

The Fish Tumor BUI for the Upper Great Lakes and the St. Clair River AOC

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IJC Delisting Guidelines for BUI #4: Fish Tumors, 1991

When the incidence rates of fish tumors or other deformities do not exceed rates at unimpacted control sites

When survey data confirm the absence of neoplastic or preneoplastic liver tumors in bullheads or suckers

Biomarkers: Traits Strong to Weak

- Causal Certainty
 - Liver neoplasms
 - Hepatic Altered Foci
 - Skin neoplasms
 - Barbel deformities
- Sensitivity
 - Barbel deformities
 - Skin neoplasms
 - Hepatic Altered Foci
 - Liver neoplasms

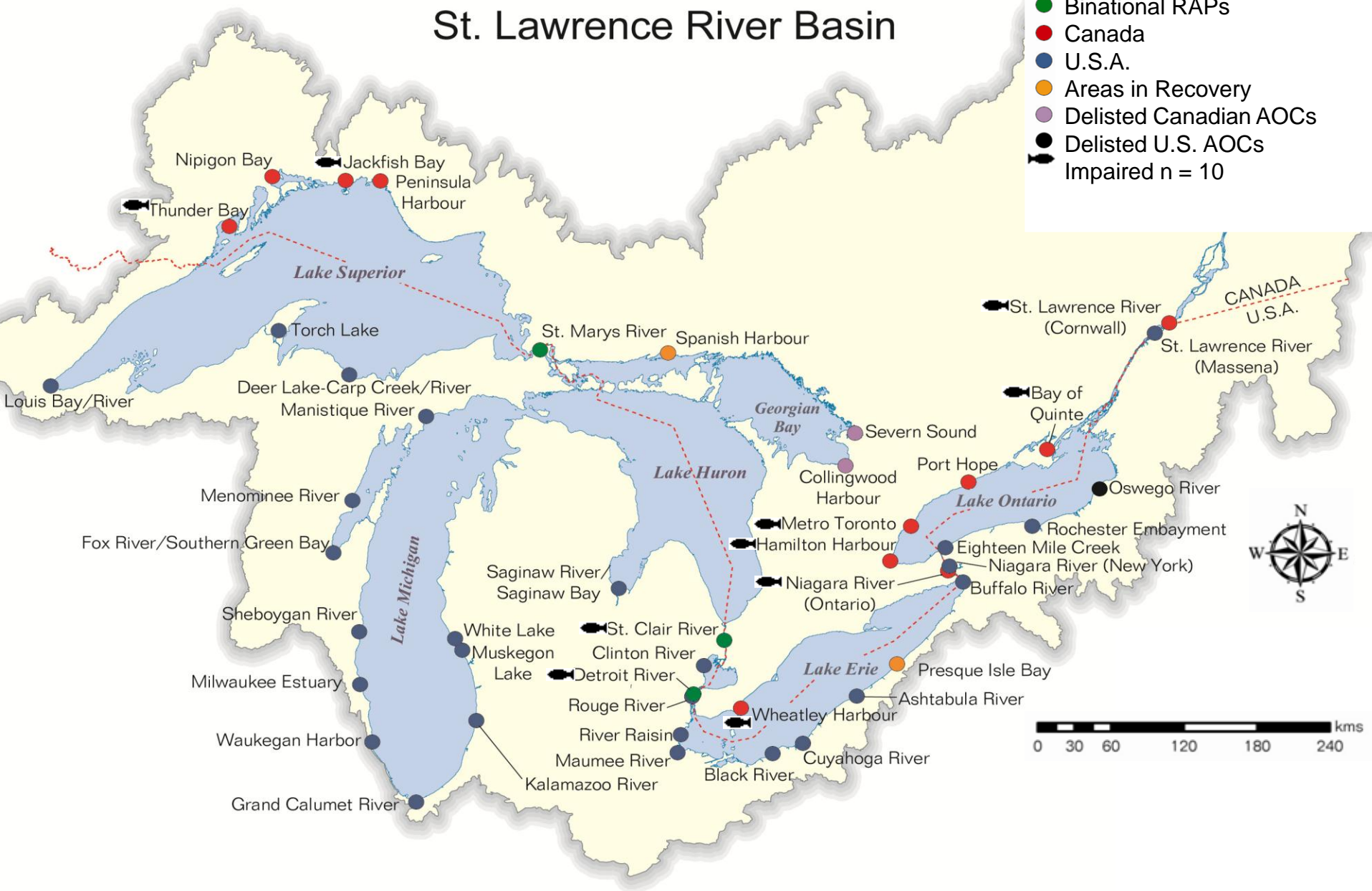
Sentinel Fish Used for Tumor Studies

- Brown Bullhead: Species used for most studies in the Lower Great Lakes
- White sucker: Species used for most studies in the Upper Great Lakes
- Shorthead Redhorse: Species selected for St. Clair River survey
- Walleye: Species studied in several systems (St. Lawrence River)

Areas of Concern in the Great Lakes - St. Lawrence River Basin

Legend

- Binational RAPs
- Canada
- U.S.A.
- Areas in Recovery
- Delisted Canadian AOCs
- Delisted U.S. AOCs
- Impaired n = 10



Species and Lake Basin by Location

- **Thunder Bay**
- **Jackfish Bay**
- **St. Clair River**
- **Detroit River**
- **Wheatley Harbour**
- **Niagara River**
- **Hamilton Harbour**
- **Toronto**
- **Bay of Quinte**
- **Cornwall**
- **Superior, Sucker**
- **Superior, Sucker**
- **Huron, Redhorse**
- **Inter. R., Bullhead**
- **Erie, Bullhead**
- **Inter. R., Bullhead**
- **Ontario, Bullhead**
- **Ontario, Bullhead**
- **Ontario, Bullhead**
- **Inter. R. Bullhead**

