

White-tailed Deer (*Odocoileus virginianus*) Fall Hunt 2023

Contaminant Tissue Burdens Analysis Report



Pictou Landing First Nation

Report Prepared by Dr. Andrew Carrier, Chemistry Department, Cape Breton University

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Cover Image from Mississippi State University Extension Service (B. Strickland)

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Introduction

The people of Pictou Landing First Nation (PLFN) have recently completed a successful deer hunt that has not occurred in many years due to concerns regarding the environmental pollution present in A'se'k. As Northern Pulp ceased discharging mill wastewater into A'se'k, the environment now has an opportunity to recover with the potential for the community to once again enjoy the natural resources and recreational opportunities presented by the land. As part of the Community-led A'se'k Assessment, samples were collected by community members for analysis to assess the recovery of A'se'k and the risk of consuming foods and medicines collected from the land. This report contains the results of the tissue analysis from the hunted deer. Samples of the muscle, fat, liver, and blood were sent for analysis to determine the metal content and for the presence of potentially cancer-causing contaminants called polycyclic aromatic hydrocarbons (PAHs).

Summary of the Findings

No polycyclic aromatic hydrocarbons (PAHs) were detected by the analysis laboratory. No metals were found in the deer's liver at toxic levels, and they were detected at levels similar or lower than those reported previously for deer harvested from the eastern mainland of Nova Scotia (Pictou, Antigonish, and Guysborough counties, **Figure 1**). Metal concentrations in the muscle and fat were at even lower levels.

Understanding the Results

Metals and minerals are an important part of our everyday diet. Some, like sodium and potassium, are common electrolytes, and others like iron are familiar nutrients required for healthy blood. Many metals are needed in trace amounts; however, at high levels metals can cause toxic effects to our bodies. The deer liver contained metal concentrations comparable to normal levels for deer liver, and all were well below levels associated with the risk of disease.

Polycyclic aromatic hydrocarbons (PAHs) are potentially cancer-causing molecules that can be formed when meat is cooked at high temperature (charring or burning) or from smoking. PAHs are also formed by industrial processes and can enter the environment as pollution. Because PAHs dissolve in fat and not water, they can build up inside the bodies of animals and become concentrated in the food chain, where they can become a health risk. No PAHs were discovered above the detection limit of the analysis laboratory, which means the health risk of consuming the deer is minimal assuming it is cooked properly. It also lets us know that the deer was not exposed to dangerous amounts of pollution while it was alive.

It is important to understand that each white-tailed deer, while harvested adjacent A'se'k by PLFN hunters, are free to forage across broad territories. For highly mobile wildlife, it is always unknown what foods were consumed by the deer, and the how much of their foraging activities were adjacent A'se'k. Despite a limited sample size ($n=2$ deer) in a single harvest year, the results are encouraging that these particular deer from the Fall 2023 harvest have no evidence of elevated contaminants burdens in their tissues.

