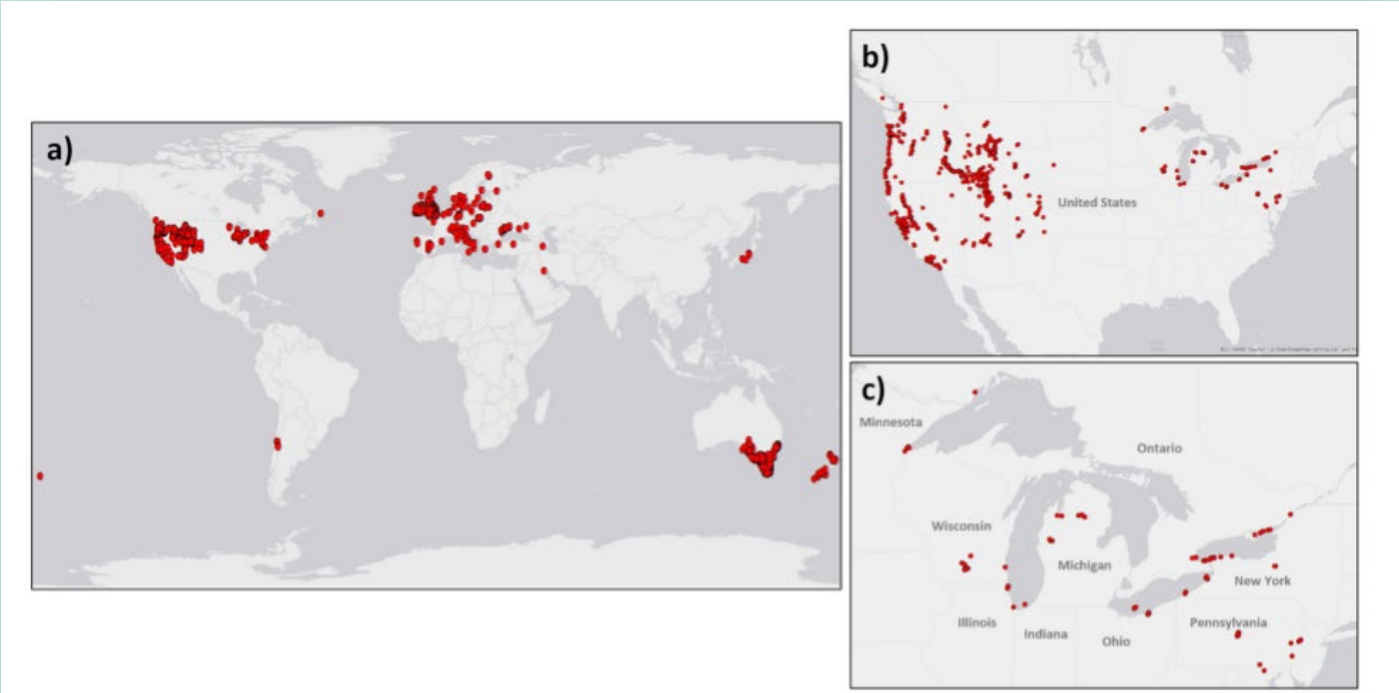


Fig. 3 **a** Global distribution of the New Zealand mud snail (NZMS); **b** North American distribution of NZMS (Canadian distribution of NZMS largely unknown); **c** distribution of NZMS in the Great Lakes region of North America

Geist et al. (2022)

