Environmental Contaminants in the Lake Huron to Erie Corridor: Effects on Zebrafish

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WATER Lab

WAYNE STATE

CURES

HEALTHY URBAN WATERS

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The Detroit River- Huron to Erie corridor

Investigating occurrence and effects of environmental contaminants in Detroit waterbodies

Objective 1: Identify concentrations of select ECs at the urban field stations and other Areas of Concern.

Objective 2: Evaluate the effect(s) of exposure to incoming raw water at the GLWA Water Works Park Pilot Plant using the zebrafish model.

Objective 3: Laboratory zebrafish studies to further examine health effects and gene expression changes of individual contaminants.

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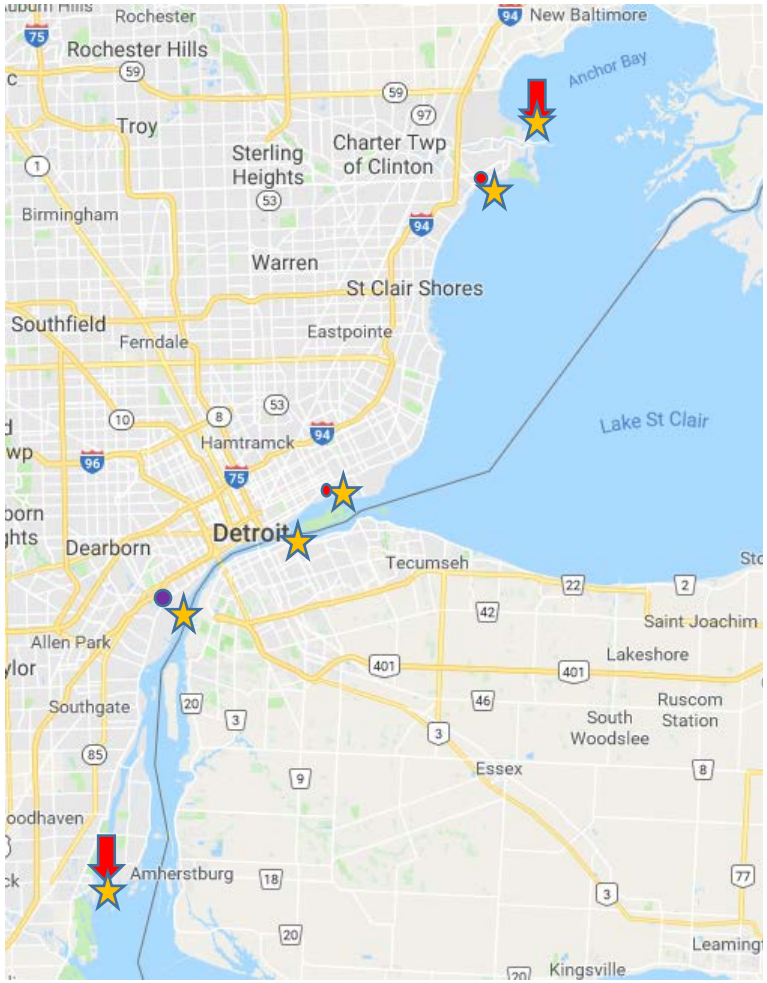
Objective 1: Identify concentrations of select ECs at the urban field stations and other Areas of Concern.



Sources of pollution:

- Urban and industrial development
- Combined sewer overflows
- Municipal and industrial discharges
- Storm water runoff and tributaries


Nmé

PFAS Surface Water Analysis

PFAS that were detected at one of more sites:

