

# Horsefly River Roundtable Discussion Paper on Biosolids



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# Watershed Considerations and Knowledge Gaps

This discussion concerns balancing agricultural benefits with environmental stewardship within a salmon-bearing watershed. Nutrifor, derived from treated municipal biosolids, is currently being applied within the Horsefly River watershed. While biosolids meet existing regulatory requirements and can provide agronomic benefits, they are also known to contain trace levels of persistent and emerging substances of concern, including per- and polyfluoroalkyl (PFAS) and perfluorooctanesulfonic acid (PFOS), certain pharmaceuticals, heavy metals, and micro-plastics.

Scientific literature has identified potential health and ecological effects associated with specific PFAS/PFOS compounds, including links to certain cancers and immune and reproductive disruption. Regulatory responses internationally are evolving, with various jurisdictions phasing out or restricting certain compounds. However, environmental behaviour, cumulative loading, and long-term transport of complex contaminant mixtures within cold-climate, high-flow watersheds remain areas of ongoing research.

From a watershed management perspective, the key question is not limited to compliance at the point of application, but whether specific local conditions create credible transport pathways. Within the Horsefly watershed, relevant considerations include:

- Surface application practices
- Storage location and duration prior to spreading
- Fall application timing and overwinter exposure
- Soil saturation conditions
- Spring freshet as the primary annual transport window

During freshet, soils are often cold and biologically less active, reducing assimilation capacity while increasing runoff potential. This period also coincides with sensitive salmon life stages present in spawning gravels and nearshore habitats. Monitoring for certain emerging contaminants can be analytically complex and costly, and routine regulatory sampling may not capture peak-flow transport events. A watershed-scale screening approach focused on runoff timing and perimeter drainages may provide clearer understanding of potential movement under high-flow conditions. The Roundtable's objective is to better understand site-specific hydrologic pathways and monitoring gaps so that land application practices reflect both agricultural productivity and long-term watershed resilience.

# Biosolid Chemicals and Global Actions

## Forever Chemicals

These are the most pressing concern right now because they persist in the environment forever. PFAS don't break down in wastewater treatment and accumulate in biosolids. They can then transfer to soil, crops, and groundwater. Here's what countries around the world are doing:

### **Europe**

Leading Regulatory Action

The European Union is taking the most aggressive stance:

PFAS Restrictions:

- In April 2025, EU Member States formally adopted a sector-specific restriction banning PFAS in firefighting foams
- Denmark, Germany, the Netherlands, Norway and Sweden have proposed restricting around 10,000 types of PFAS under REACH regulations, with the European Chemicals Agency aiming to complete its scientific evaluation by the end of 2026
- France adopted legislation in February 2025 banning PFAS in cosmetics, textiles and ski wax from 2026, extending to all textiles by 2030

Drinking Water:

- The EU recast Drinking Water Directive limits 20 individual PFAS to roughly 100 parts per trillion and total PFAS to 500 parts per trillion, with stricter country-specific measures in Denmark (2ppt), Sweden (4ppt), and Germany (20ppt by 2028)

### **Germany**

Is phasing out agricultural use of sewage sludge since 2017. They are banning direct agricultural application for larger wastewater treatment plans.

### **United States**

State-led actions

Since there are no federal biosolids limits:

- Maine became the first state in 2022 to ban all land application of sludge and sludge-derived compost following severe contamination cases and some dairy farms have been closed due to PFAS contamination from biosolids impacting milk

- Michigan set thresholds where biosolids containing 100 *ppb* or more PFOS and an additional group called perfluorooctanoic acid (PFOA) cannot be land-applied, while those with 20-100 *ppb* face reduced application rates
- In April 2024, the EPA set legally enforceable drinking water limits: 4 parts per trillion for PFOA and PFOS, and 10 parts per trillion for several others

## **Australia & New Zealand**

- Version 3.0 of the PFAS National Environmental Management Plan includes trigger levels for PFOS and another group called Perfluorohexane sulfonic acid (PFHxS) in biosolids in the low microgram per kilogram range, though it's not legally binding unless other legislation gives it force
- Although there is no ban on PFAS in biosolids, national and state-level guidelines for PFAS levels in land-applied sludge have been introduced

## **Asia**

Many Asian countries are still in the early stages of addressing PFAS, with primary focus on drinking water standards and limited discussion so far on biosolids reuse

The key global challenge is that few countries have implemented action on biosolids and there is no consensus on the approach to setting limits for use . The responses range from complete bans (Maine) to risk-based management (Australia) to concentration limits (Michigan, Germany).