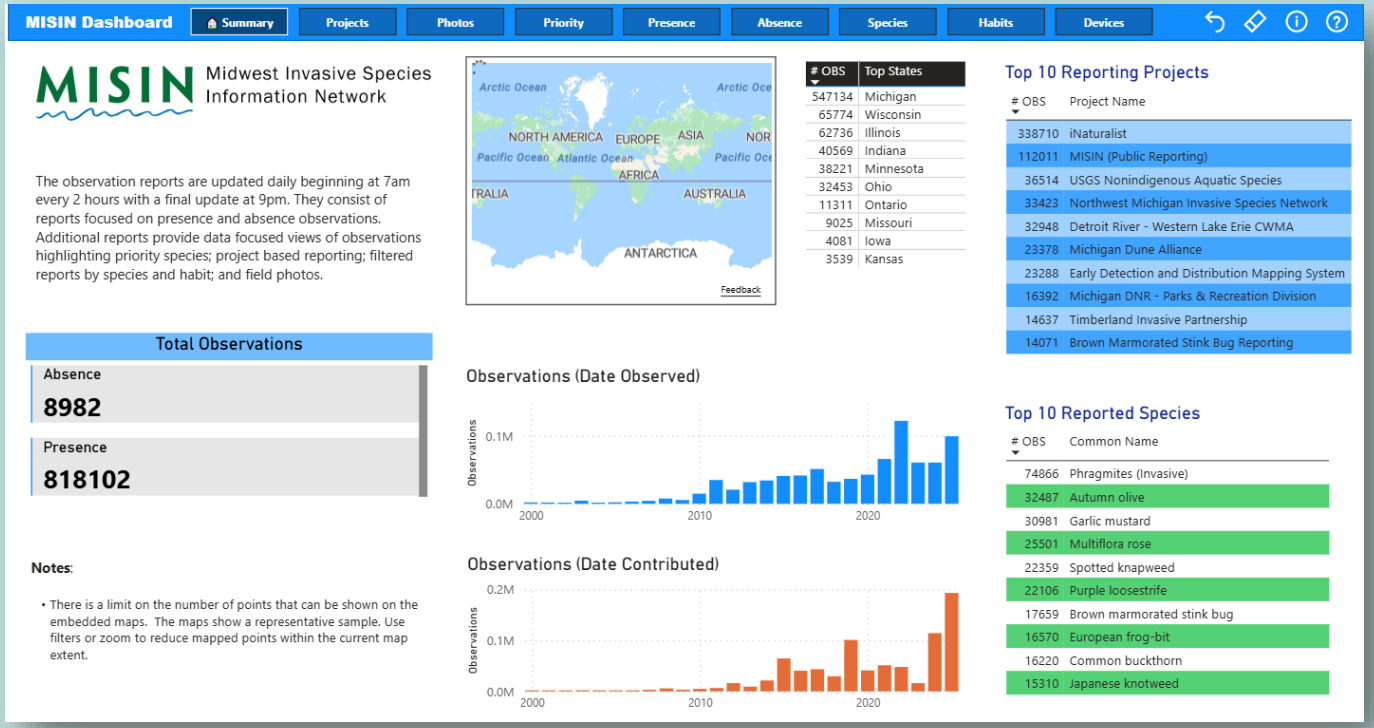
- Native to New Zealand
- Now in Europe, western US and GL Regions
- Found in Pere Marquette in 2015 (first MI detection)
  - Boardman, Au Sable, Grass, Pine, and Manistee
- Found in Boardman in 2016

NZMS Impact on Sediment Testing

- Control sediment in toxicity testing with organisms
- Discovered NZMS in 2023
- Microcosm of *in situ* impacts
  - Low DO, low survival/growth