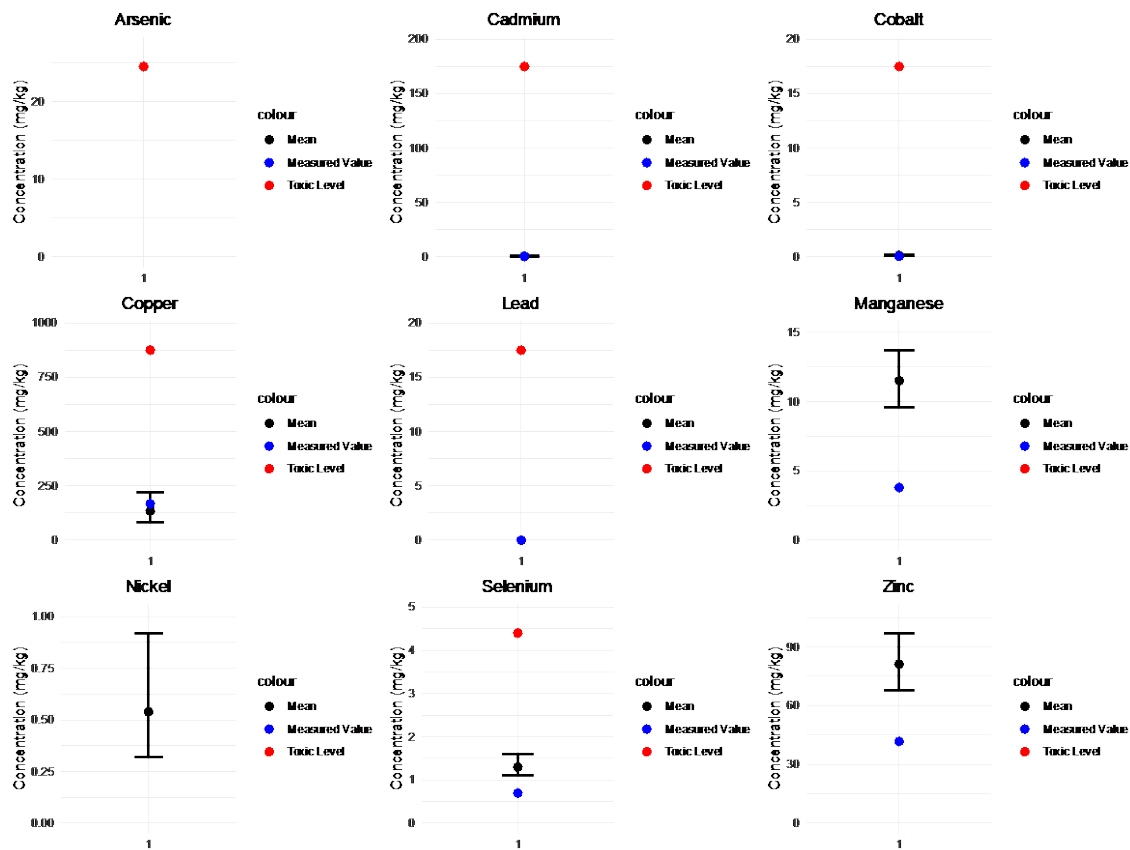


Figure 1. Metal concentrations detected in deer liver. The mean and 95% confidence interval (the true average value has a 95% chance to fall within the error bars) corresponds to values obtained from 26 deer and reported in 2005 (Pollock 2005). Toxic levels are reported based on the equivalent toxic levels for beef (Puls 1994). The measured value is the value measured in the deer hunted by Pictou Landing First Nation. Where no data is recorded the measured values were below the detection limit or there is no established toxic level.

Conclusion

Analyzing the foods, medicines, soil, and water around A'se'k will allow the community to continue monitoring its recovery and assess their risk of exposure when using harvested foods and medicines as well as participating in recreational activities. Building Pictou Landing First Nation's capacity to perform this research further enables its ability to advocate for itself and engage with others to promote community welfare and recover and preserve its traditional land uses.

References

- Pollock, B. "Trace elements status of white-tailed deer (*Odocoileus virginianus*) and moose (*Alces alces*) in Nova Scotia" (2005)
- Puls, R. "Mineral levels in animal health: diagnostic data." 2nd ed. Clearbrook, British Columbia: Sherpa International. 356 pp. (1994)

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 Date Received: 17-Apr-24

CERTIFICATE OF ANALYSIS
 for
Pictou Landing First Nation
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Attention: Tina Kelly
 Project #: DEER-1
 Location: Pictou Landing
 Analysis of Samples