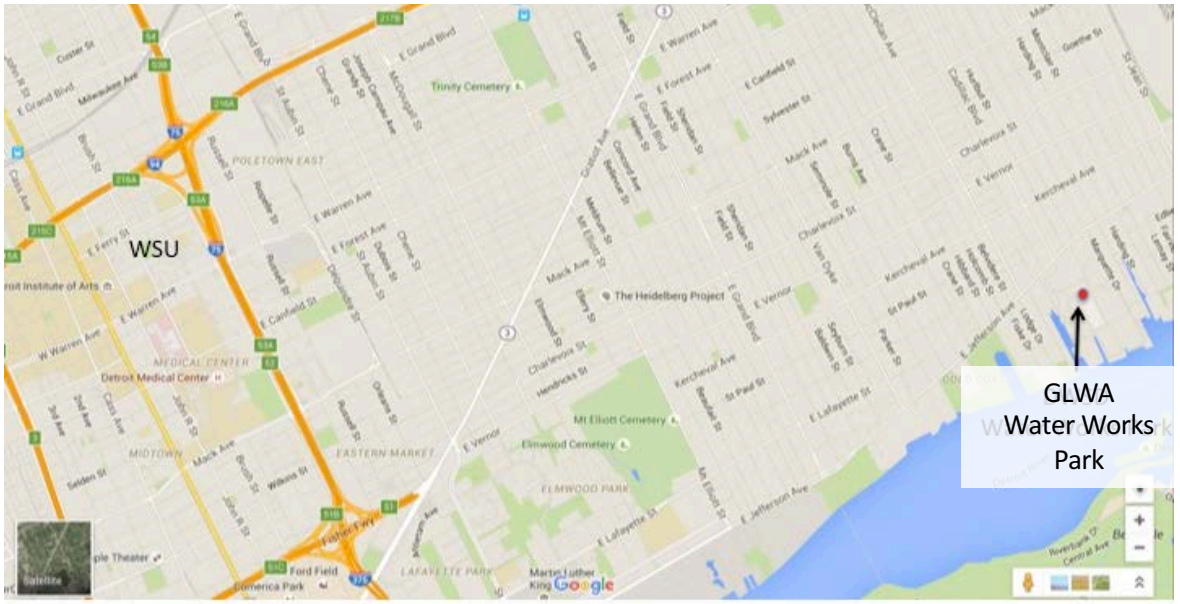
PFH_xA
PFOS
PFBA
PFOA
PFBS

PPCP_Surface Water Analysis

PPCPs that were detected at one of more sites:

Acesulfame-K
Acetaminophen
Atenolol
Caffeine
Carbamazepine
Cotinine
DEET
Diltiazem
Gemifibrozil
Meprobamate
Naproxen
Nicotine
Paraxanthine
Primidone
Sucralose
Sulfamethoxazole
Triclocarban
Trimethoprim
Tris(chloropropyl) phosphate
2,4-D
Atrazine
DACT
DEA
DIA
Iohexol

Objective 2: Evaluate the effect(s) of exposure to incoming raw water at the GLWA Water Works Park Pilot Plant using the zebrafish model.



Wayne State University – GLWA Drinking Water Treatment Plant Field Station

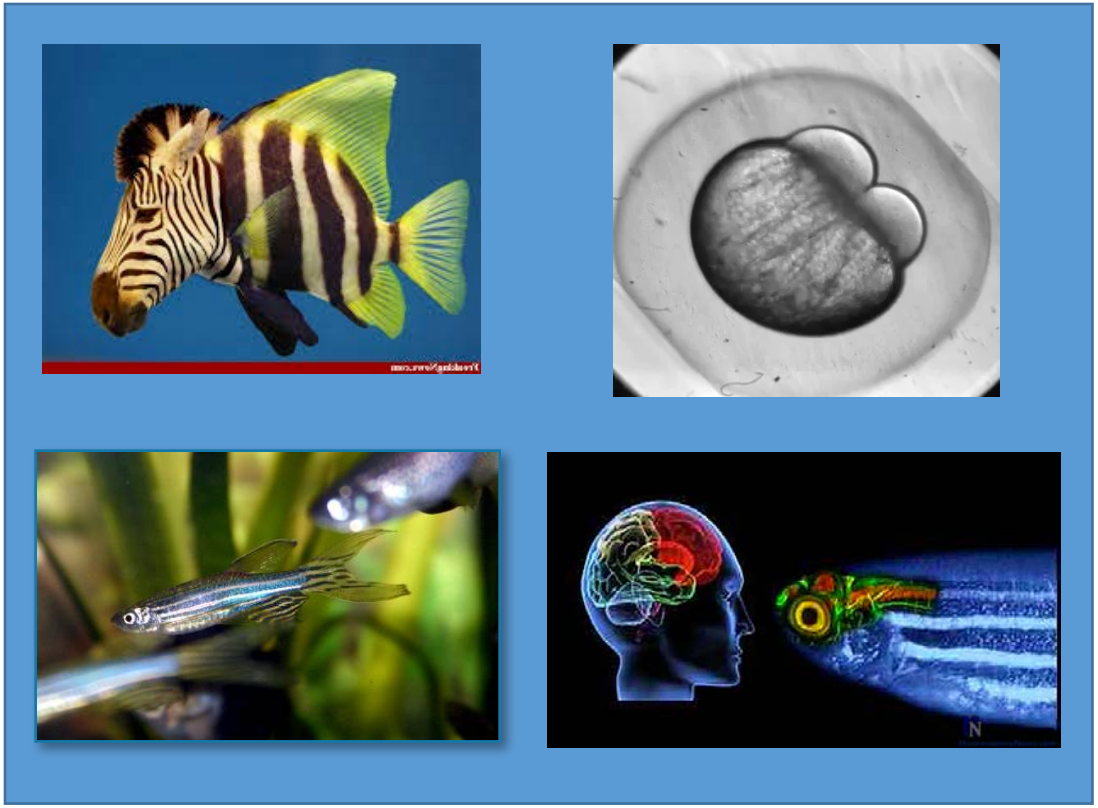
Objective 2: Evaluate the effect(s) of exposure to incoming raw water at the GLWA Water Works Park Pilot Plant using the zebrafish model.

