

Assessing the Potential for Endocrine Disruption in Urbanized Aquatic Environments: Study Design, Findings and Impacts for the Calumet Region

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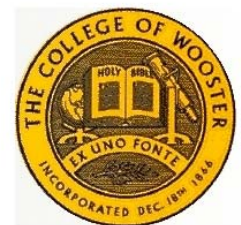
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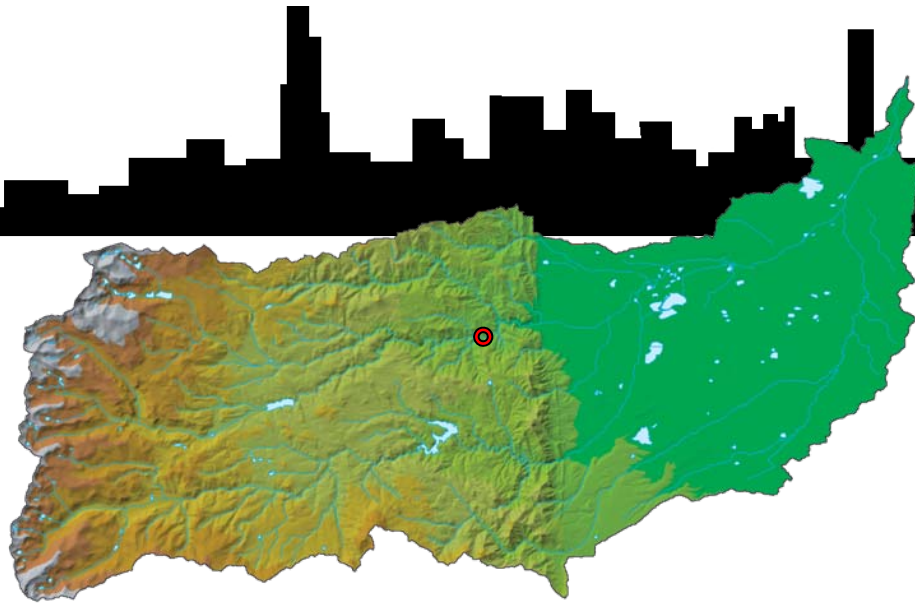


What is an Endocrine Active Compound?

An exogenous chemical that causes adverse health effects in an organism, or its progeny, consequent to changes in the endocrine function.



Literature



Boulder Creek, CO

(Vajda et al. 2008)

Total Estrogenicity: 11 to 31 ng/L E2

Less than 25% of fish are male

1/5 of male fish are hermaphrodites

Male fish produce egg yolk protein



Literature

North Shore Channel, IL

(Barber et al. In review)

Total Estrogenicity: 9 to 19 ng/L E2

Half of all fish are males

No hermaphrodites found

Male fish do produce egg yolk protein.