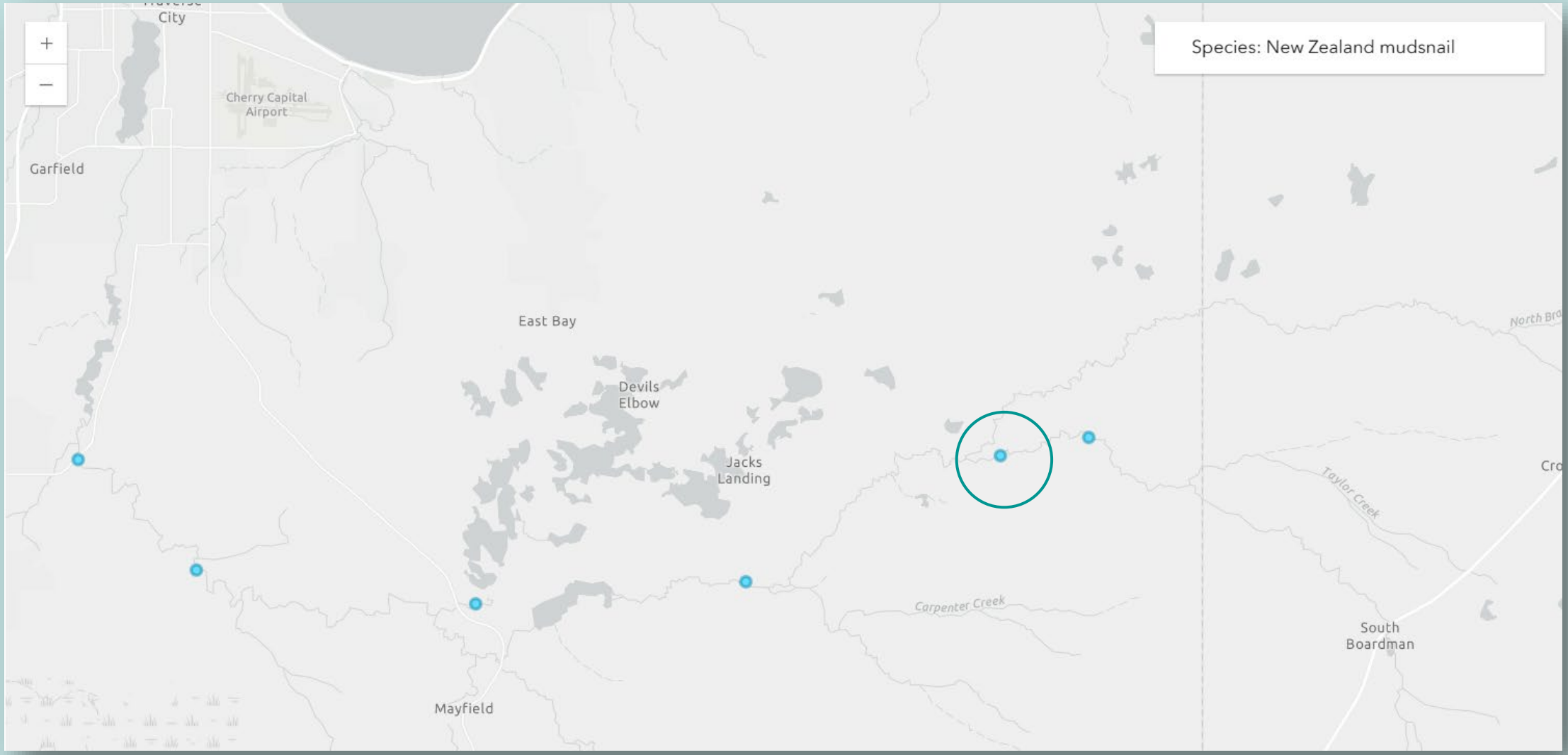
ANDROID APP ON Google play

Available on the App Store

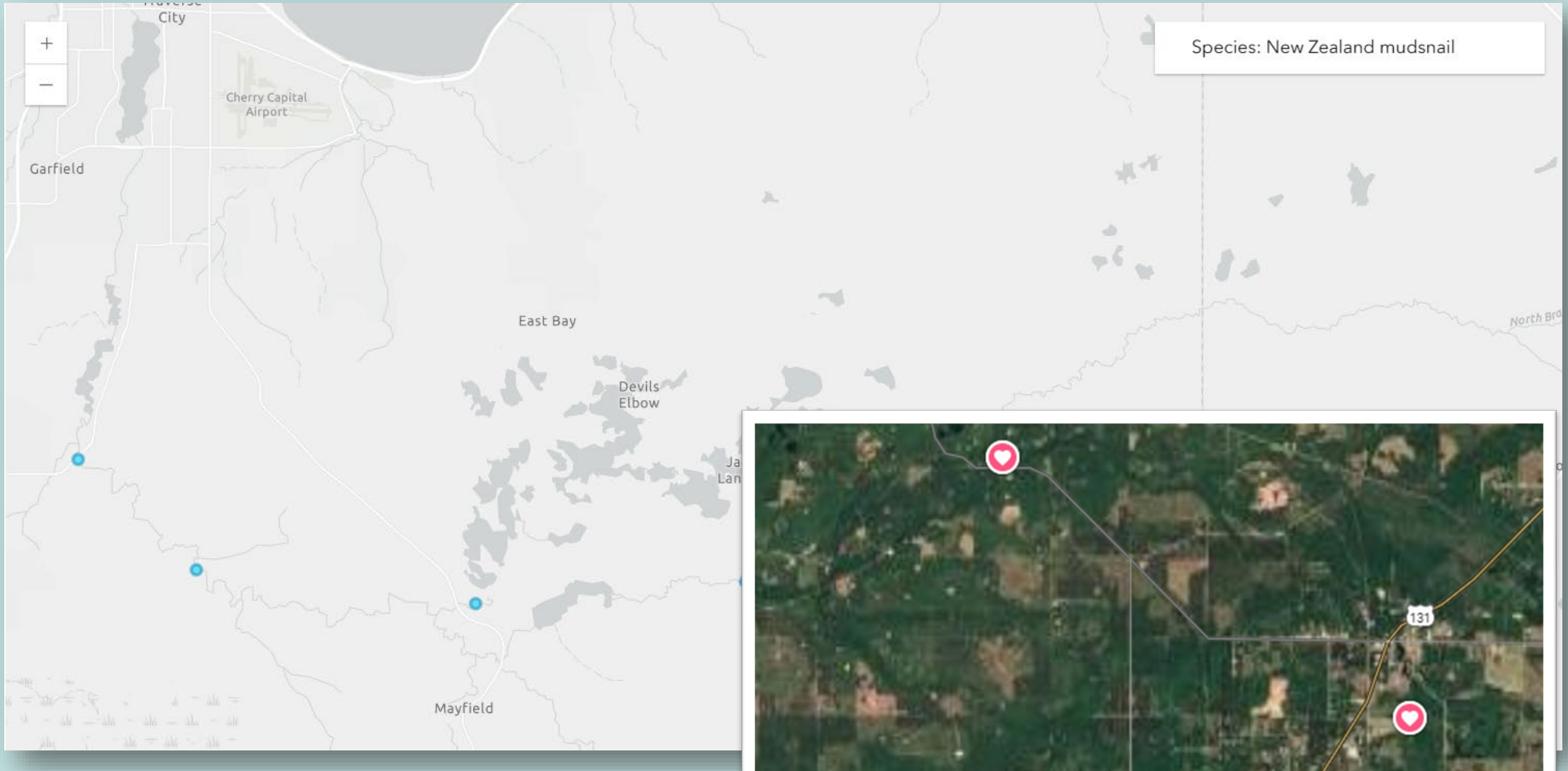


MISIN Midwest Invasive Species Information Network

MISIN Current Detections



Our Sampling Locations



Sampling Methods

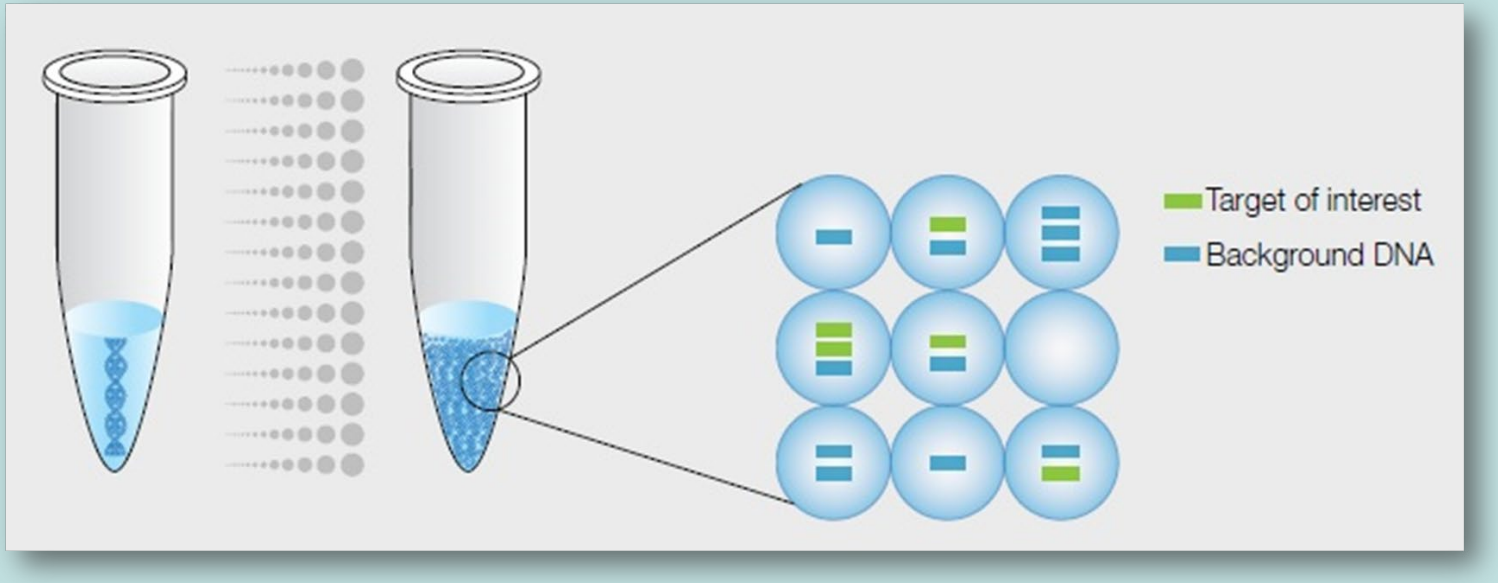
- Goldberg et al. (2013)
- 3 x 2 L sterile PETG bottles
- Upstream of bridge/crossing
- Just below surface, without disturbing sediment
- Grab samples
- Outside of thalweg

Processing Methods

- Vacuum filtration
- 0.45 micron cellulose nitrate filters
- 2 L per filter
- Field negative control – same process
- Modified Qiagen Tissue Kit w/Zymo cleanup
  - High tannin content