Location	Year/ season	Walleye	Suckers
Bay of Quinte *	spring 1989	Trent River Napanee R. (n=208)	Trent River
	summer 1989	B. of Quinte (n=30)	B. of Quinte
St. Clair *	Spring, 1989	Thames River (n=203)	Sydenham River
	Summer, 1990	St. Clair River (n=62)	St. Clair River
Lake Nipissing	Spring, 1990	Wasi Falls (n=50)	Wasi Falls
	Summer, 1990	Sandy Isle (n=146)	Sandy Isle
St. Lawrence River *	Spring, 1990	Raison River (n=189)	Raison River
	Summer, 1990	Lake St. Francis (n=22)	Lake St. Francis

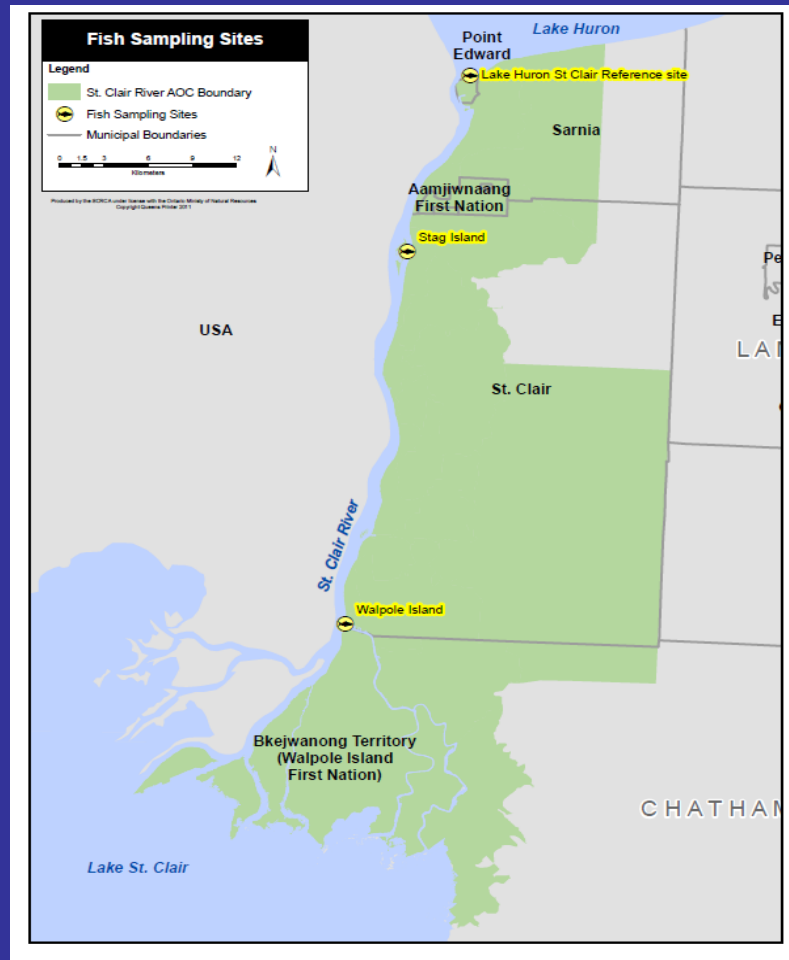
Location	Walleye		Suckers	
	Skin	Liver	Skin	Liver
Bay of Quinte *	36.9	0.5	NA	0.0
St. Clair *	39.2	ND	NA	ND
Lake Nipissing	6.1	0.0	NA	0.4
St. Lawrence River *	49.7	16.3	NA	6.1

* - RAP site

Walleye Epidermal Tumours

- Lymphocystis mimics skin neoplasms, caused by virus
- Walleye dermal sarcoma
 - Retrovirus transmitted with cell-free filtrate (1990)
- Discrete epidermal hyperplasia
 - Identified two related retroviruses, WEHV 1 and WEHV2 (1991 & 1998)
 - Induced with cell-free filtrates (1998)

St. Clair River AOC – Sampling sites



Shorthead Redhorse

- Maxima: 75cm (length), 3.9 kg (weight), 9 years old
- Widely distributed in Great Lakes – St Lawrence
- Feeds on small benthic invertebrates
- Selected at SCR as bullhead and white suckers were not common





Upper Lakes Liver Tumor Prevalence at AOCs and Reference Sites (R)

Location	# of Fish	Neo. % 1986-90	Neo. % 2003-07	Signif. Differ.
Thunder	100	7.1%	2%	No?
Mt. Bay - R	100	2.4%	0%	
Jackfish	100	7.2%	0%	No
Mt. Bay - R	100	2.4%	0%	
St. Clair	126	NA	0%	No
L. Huron - R	100	NA	1%	

St Clair River AOC Conclusions

- No historical data on bullhead or sucker liver tumours exists for the St. Clair River.
- No liver tumors were observed in the survey of shorthead redhorse from the St. Clair River.
- Shorthead redhorse from Lake Huron had a 1% prevalence of liver tumors, as did brown bullhead from reference sites
- Male to female ratio was similar at AOC and reference site.
- Sample population was older than reference site

One More Survey ?

- First Nations use St. Clair walleye as major food source
- Walleye are a predominant game species
- Walleye are known to develop liver tumours.
- Age related walleye tumour rates have been published
- Such a sample effort is feasible





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