## **Canada**

PFAS specific actions at the federal level affecting BC:

- The Canadian Food Inspection Agency announced plans to implement an interim standard for PFAS in biosolids used as fertilizers, set at 50 parts per billion *ppb* of PFAS.
- Biosolids in Canada contained total PFAS concentrations ranging from 200 to 900 *ppb* (dry weight), and several provinces are now considering restrictions or enhanced monitoring requirements.

Here's a link to a blog that discusses Canadas actions dated March 2025:  
<https://www.bennettjones.com/Insights/Blogs/Federal-Government-publishes-State-of-PFAS-Report-and-Risk-Management-Approach>

Closer to home, we know that the prairie provinces allow sewage sludge to be used on agricultural lands where it is either injected five to 10 centimetres below ground level or surface application must be tilled as soon as possible after application. All provinces are starting to test for forever chemicals, and have been testing for specific heavy metals. They are not yet testing for pharmaceuticals or nanoplastics, but these concerns are being examined in Ontario. Quebec has 2023 guidelines that define biosolids classes and assign varying PFAS and PFOS *ppb* limits and has implemented a temporary moratorium on agricultural application of sewage sludge imported from the United States. Halifax, Nova Scotia the biosolids program is voluntarily not used on food crops. Other East Coast Provinces have modelled their biosolids management programs like Calgary's.

BC Regulations manage biosolids through the *Organic Matter Recycling Regulation* (OMRR), which has been in place since 2002. The province has been reviewing these regulations since 2018, their amendments were expected last year including new standards for Class A biosolids. We encourage you to get involved and read more here: <https://www2.gov.bc.ca/gov/content/environment/waste-management/food-and-organic-waste/regulations-guidelines>

Here is some information on the state of current testing in BC. Some BC facilities are already testing for PFAS. For example, the Capital Regional District tests biosolids at their Residuals Treatment Facility for PFAS compliance with the federal standard, be it right or wrong.

The challenges are that the current BC OMRR primarily regulates pathogens and heavy metals but does not yet have specific limits for PFAS, pharmaceuticals, or nanoplastics, a regulatory gap that is highly concerning.

The research and significant knowledge gap in BC, given global concerns about PFAS, pharmaceuticals, nanoplastics, and heavy metals, is that there is no recent published research examining how these contaminants in biosolids specifically affect these smallest organisms in the food web

- BC's native earthworm species
- BC reptiles (snakes, turtles, lizards)
- Amphibians exposed to biosolids in BC watersheds

This absence of data is concerning as these organisms are often the first indicators of environmental contamination and are critical parts of the food web.

There is some global research on earthworms (Annelida) exposed to PFAS in biosolids-amended soils is well-established, with multiple studies measuring

bioaccumulation factors and uptake kinetics for PFOS and PFOA . Recent work has documented PFAS biomagnification in terrestrial food webs, including small mammals like bank voles, showing extremely high PFOS concentrations and potential health effects. However, reptile studies are limited, with toxicity data described as insufficient to develop robust assessments, though some amphibian data exists.

### Pharmaceuticals

Pharmaceuticals from biosolids enter terrestrial ecosystems, with over 4,000 pharmaceuticals used globally that can partition to biosolids and be applied to agricultural land . Research on pharmaceuticals has focused heavily on birds, with significant knowledge gaps regarding amphibians, reptiles, and mammals . Studies have shown antimicrobials from biosolids can transfer through food chains to secondary and tertiary consumers, and earthworms bioaccumulate various pharmaceuticals from biosolid-amended soils .

