

**Prospecting for organochlorine compounds
in Yukon wetlands using wood frogs
(*Rana sylvatica*).**

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PROSPECTING FOR ORGANOCHLORINE COMPOUNDS IN YUKON WETLANDS USING WOOD FROGS (*Rana sylvatica*).

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INTRODUCTION

The Arctic Environmental Strategy of the Department of Indian Affairs and Northern Development, Canada has provided resources to identify and cleanup some contaminated sites in the Yukon. Local residents have expressed concerns about the about the status of wetlands near communities that may have been strayed for mosquito control or may have been contaminated with other organochlorine compounds. Resident fish, birds or mammals are not always available or suitable for assessment. The wood frog (*Rana sylvatica*) is a common resident of Yukon boreal forest wetlands (a) and was considered as a possible prospecting tool for organochlorine contaminated sites.

Systematic mosquito control programs using DDT began in 1950 and continued until 1969 when the Canadian Wildlife Service banned the use of DDT for mosquito control in the Yukon. Ground fogging, air spraying and hand application (using Tossits) were used to control mosquitos around nine communities. (b) Two fish kills, one in Whitehorse and one in the community of Watson Lake at Wye Lake, contributed to growing public concern about the spraying program and to a continuing concern about the wetlands which were sprayed.

Spring peepers in Point Pelee National Park contained organochlorine pesticide residues 26 years after the last application of DDT. (c) This work suggested that Yukon wood frogs from DDT sprayed wetlands might still contain measurable levels of DDT. A collection permit was obtained from the Yukon Department of Renewable Resources. Suitable sites were selected based on local knowledge and sites were sampled as duties permitted during the summer of 1996.

Methods

Wood frogs (*Rana sylvatica*) were captured in southern Yukon wetlands and transported live to Whitehorse. The frogs were measured for length and weighed, then placed in a ziplock bag and frozen at -20 C. The whole frog was submitted for analysis to ETL Enviro-test Laboratories for the organochlorine GC/MSD analysis. After encouraging data from the first frogs had been received, it was decided to sample some sites for PCB's. Where three frogs were available from a site, they were combined to provide a larger mass and lower detection limit.

Results and discussion

Wood frog adults captured in 1996 averaged 6.8 grams and 4.0 cm from snout to vent. Results of organochlorine analysis for DDT, DDD, DDE and PCB's are presented in Table 1. Where two frogs from a site were analyzed, the mean concentration is presented in table 1 as is the number of frogs involved (n). Where three frogs were combined to provide a larger sample to reduce the detection limit for DDT and provide enough sample for PCB's analysis, the 'n' value of 3 and the PCB's value are provided. Sites were numbered from 1 to 14 and frogs were numbered individually from 1 to x for each site. Sites which were known to be treated with DDT compounds are indicated. Site 8, Golden Pond, was sampled because of a known PCB's problem on adjacent land. Not detected (ND) or 'less than' values are indicated as negative numbers in table 1 as the detection limit varied with the mass of the sample.

The p,p'-DDE levels were about 10 times higher in frogs from wetlands known or strongly suspected of being treated with DDT. Wye Lake (site 7) near Watson Lake was sprayed in the mosquito spray program. In 1967, DDT spraying killed the entire rainbow trout planting in this lake. The DDE concentration of 37 ng/g in the frog submitted for analysis shows that the signature of DDT spraying can be found in the wood frogs. Paddy's Pond (site 1) in the Whitehorse neighborhood of Hillcrest was sprayed at least once per year between 1950 and 1969 with DDT at a rate of about 0.2 pounds per acre. The averaged spring concentrations in two separate frogs from Paddy's Pond were higher (28 ng/g) than the fall results (13 ng/g) from a combined sample of three frogs. This may have been due to sample variation, dilution due to weight gain through the summer or to the larger sample size for the fall frogs. Wood frogs from treated Yukon wetlands contained substantially lower DDE (~30 ng/g) than the spring peepers in Point Pelee, Ontario (~1000 ng/g)(b). The background Yukon DDT, DDD and DDE values would appear to be about 1 ng/g. Sites which were treated with DDT for mosquito control could be identified using this approach.