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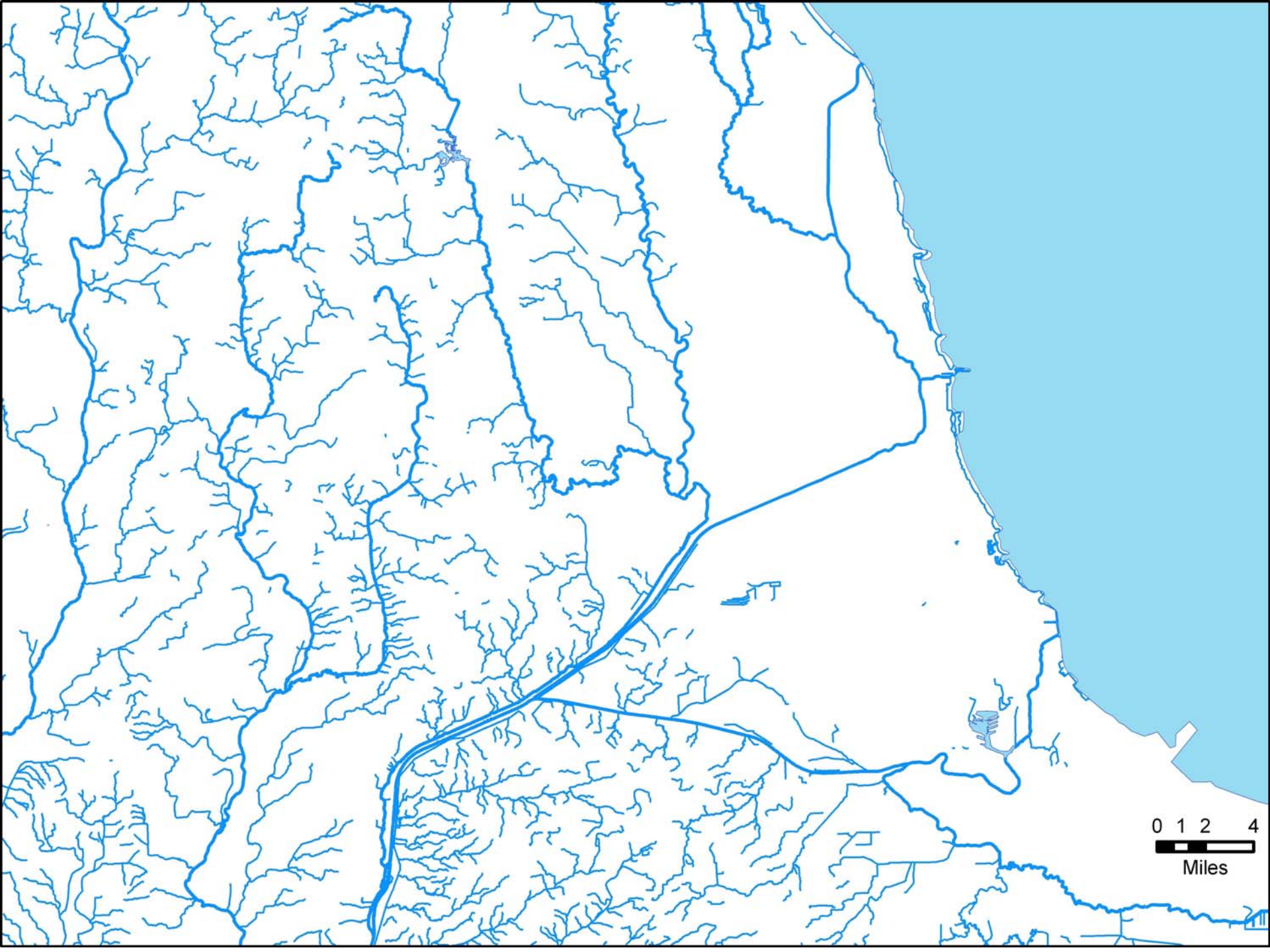
Male fish produce egg yolk protein



Why Study Urban Aquatic Environments?

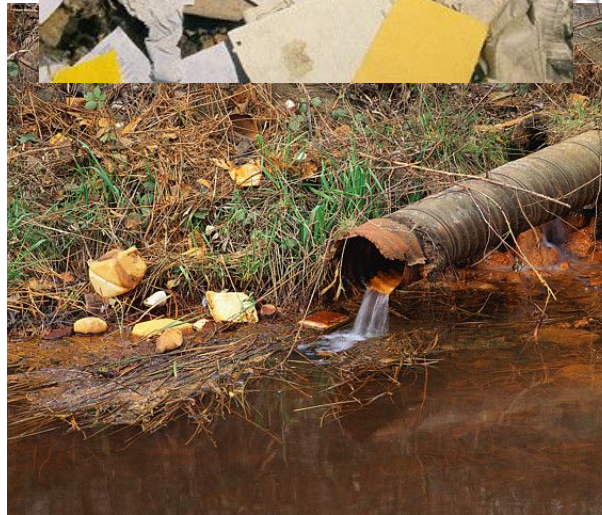
- They are more common than you think.
- Their abundance is likely to increase in the next 50 years.
- Resources are most utilized by the human population.
- They are aquatic **habitats**.

