## MESSAGE IN A MOLECULE

## USING ENVIRONMENTAL DNA (eDNA) FOR INVASIVE SPECIES EARLY DETECTION

Black River Watershed Conference 2023

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#### GENERALISED INVASION CURVE SHOWING ACTIONS APPROPRIATE TO EACH STAGE

Version 1.0: 30 APR 2009



eDNA allows for the earliest possible detection

AREA OCCUPIED

## HOW CAN eDNA BE USED?

#### • SPECIES DETECTION

- RARE (ENDANGERED/THREATENED)
- EARLY DETECTION OF INVASIVES
- ANIMAL (FISH & INSECTS) AND PLANTS

#### • **BIODIVERSITY SURVEYS**

- COMMUNITY COMPOSITION
- SPECIES ASSEMBLAGES
- BEHAVIOR e.g. SPAWNING, MIGRATION



#### eDNA from aquatic systems



### eDNA from terrestrial systems



## FIELD COLLECTION AND PROCESSING





1 2 3	4 5	6	2	В	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
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Chaum	ont River	Wate	er Sai	mple	s				Fr	rench	Creek	« Wo	ater S	Sampl	es					
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	QA Du	plicate	es								QA I	Dupli	icates	5						
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# of copies of target Experiment Results Report

DNA found in well

QuantStudio™ Real-Time PCR Software v1.2

#### **Results Table**

Experiment:FinaGobyNC8116

	-											
Well	Sample	Target	Task	Qty	Ст	Ст Маза	Ct SD	Qty Mean	Qty SD	Ст Threshold	Baseline Start	Baselin End
A1		Target 1	s	3,000,000,0 00	21.309	21.301	0.010			0.040	3	18
A2		Target 1	s	360,000.000	24.534	24.560	0.038			0.040	3	21
Аз		Target 1	s	36,000.000	27.966	27.952	0.020			0.040	3	24
A4		Target 1	s	3,600.000	30.825	30.890	0.093			0.040	3	27
A5		Target 1	s	360.000	33.325	33.578	0.359	Cor	otrol	0.040	3	30
A24		Target 1	N		UND.	,	>			0.040	3	39
B1		Target 1	s	3,600,000.0 00	2 .294	21.301	0.010	DN	A	0.040	3	18
B2		Target 1	s	360,000.000	24.587	24.560	0.038			0.040	3	21
B3		Target 1	s	36,000.000	27.938	27.952	0.020			0.040	3	24
B4		Target 1	s	3,600.000	30.956	30.890	0.093			0.040	3	27
B5		Target 1	s	360.000	33.832	33.578	0.359			0.040	3	30
B24		Target 1	N	$\bigcirc$	UND.	$\square$				0.040	3	39
E1		Target 1	U	17.482	37.891	37,961	0.909	20.559	14.250	0.040	3	34
E2		Target 1	U	8.655	38.834	37.961	0.909	20.559	14.250	0.040	3	35
E3		Target 1	U	/	UND.	37.961	0.909	20.559	14.250	0.040	3	35
E4		Target 1	U		UND.	37.961	0.909	20.559	14.250	0.040	3	39
E5		Target 1	U	34.723	36.970	37.961	0.909	20.559	14.250	0.040	3	33
E6		Target 1	U	29.945	37,169	37.961	0.909	20.559	14.250	0.040	3	34
E7		Target 1	U	21.751	37.598	37.961	0.909			40	3	34
E8		Target 1	U	16.843	37.941	37.961	0.909	DN.	A in	40	3	35
E9		Target 1	U	8.428	38.869	37.961	0.909		or	40	3	35
E10		Target 1	U	34.525	36 978	37.961	0.909	wui	ei	40	3	34
E11		Target 1	U		UND.	37.961	0.909	san	nples	40	3	39
E12		Target 1	U	17.493	37.890	37.961	0.909	20.008	14.200	0.040	3	34
E13		Target 1	U	4.206	39.801	37.961	0.909	20.559	14.250	0.040	3	35
E14		Target 1	U	50.944	36.456	37.961	0.909	20.559	14.250	0.040	3	33
E15		Target 1	U	28.972	37.213	37.961	0.909	20.559	14.250	0.040	3	34
E16		Target 1	U	$\bigcirc$	UND.	37,951	0.909	20.559	14.250	0.040	3	35
E17		Target 1	U		UND.	37.961	0.909	20.559	14.250	0.040	3	35

Labs are expressed in two different ways.

 Number of copies of species specific eDNA sequences in each sample.

• And via amplification plots

Task Legends: S = Standard, N = NTC, U = Unknown, UND. = Undetermined





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	THE OVERALL P	ICT	URE			l e	<sup>st</sup> impas each stree	sible bar am	rier on
0	Species	OSD	SRD	CRD	FCD	SRU	OSU	CRU	FCU
	<b>Bighead carp</b> (Hypophthalmichthys nobilis)								
Additional	<b>Black carp</b> (Mylopharyngodon piceus)								
Species Include:	<b>Grass carp</b> (Ctenopharyngodon idella)								
<ul> <li>Tench</li> <li>Tubenose goby</li> </ul>	Silver carp (Hypopthalmichthys molitrix)								
<ul> <li>Asian swamp eei</li> <li>Rusty crayfish</li> </ul>	Northern snakehead (Channa argus)								
	Round goby (Neogobius melanostomus)								
	Lake Herring (Coregonus artedi)								
	<b>Rock bass</b> (Ambioplites rupestris)								

### **BLACK RIVER WATERSHED**

Sandy Crev

Little River

02

#### **Species Detected**

Tench

Stony Creek

- Round goby
- Tubenose goby
- Asian carp
- Northern snakehead
- Rusty crayfish
- Eurasian watermilfoil

Oneida

Lake

- **Fanwort**
- 🔵 Hydrilla

Source: Rogers, Yerdon, 2021-22

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11

05

8

dependence p

14

S Otter Creek

09

13

Erie Canal

08

06

04



We have collected hundreds of samples from multiple Priority Conservation Areas throughout the region.

Sites are selected based on water connectivity or habitat-based.



Potential (Hemlock Woolly Adelgid) Terrestrial eDNA Sample Sites

#### Primary Sites

- 1. South Sandy Creek
- 2. Winona State Forest \*
- 3. Salmon River Falls \*
- 4. Altmar State Forest \*
- 5. Camp Zebre \*

#### Backup Sites

- 7. Black Pond WMA
- 8. Lakeview WMA
- 9. Battle Hill SF





# THANK YOU

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# **SLELO PRISM**

ST. LAWRENCE EASTERN LAKE ONTARIO PARTNERSHIP FOR REGIONAL INVASIVE SPECIES MANAGEMENT