RPC Sample ID:			518964-1	518964-2	518964-3
Client Sample ID:			PLFN_WTD Blood	PLFN_WTD Adipose	PLFN_WTD Liver
Date Sampled:			10-Apr-24	10-Apr-24	10-Apr-24
Analytes	Units	RL			
Aluminum	mg/kg	0.1	45.6	0.6	3.6
Antimony	mg/kg	0.01	0.02	< 0.01	< 0.01
Arsenic	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Barium	mg/kg	0.1	1.3	< 0.1	0.1
Beryllium	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Bismuth	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Boron	mg/kg	0.1	1.0	< 0.1	0.3
Cadmium	mg/kg	0.001	0.064	0.002	0.702
Calcium	mg/kg	5	199	25	47
Chromium	mg/kg	0.1	0.3	< 0.1	< 0.1
Cobalt	mg/kg	0.01	0.03	< 0.01	0.08
Copper	mg/kg	0.1	3.1	0.2	168.
Iron	mg/kg	2	1350	4	109
Lead	mg/kg	0.01	0.65	< 0.01	0.01
Lithium	mg/kg	0.01	0.06	< 0.01	< 0.01
Magnesium	mg/kg	1	109	7	177
Manganese	mg/kg	0.1	3.8	< 0.1	3.8
Mercury	mg/kg	0.01	< 0.01	< 0.01	0.02
Molybdenum	mg/kg	0.01	0.01	< 0.01	0.80
Nickel	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Potassium	mg/kg	2	5380	121	3380
Rubidium	mg/kg	0.01	9.91	0.29	11.2
Selenium	mg/kg	0.1	0.4	< 0.1	0.7
Silver	mg/kg	0.01	< 0.01	< 0.01	0.36
Sodium	mg/kg	5	6380	325	1060
Strontium	mg/kg	0.1	0.4	< 0.1	< 0.1
Tellurium	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Thallium	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Tin	mg/kg	0.01	0.04	< 0.01	< 0.01
Uranium	mg/kg	0.01	< 0.01	< 0.01	< 0.01
Vanadium	mg/kg	0.05	0.10	< 0.05	< 0.05
Zinc	mg/kg	0.1	7.1	0.9	41.8

This report relates only to the sample(s) and information provided to the laboratory.
 RL = Reporting Limit

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Report ID: 518964-OAS
 Report Date: 06-May-24
 Date Received: 17-Apr-24

CERTIFICATE OF ANALYSIS
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Attention: Tina Kelly
 Project #: DEER-1
 Location: Pictou Landing
PAH in Other

RPC Sample ID:			518964-2	518964-3	518964-4
Client Sample ID:			PLFN_WTD Adipose	PLFN_WTD Liver	PLFN_WTD Muscle
Date Sampled:			10-Apr-24	10-Apr-24	10-Apr-24
Matrix:			other	other	other
Analytes	Units	RL			
Naphthalene	mg/kg	0.01	<0.05	<0.01	<0.01
Acenaphthylene	mg/kg	0.01	<0.05	<0.01	<0.01
Acenaphthene	mg/kg	0.01	<0.05	<0.01	<0.01
Fluorene	mg/kg	0.01	<0.05	<0.01	<0.01
Phenanthrene	mg/kg	0.01	<0.05	<0.01	<0.01
Anthracene	mg/kg	0.01	<0.05	<0.01	<0.01
Fluoranthene	mg/kg	0.01	<0.05	<0.01	<0.01
Pyrene	mg/kg	0.01	<0.05	<0.01	<0.01
Benz(a)anthracene	mg/kg	0.01	<0.05	<0.01	<0.01
Chrysene/Triphenylene	mg/kg	0.01	<0.05	<0.01	<0.01
Benzo(b+j)fluoranthene	mg/kg	0.01	<0.05	<0.01	<0.01
Benzo(k)fluoranthene	mg/kg	0.01	<0.05	<0.01	<0.01
Benzo(e)pyrene	mg/kg	0.01	<0.05	<0.01	<0.01
Benzo(a)pyrene	mg/kg	0.01	<0.05	<0.01	<0.01
Indeno(1,2,3-c,d)pyrene	mg/kg	0.01	<0.05	<0.01	<0.01
Benzo(g,h,i)perylene	mg/kg	0.01	<0.05	<0.01	<0.01
Dibenz(a,h)anthracene	mg/kg	0.01	<0.05	<0.01	<0.01
2-fluorobiphenyl (surrogate)	%		98	104	102
p-terphenyl-d14 (surrogate)	%		92	105	106

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