Evaluate endpoints:

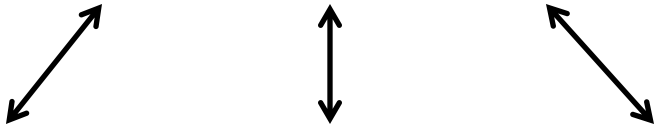
- Embryonic/developmental toxicity
- Reproductive toxicity
- Sex ratios
- Fertility
- Gene expression changes

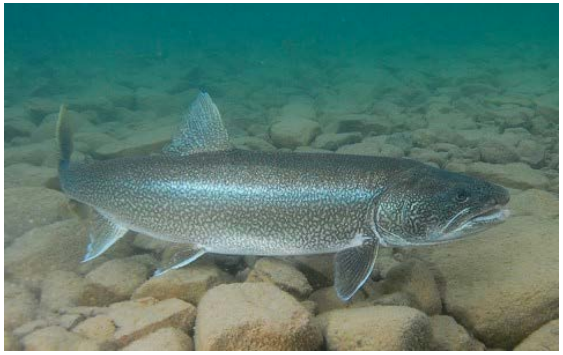
What is a zebrafish?

- *Danio rerio*
- Common aquarium fish
- Easy and inexpensive to care for
- Fast development and reproduction
- Sequenced genome
- NIH accepted model for human health
- 84% gene homology with human disease



Translational Model





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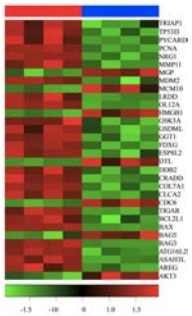
Objective 3: Laboratory zebrafish studies to examine health effects and gene expression changes



Gene expression

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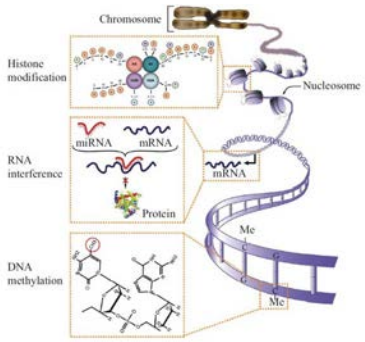