0 1 2 4
Miles




0 1 2 4
Miles

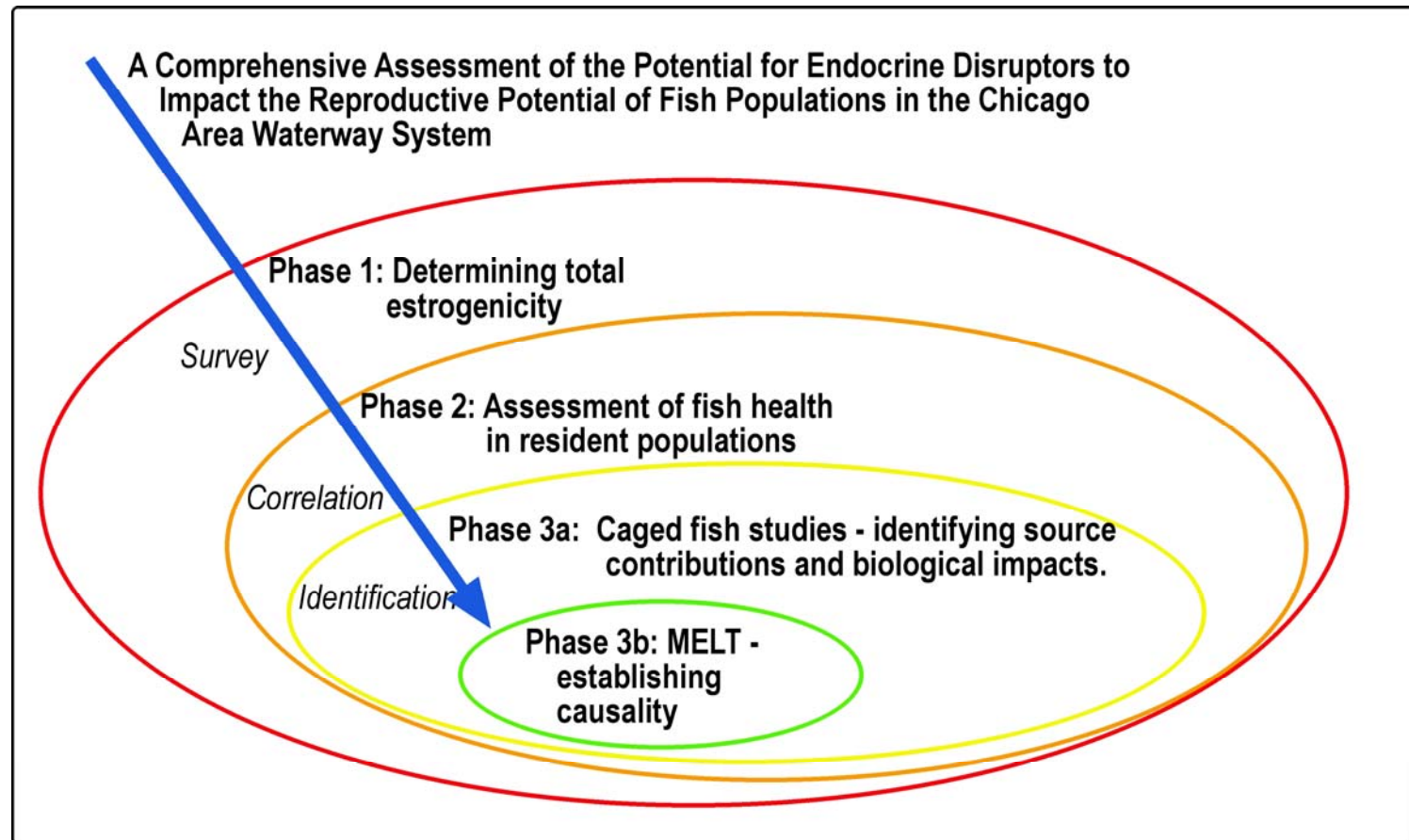
What Makes Urban Habitats Different?