### Nanoplastics

Microplastics contaminate agricultural soils through biosolids application, with concentrations varying globally from 0.7 to 240 MPs per gram in different nations . Earthworm studies are extensive, showing nanoplastics exhibit higher toxicity than microplastics, with concentrations above 1000 *ppb* causing growth inhibition and reduced survival . Effects on fish, birds, and mammals have been documented, though terrestrial vertebrate research is less developed .

### Heavy Metals

Small mammal studies examining heavy metal bioaccumulation from contaminated soils exist, with research on shrews and mice showing tissue accumulation and histopathological effects including liver and kidney damage . Reptiles remain underrepresented in ecotoxicological research despite being threatened by chemical pollution, with some studies on alligators, turtles, and lizards .

The gap in all of this research is that it is mostly developed for earthworms across all types of contaminant types, while reptile studies remain notably sparse for all contaminants. Small mammal research exists but is less comprehensive than invertebrate work.

## Global Actions for Forever Chemicals

### **The Stockholm Convention**

The Stockholm Convention is the primary international mechanism for stopping PFAS production worldwide. The Stockholm Convention is a global treaty signed by over 180 countries to eliminate or restrict the most dangerous persistent organic pollutants:

Already Banned Globally:

- PFOS, its salts and perfluorooctane sulfonyl fluoride were listed in 2009
- PFOA (perfluorooctanoic acid), its salts and PFOA-related compounds were added in 2019
- PFHxS, its salts and PFHxS-related compounds were listed in 2022

NEW - Just Added in 2025:

- Long-chain perfluorinated carboxylic acids (C9-21 PFCAs), their salts and related substances were included in May 2025
- The ban on production and use of long-chain PFCAs takes effect across countries party to the Stockholm Convention on January 1, 2026

This means that countries signing on to the Stockholm Convention must eliminate production and use of these chemicals (not just restrict them). This creates legally binding obligations, the challenge is adding a new substance to the Stockholm Convention takes at least three years, and the Convention was not designed to handle thousands of chemicals, but rather to regulate a handful of highly hazardous ones.

There are an estimated 10,000-14,000 different PFAS chemicals, and only a handful have been banned so far. As soon as one is banned, manufacturers can simply switch to a slightly different molecular structure that isn't yet regulated.

The other major global challenge is that China and the United States - the world's two largest manufacturers - are not among the more than 150 signatories to the Stockholm Convention.

## **European Union**

Most Aggressive Approach:

- Germany, Denmark, the Netherlands, Norway, and Sweden proposed broader PFAS restrictions in January 2023, currently under review

- From January 2026, ban on manufacture, import, export, and sale of PFAS-containing textiles, footwear, and waterproofing agents for consumers
  - On July 8, 2025, the European Commission presented an Action Plan for the Chemicals Industry, including a revision of the REACH Regulation by Q4 2025 and a proposal to restrict PFAS comprehensively
  - A legislative proposal to ban the production and use of all PFAS compounds at the EU level could come to fruition by 2026
- France - Leading National Action:
- French law bans the production, import or sale from January 2026 of any product for which an alternative to PFAS already exists

In January 2025 investigation revealed a coordinated lobbying and misinformation campaign by the chemical industry aimed at weakening the EU's proposed PFAS ban.

## **United States**

### **State-by-State:**

- The EPA has eliminated exemptions for low-volume PFAS and requires detailed risk assessments before approval
- Multiple states implementing bans, but no comprehensive federal production ban
- TSCA reporting requirements force manufacturers to report PFAS use dating back to 2011

## **Canada**

In March 2025, Canada announced its plan to phase out PFAS in many products starting in 2027, first in firefighting foams, followed by cosmetics, food packaging, textiles, medicines, and medical devices. The innovation vs. industry debate continues as industry lobbies claim there are no alternatives, but proponents argue that setting clear and binding rules creates the right conditions for research and development of safer solution, alternatives are available for all potential applications, including both fluorinated and non-fluorinated substances as well as alternative technical solutions.