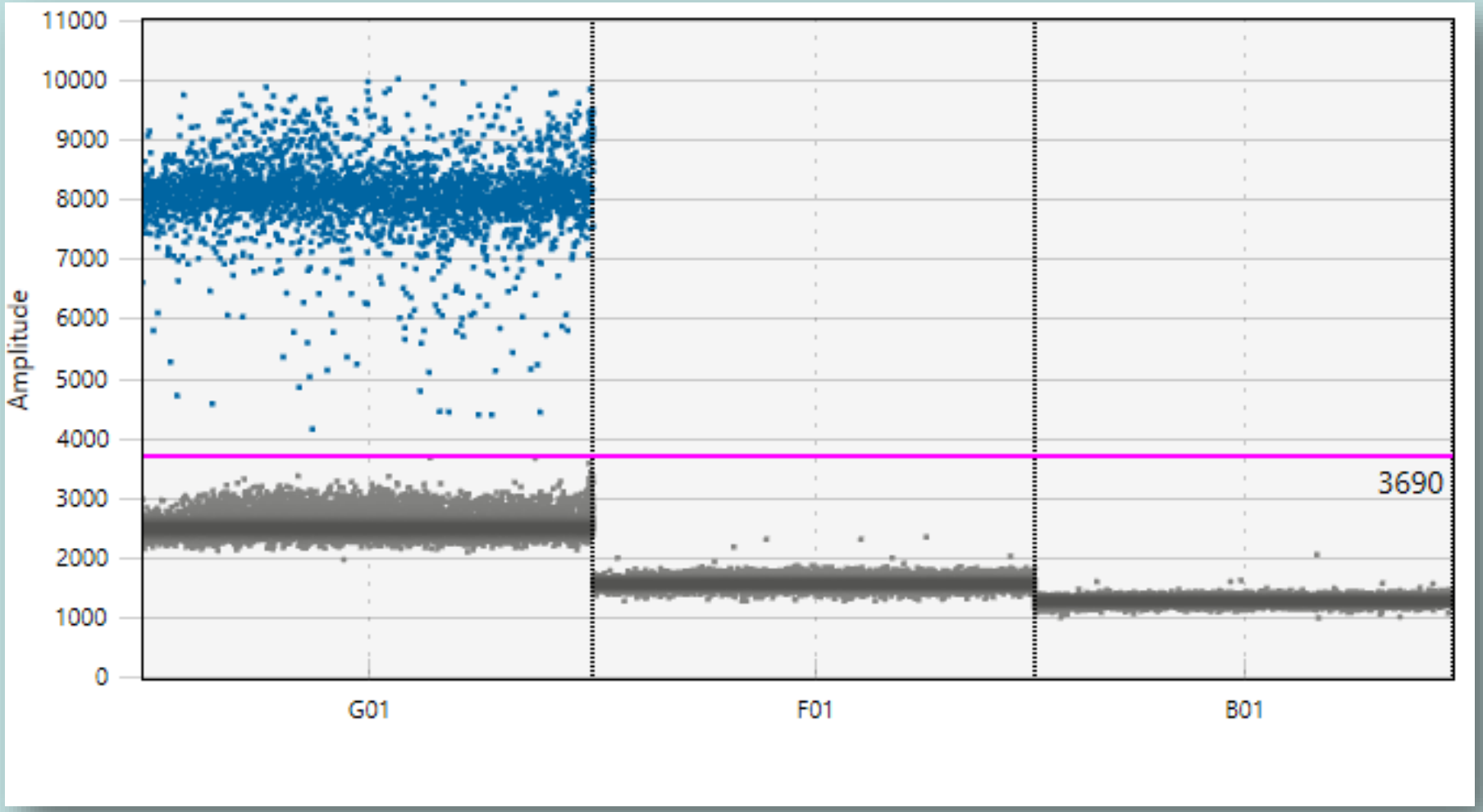
droplet digital PCR Methods

- Bio-Rad droplet digital PCR system
- Modified from RT-qPCR assay
- High volume of template DNA
- Further optimization required



Preliminary Results

S. Branch (known +) Hudson Creek (no ID) Filtration Negative



Next Steps

- Fine-tuning assay and sample processing methods
- Watershed wide sampling schema to establish boundaries of population(s)
  - Samples can be used for multiple targets, not just NZMS or even invasive species
- Paired eDNA with traditional macroinvertebrate sampling and ID
  - Correlate density of population to gene copies for quasi-quantitative data

Thank you!

Visit us at the GLEC Booth

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