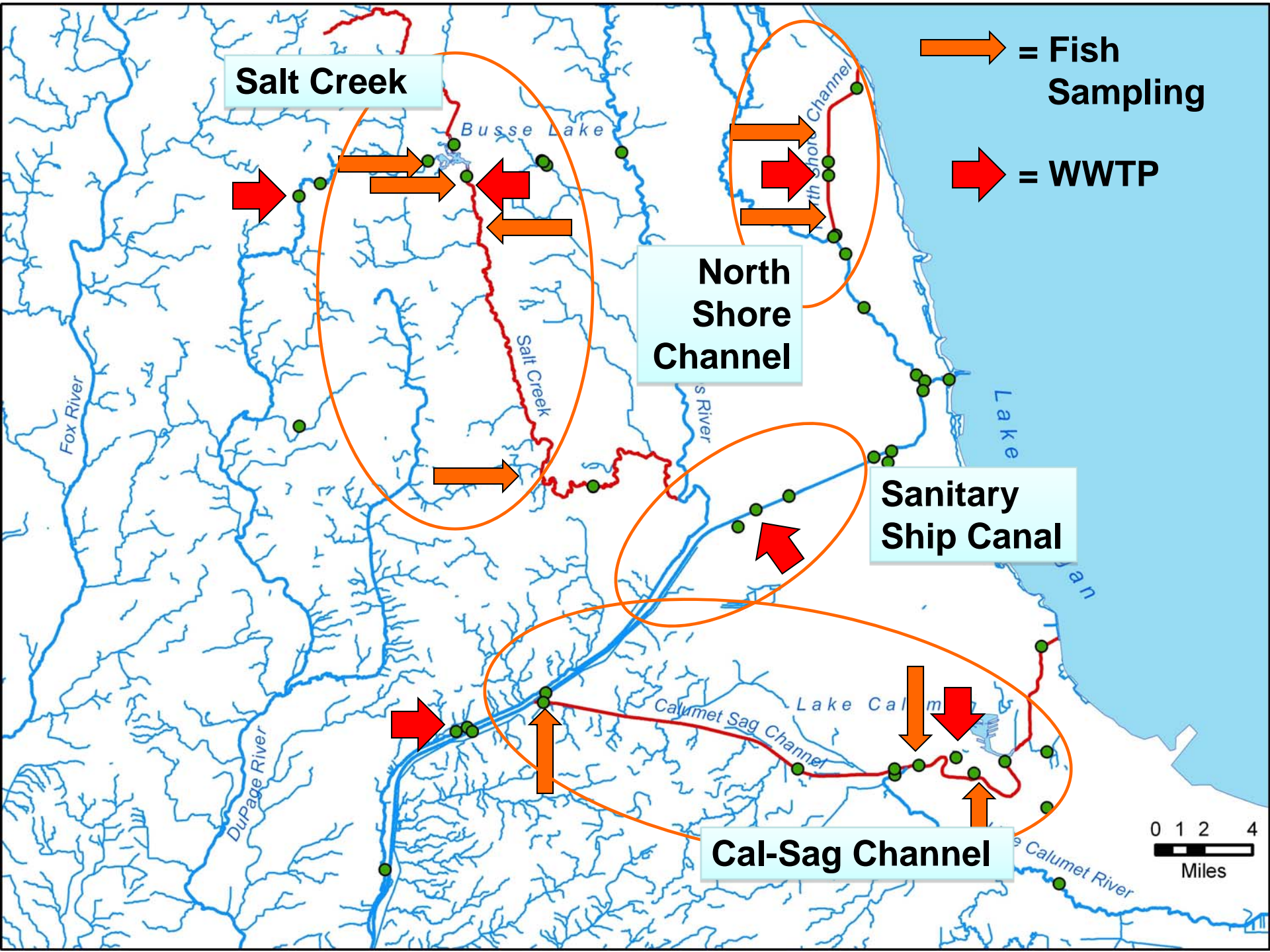


Research Question

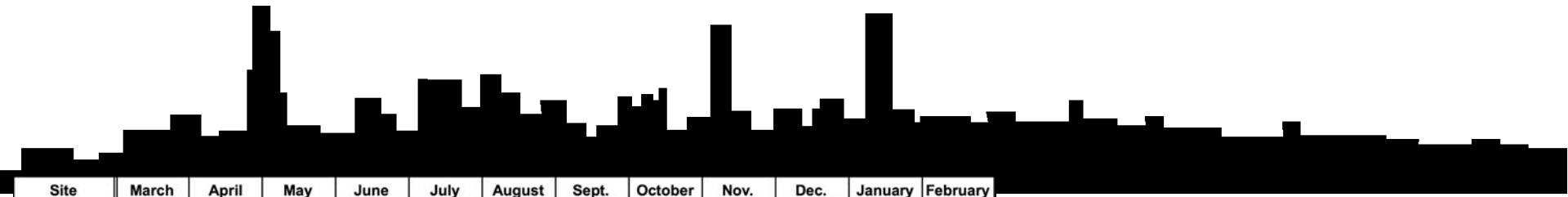
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- 1. What is the estrogenic exposure environment for fish in an urban aquatic ecosystem?*
 - 2. How is fish health impacted by the exposure to endocrine active compounds in an urban aquatic environment?*
 - 3. What are sources of endocrine active compounds and can they be causally related to adverse effects on fish health?*
 - 4. How do fish responses to estrogenic exposure differ from effects observed in less urban or laboratory settings?*

Study Overview





Water Estrogenicity Sampling



Site	March	April	May	June	July	August	Sept.	October	Nov.	Dec.	January	February
RP 1												
RP 2												
RP 3												
RP 4												
RP 5												
RP 6												
RP 7												
WW 18												
WW 29												
WW 35												
WW 36												
WW 37												
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WW 99												
WW 100												
WW 101												
WW 102												
WW 108												
WW 110												

Water Sampling

Collected water samples from 38 waterways and seven Reclamation Plants monthly.

Solid-phase extracted, eluded and curated 506 samples.