Frogs from one wetland (site 8, Golden Pond), adjacent to land where PCB's contaminated oils were applied to land for dust control, contained 420 ng/g PCB's compared to the background of less than 10 ng/g in other wetlands sampled. This indicates that PCB's contamination can be detected with samples larger than 10 grams. The background Yukon PCB's concentration appears to be less than 10 ng/g

The frogs captured from the wetland in McIntyre Creek at the toe of the Range Road dump (site 14) contained 2 ng/g DDT, 0.9 ng/g DDD, 5.9 ng/g DDE and 41 ng/g PCB's. This dump was used by Whitehorse during the period of the DDT spraying program and may have been treated for mosquitos as well as have been used to dispose of residual organochlorine compounds. Sediments from the wetland below the dump have been sampled as a possible source of organochlorine compounds for the fish in Lake Laberge downstream on the Yukon River. The levels measured here are not high enough to be a major source of these contaminants and are similar to sediment samples collected from the site.

The frog from site 5, the Watson Lake airport wetland, contained 18 ng/g DDT as well as 4.5 ng/g DDD and 28 ng/g DDE. This site was sprayed for mosquitos and is suspected to be a disposal site for DDT residuals. The frog from Watson Lake near the airport (site 6) contained 3 ng/g DDT, 1.8 ng/g DDD and 31 ng/g DDE. Fish from Watson Lake are known to contain DDT and DDE from previous studies. Comparison of the wood frog and fish results may assist the assessment of this site planned in 1997. These results indicate that a source of fresh DDT may be present near site 5.

Conclusions

Wood frogs are useful for prospecting for organochlorines in Yukon wetlands. The approach outlined here is a simple and cost effective way of screening wetlands. Sample sizes of one to three frogs (10 to 20 grams) were able to provide concentrations to about the 1 ng/g level for DDT, DDD, DDE and the 10 ng/g level for PCB's. These concentrations are sufficient for initial assessment purposes and close to background levels.

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References

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Table 1: DDT, DDD, DDE and PCB concentrations in Yukon wood frogs

Site	Wetland	n	p,p'-DDT ng/g	p,p'-DDD ng/g	p,p'-DDE ng/g	PCB's ng/g
1	Paddy's pond-spring (1)	2	-2.0	-1.0	28.0	
1	Paddy's pond-fall (1)	3	1.0	0.7	13.0	-10
2	Hidden Lake #2-Riverdale	2	-2.0	-1.0	3.0	
3	M'Clintock River delta	1	-1.0	-0.2	0.8	
3	M'Clintock River delta	3	-0.5	-0.5	1.4	-10
4	Johnson's Crossing pothole	1	-2.0	-0.4	0.9	
5	Watson Lake Airport (1)	1	18.0	4.5	28.0	
6	Watson Lake (1)	1	3.0	1.8	31.0	
7	Wye Lake (1)	1	-3.0	1.4	37.0	
8	Golden Pond (2)	3	-1.0	-0.2	0.7	420
10	Whitehorse pothole	1	-1.0	-2.0	4.0	
11	Marsh Lake pothole	1	-2.1	-2.1	2.3	-50
12	Snag airport	2	-0.5	-0.5	-0.5	-10
13	Thistle Creek	1	-0.6	-0.6	-0.6	-10
14	McIntyre Creek-dump	3	2.0	0.9	5.9	41

- (1) known to have been sprayed with DDT for insect control
- (2) PCB's contaminated soil nearby.

Note: Minus signs indicate that the sample was less than the the detection limit.
The detection limit was dependent upon the mass of the sample.

Photo 1: Paddy's Pond in the Hillcrest neighborhood of Whitehorse Yukon. This sedge meadow wetland was sprayed with DDT between 1950 and 1969 to control mosquitos. It is a popular local recreation area.



Photo 2: Collecting wood frogs in the Whitehorse pothole, site 10. This pothole pond may be used for future sewage lagoon effluent disposal. The single frog captured at this site was found on the access road.



Photo 3: This wood frog, *Rana sylvatica*, from Golden Pond south of Whitehorse, (sample site 8 frog 3) was 4.3 cm long (from snout to vent) and weighed 8.2 grams. The eye mask, the light dorsal stripe and the dark coloring were typical of the wood frogs captured during this study.