Epigenetic changes

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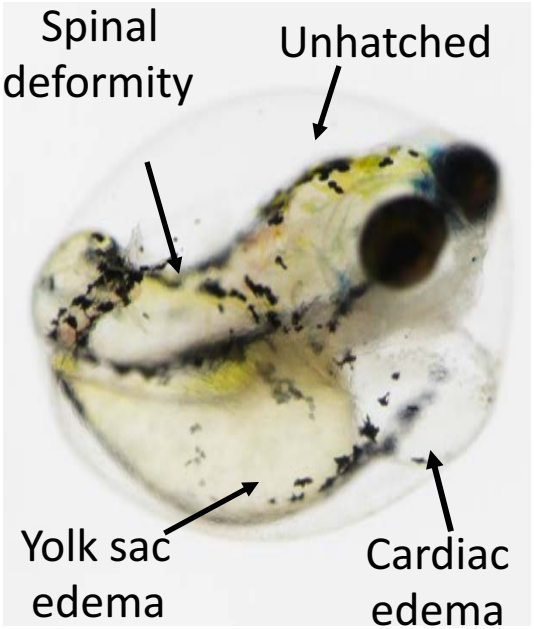

Larval Abnormalities (Day 5)

	Skeletal	Swim Bladder	Yolk Edema	Heart Edema	Total with Abnormalities
4-nonylphenol					
Atrazine		✓			✓
Bisphenol	✓	✓			✓
Chlorpyrifos					
Dieldrin	✓	✓	✓		✓
Estrone	✓	✓			✓
Metformin		✓	✓	✓	✓
Triclocarban	✓	✓	✓		✓
Triclosan					

Behavioral Analysis (Day 5)

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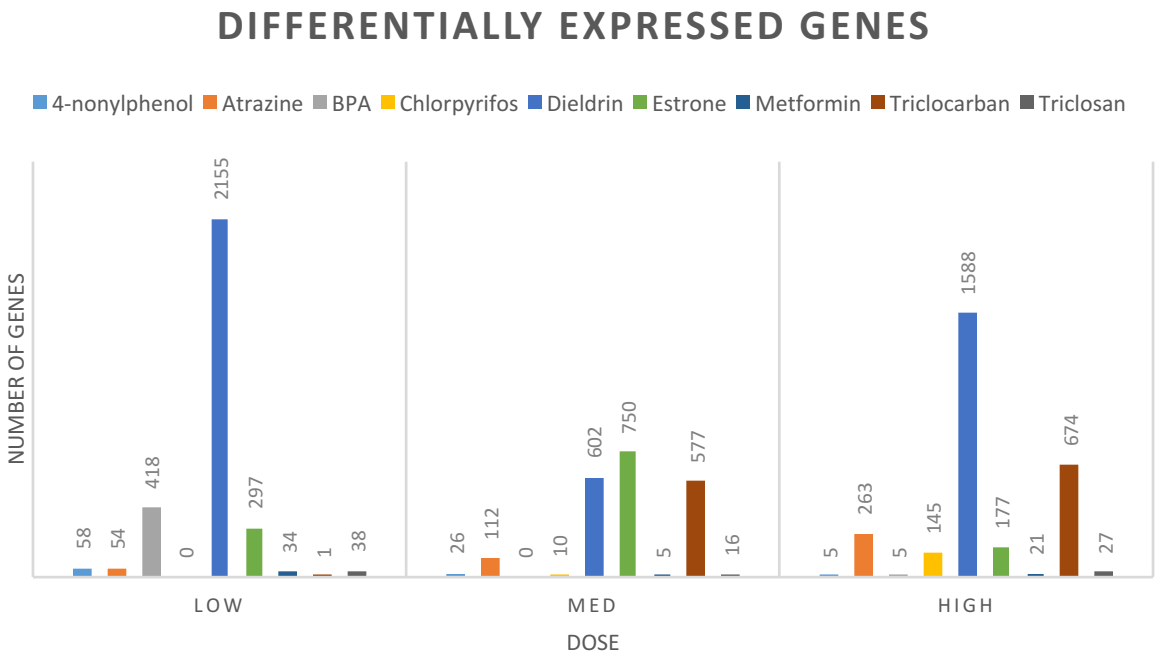

Summary and Conclusions

- Many ECs identified in the Lake Huron to Lake Erie corridor
- Growth and fertility are severely affected by chronic exposure to Detroit river water
- Genes of interest have been identified and are in the process of being more closely evaluated

Future Directions

- Continue to determine health effects of relevant contaminants and mixtures
- Windows of susceptibility
- Adult-onset and transgenerational disease
- Population level effects on wild fish populations

WATER Lab

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