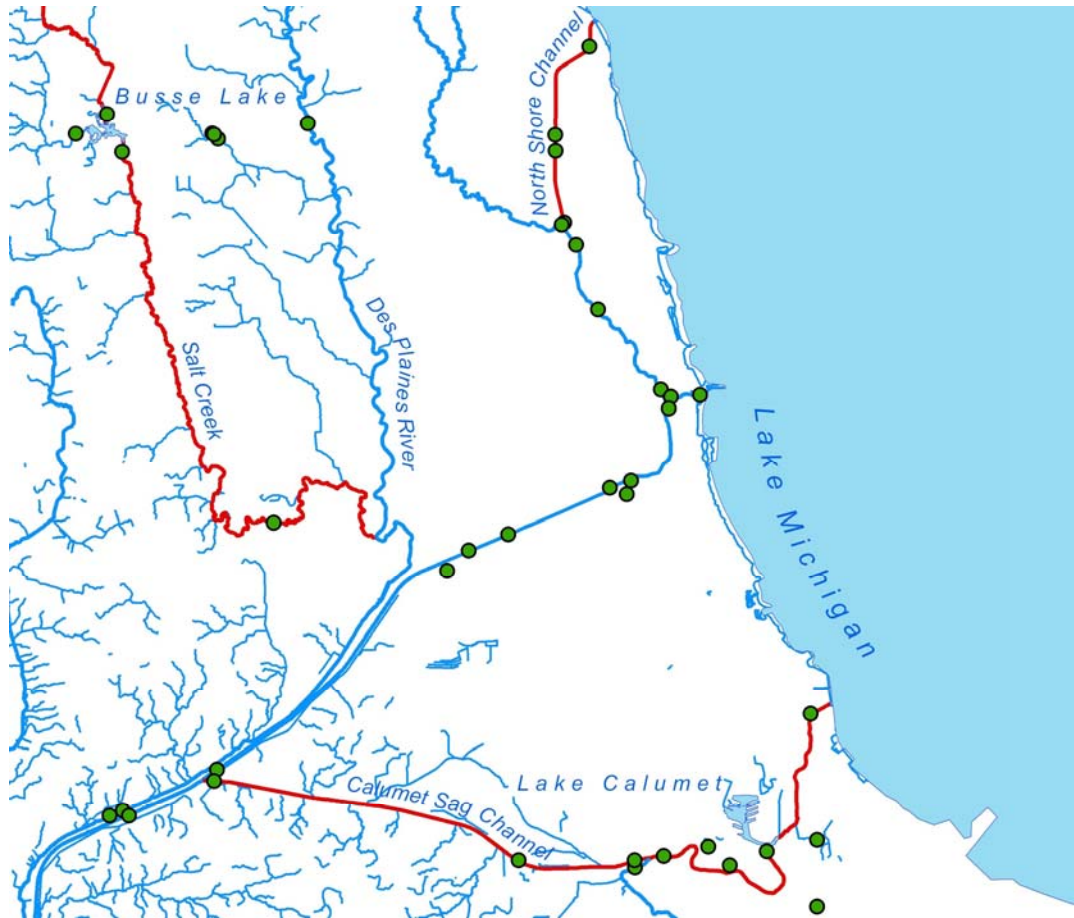
Continue for three years (~1,500 samples).

sample collected & curated

sample not collected

estrogenicity analysis

Water Chemistry Evaluations



Water Chemistry

(concurrent fish sampling)

- Natural & Synthetic steroids
- Pharmaceuticals
- Personal Care Products
- Alkylphenols

-> Ancillary environmental (continuous) and chemistry (monthly) data provided by funding agency.

Fish Survey Activities

		Caging & Collections Spring 2009						Caging Fall 2009			
		<i>Caged</i>		<i>Resident Fish</i>				<i>Caged</i>			
		Minnow	Sunfish	Minnow	Sunfish	Carp	Shiner	n	Minnow	Sunfish	n
Salt Creek	Busse Lake	2/5	2/3	1/3	18/18	18/15	0/1	86	17/9	19/19	66
	Eagan WRP	n/a	n/a	-	15/24	-	23/13	75	n/a	n/a	n/a
	Devon	10/5	0/1	-	-	-	-	16	7/6	10/8	31
	Wolf	-	1/0						9/7	22/23	16
N. Shore Channel	Oakton Ave	-	9/13	13/5	22/18	18/25	19/7	123	4/4	-	8
	Touhy	-	6/11	12/3	10/30	16/24	9/5	112	4/4	19/21	48
Cal-Sag Channel	Indiana Ave	1/7	13/8	14/25	14/11	16/24	0/1	134	4/3	12/22	41
	Calumet WWTP	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5/2	5/1	13
	Halsted St	6/3	11/11	5/10	12/28	12/24	3/8	133	17/14	23/17	71
	SEPA 5	2/11	-	22/15	13/18	20/20	2/1	124	11/7	27/12	67
Totals		21/31	42/47	67/56	104/147	100/132	56/36	803	78/56	137/123	406

Year 1 – Results



- Good correlation between total estrogenicity and water chemistry.
- Concentrations and composition of endocrine active compounds vary with seasons.
- Total estrogenicity correlates with production of egg yolk protein in male fish.
- Treated wastewater effluent does not produce a strong signal of estrogenicity → need to identify other sources.



funding provided by:

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago