
Regional District of Nanaimo

2025 Biosolids Management Summary Report

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1 PROGRAM OVERVIEW

The Regional District of Nanaimo (RDN) operates two wastewater treatment plants that produce municipal biosolids:

1. Greater Nanaimo Pollution Control Centre (GNPCC) - Class B biosolids
2. French Creek Pollution Control Centre (FCPCC) - Class A biosolids

This report provides a summary management of GNPCC biosolids. In 2025, GNPCC biosolids were managed at one site in the Nanaimo area: private forest lands off Nanaimo River Road (Blackjack) managed by Mosaic Forest Management (Mosaic).

At Blackjack, Class B GNPCC biosolids were used by SYLVIS in a forest fertilization program. The objectives of biosolids forest fertilization were to increase soil quality and nutrients for tree growth. Since the GNPCC biosolids management program was begun at Blackjack in 2021, over 22,600 wet tonnes (wt) have been managed at this site through forest fertilization and reclamation.

A total of 5,929 wt of biosolids were produced from the GNPCC in 2025, all of which were delivered to Blackjack (Table 1, Appendix One). Total GNPCC biosolids production in 2025 was consistent with the five-year average annual production, since the implementation of secondary treatment operations at the GNPCC has stabilized (Table 1, Appendix One).

2 REGULATORY AUTHORIZATION

RDN biosolids were managed at Blackjack under the *2024 Blackjack – Forest Fertilization & Reclamation Land Application Plan* (SYLVIS document #1701-24) associated with Authorization #112120 valid April 22, 2024 to April 21, 2025 and under the *2025 Blackjack – Forest Fertilization & Reclamation Land Application Plan* (SYLVIS document #1805-25) associated with Authorization #112589 valid April 21, 2025 to April 21, 2025 to April 20, 2026.

3 2025 BIOSOLIDS MANAGEMENT

3.1 BIOSOLIDS MANAGEMENT SUMMARY

In 2025, all GNPCC biosolids were managed at Blackjack on Nanaimo River Road in Nanaimo, British Columbia (BC). Contractual tasks under the 2021-2026 contract relating to biosolids quality monitoring, biosolids delivery coordination, site safety, environmental monitoring, public engagement, First Nations communications, sustainability activities, and reporting were completed in 2025 are summarized in Table 3 (Appendix One).

3.2 BIOSOLIDS TRANSPORTATION

Biosolids produced at GNPCC are scaled at the plant and tonnages are provided by the RDN. In 2025, all biosolids produced at the GNPCC (5,929 wt) were transported by DBL Disposal to Blackjack (Table 1 and Table 2, Appendix One). Monthly tonnage delivered to this site in 2025 is shown in Figure 1 (Appendix One).

3.3 BIOSOLIDS STORAGE

Two storage sites were used at Blackjack in 2025. The majority of biosolids were delivered to the newer application area south of Nanaimo Lakes. In May 2025, the Old Jump Main stockpile was paved and lock blocks were installed along three sides (Photograph 1, Appendix Three). All other biosolids were delivered to the main stockpile which also consists of a paved base and lock blocks delineating three sides of the stockpile. Biosolids storage conformed to OMRR requirements for Vancouver Island where biosolids are required to be covered from October 1 to March 31 of every year. At the end of 2025, no biosolids remained stored onsite at Blackjack (Table 2, Appendix One).

3.4 2025 PRE-APPLICATION MEASURES

At Blackjack, site inspections were carried out by a SYLVIS Qualified Professional or designate prior to biosolids forest fertilization. During site inspections, water features and other sensitive site features were identified, mapped, and appropriate setback distances were determined. Pre-application soil samples were collected in order to determine an appropriate agronomic rate for biosolids applications. Groundwater depth was assessed using a soil auger or visually in road cuts and was confirmed to be in excess of 1 metre (m) prior to commencing biosolids applications.

3.5 BIOSOLIDS LAND APPLICATION

Biosolids (6,049 wt) were land-applied to 65.4 hectares (ha) of forested lands for forest fertilization (Figure 2 and Figure 3, Appendix Two). Biosolids were land-applied in forested areas using a side-discharge spreader equipped with a hydraulic fan which propels the biosolids up to 30 m into forest stands. Forest fertilization biosolids applications occurred throughout 2025 except during periods of extreme weather (i.e., snowfall, heavy rainfall, heat waves), during bud break in the late spring, or when the ground was snow-covered. All biosolids applications adhered to a 30-m setback distance from permanent water features and identified ephemeral water features.

Forest fertilization application rates were specific to the individual fertilization units based on pre-application soil sampling and nutrient requirements of the trees, understory vegetation, and soils. The biosolids application rate for forested land averaged 18.1 dry tonnes per ha (dt/ha) which does not exceed the lower of the maximum agronomic application rates specified in the LAPs for forest fertilization (35 dry tonnes per ha).

3.6 BIOSOLIDS QUALITY

The OMRR requires that a set of seven discrete samples be collected for fecal coliform analysis and one sample for trace elements annually or for every 1,000 dry tonnes of biosolids applied, whichever comes first. Biosolids quality was characterized throughout 2025 to ensure biosolids met quality requirements for trace element concentrations, foreign matter, and pathogen reduction set forth in the OMRR.

In 2025, 1,061 dt of biosolids were produced by the GNPCC. Three composite samples, each composed of eight equal-volume subsamples, were collected by SYLVIS at the GNPCC. Composite samples were analyzed for physical parameters, nutrients, and trace elements (Table

4, Appendix One). All RDN biosolids samples collected in 2025 met the OMRR Class B criteria for trace elements concentrations.

SYLVIS collected 14 fecal samples from the GNPCC, the geometric mean of the sampling sets was 5,500 MPN/g (Table 4), meeting OMRR Class B criterion of 2,000,000 MPN/g.

3.7 SOIL MONITORING

Soil monitoring was conducted prior to applications in forest fertilization areas at Blackjack in 2025. Soil samples, each comprised of 15 sub-samples, were collected from the top 15 cm of soil by SYLVIS. Soil trace element concentrations were below applicable OMRR soil criteria for this site. Further details on soil sampling and nutrient concentrations can be found in the LAP.

3.8 REGULATORY COMPLIANCE

A Qualified Professional Certification was provided to Mosaic for biosolids applied at Blackjack under Authorization #112120. Authorization #112589 remains active until April 20, 2026; a Qualified Professional Certification will be authored upon completion of the Authorization term.

3.9 CARBON ACCOUNTING RELATED TO BIOSOLIDS MANAGEMENT

The management of all GNPCC biosolids delivered (5,929 bt) and applied (6,049 bt) to Blackjack in 2025 resulted in -1,536 t/CO₂e of net emissions (emissions and emissions removals), of which transport represents +60 t CO₂e GHG emissions.

This carbon emissions estimate considers biosolids transport, biosolids storage, land application, soil carbon sequestration, and soil nitrous oxide emissions. Carbon sequestration related to tree growth is accounted for separately by Mosaic and vehicle (i.e., pickup truck) emissions related to project operations are accounted for externally by SYLVIS.

4 SUMMARY AND INTERPRETATION OF THE EFFECTS OF BIOSOLIDS DISCHARGES ON RECEIVING ENVIRONMENT

The objectives of biosolids forest fertilization at Blackjack are to increase soil quality and tree growth while remaining compliant with the OMRR. Biosolids fertilization has increased organic matter content and available nutrients in the surface horizon. These enriched soils store more carbon and enable accelerated tree growth (Photograph 2, Appendix Three), which has been documented at this site and other biosolids forest fertilization sites. It has been observed at the previous TimberWest Properties site on Doumont Road that deer browsing of trees is increased in biosolids-fertilized areas¹. Other biosolids fertilization sites in BC have documented similar results with improved wildlife habitat from biosolids applications on grasslands². Elk are frequently seen browsing in biosolids-fertilized stands at Blackjack (Photograph 3, Appendix Three).

¹ Danjou, B. 2014. Effect of Biosolid on Vegetation Development Within Two Douglas-fir Plantations: Third Year Progress Report - DRAFT. Vancouver Island University, Nanaimo, B.C.

² Meineke, J., Doyle, F. I., Oukil, L., & Hodges, K. E. (2023). Small mammal responses to biosolids on grazed rangelands in British Columbia. *Restoration Ecology*, e14063.

Water sampling upstream and downstream of biosolids applications were completed by SYLVIS in April and November 2025. No adverse impacts from biosolids were seen; data can be provided upon request.

5 CONCLUSION

RDN's GNPCC biosolids were managed at Blackjack in 2025; 5,929 wt were delivered and 6,049 wt were applied onsite (Table 2). All biosolids land application activities at Blackjack occurred as specified in the applicable LAPs and according to management requirements included in the OMRR. Since transitioning the biosolids management program to Blackjack in 2021, over 22,600 wt of GNPCC biosolids have been managed onsite while being set up to become a successful long-term management site.

SYLVIS looks forward to continuing this productive relationship and providing biosolids management services and support to the RDN throughout 2026.

APPENDIX ONE – TABLES

Table 1: Historical management of Regional District of Nanaimo’s Greater Nanaimo Pollution Control Centre biosolids at the TimberWest Properties and Blackjack from 2014 to 2025.

Year	TimberWest Properties	Blackjack	Total Production
2014	3,506 wt	-	3,506 wt
2015	3,087 wt	-	3,087 wt
2016	3,074 wt	-	3,074 wt
2017	2,686 wt	-	2,686 wt
2018	3,550 wt	-	3,550 wt
2019	3,776 wt	-	3,776 wt
2020	3,653 wt	-	3,653 wt
2021	5,060 wt	317 wt	5,377 wt
2022	802 wt	5,095 wt	5,897 wt
2023	-	5,717 wt	5,717 wt
2024	-	5,727 wt	5,727 wt
2025	-	5,929 wt	5,929 wt
Total	29,194 wt	22,785 wt	51,979 wt

Table 2: Regional District of Nanaimo’s Greater Nanaimo Pollution Control Centre Class B biosolids management summary - 2025.

Site	Blackjack (wt)
Storage from 2024	120
Delivered	5,929
Land Applied	6,049
Storage to 2026	0

Table 3: Summary of SYLVIS 2025 deliverables as outlined in the RDN-SYLVIS 2021-2026 Agreement for GNPCC biosolids management.

Task or Activity	Description
Biosolids Quality	RDN biosolids quality was monitored throughout 2025 through the collection of three full suite samples and 14 fecal coliform samples.
Biosolids Quantity	5,929 tonnes of RDN biosolids were transported to the Blackjack site by DBL Disposal in 2025. 6,049 tonnes of biosolids were land-applied in 2025. No biosolids remained stored at Blackjack at the end of 2025.
Biosolids Transportation & Delivery Coordination	The RDN coordinated biosolids deliveries with DBL and SYLVIS throughout 2025.
Contingency Plan & Management	A Contingency Plan was written for the 2021-2026 biosolids management contract and the following contingency sites were available for use in 2025: TimberWest Properties, Harmac, Hamm Road, 155-A Pit, and Haslam Pit. No contingency management was required in 2025.
Storage of Biosolids	Biosolids were stored at the south and north storage sites at Blackjack and covered with tarps from October 1 to March 31 as per OMRR requirements.
Invoicing	Biosolids deliveries were invoiced on a monthly basis.
Environmental Incidents	No environmental incidents occurred in 2025.
Site Safety	No safety incidents occurred at Blackjack in 2025. SYLVIS maintained COR and BC Forest SAFE safety accreditations in 2025.
Complaints Management	There were no inquiries or complaints received about the biosolids forest fertilization program in 2025.
Odour Management Plan	The program Odour Management Plan was adhered to in 2025.
Communications Plan & Engagement	<p>The program Communications Plan was adhered to in 2025.</p> <p>SYLVIS participated in the GNPCC open house in March 2025, there was excellent turn out and interest from the public.</p> <p>Engagement regarding biosolids operations at the Blackjack site was carried out with the Snuneymuxw First Nation through Mosaic during 2025. Mosaic familiarized a new staff member with the project and met with senior staff member to discuss program benefits, opportunities to be involved, and discussing a path for engagement going forward. Questions around media attention to biosolids were addressed by Mosaic.</p> <p>One email inquiry to the RDN was received regarding potential impacts to drinking water from The Vancouver Island Water Watch Coalition. A response was provided by the RDN.</p>
Annual Reporting	Qualified Professional Certification of Compliance report, fulfilling the regulatory requirement for written certification under OMRR Section 5(3), were provided to the RDN and Mosaic for land applications at Blackjack under Authorization #112120.
Biosolids Beneficial Use	Two biosolids Land Application Plans for Authorizations #112120 and #112589 were submitted to the Ministry of Environment and Climate Change on May 5, 2024 and March 21, 2025 respectively, for Blackjack. 6,049 tonnes of biosolids were land-applied to 65.4 ha of forest.
Review of Biosolids Technology &	A review was completed of emerging biosolids treatment technologies and management strategies across BC and Canada. A summary is provided in Appendix Four.

Management Advancements	
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Table 4: Regional District of Nanaimo – Greater Nanaimo Pollution Control Centre biosolids quality summary - 2025.

Parameter	GNPCC	Regulatory Criteria ^a	Units
Available Nutrients, Physical Properties, Acidity			
Total Nitrogen - TKN	57,626	-	µg/g
Ammonia + Ammonium- N (available)	6,213	-	µg/g
Nitrate - N	7	-	µg/g
Phosphorus (available)	1,283	-	µg/g
Potassium (available)	725	-	µg/g
Organic Matter	68.1	-	%
Total Solids	17.9	-	%
pH	7.0	-	pH
Electrical Conductivity	3.79	-	dS/m
Trace Elements			
Arsenic	2.4	75	µg/g
Cadmium	1.21	20	µg/g
Chromium	32.9	1,060	µg/g
Cobalt	2.9	150	µg/g
Copper	548	2,200	µg/g
Lead	23.2	500	µg/g
Mercury	0.743	15	µg/g
Molybdenum	8.3	20	µg/g
Nickel	15.0	180	µg/g
Selenium	5.5	14	µg/g
Zinc	870	1,850	µg/g
Microbiological Analysis - Fecal Coliforms			
Fecal Coliforms	5,500 ^b	2,000,000	MPN/g

Note: Unless otherwise noted, values are the mean of three composite samples, each composed of eight equal-volume subsamples, collected during 2025 by SYLVIS Environmental and analyzed by Element Laboratories. All analyses based on dry weight.

- a Class B trace element criteria specified in Schedule 4 and microbiological criteria in Schedule 3 of the BC *Organic Matter Recycling Regulation*.
- b Value is the geometric mean of 14 samples collected by SYLVIS throughout 2025 and analyzed by ALS Laboratories.

APPENDIX TWO – FIGURES

Figure 1: Tonnage of Regional District of Nanaimo – Greater Nanaimo Pollution Control Centre (GNPCC) dewatered biosolids delivered and applied at Blackjack by month in 2025.

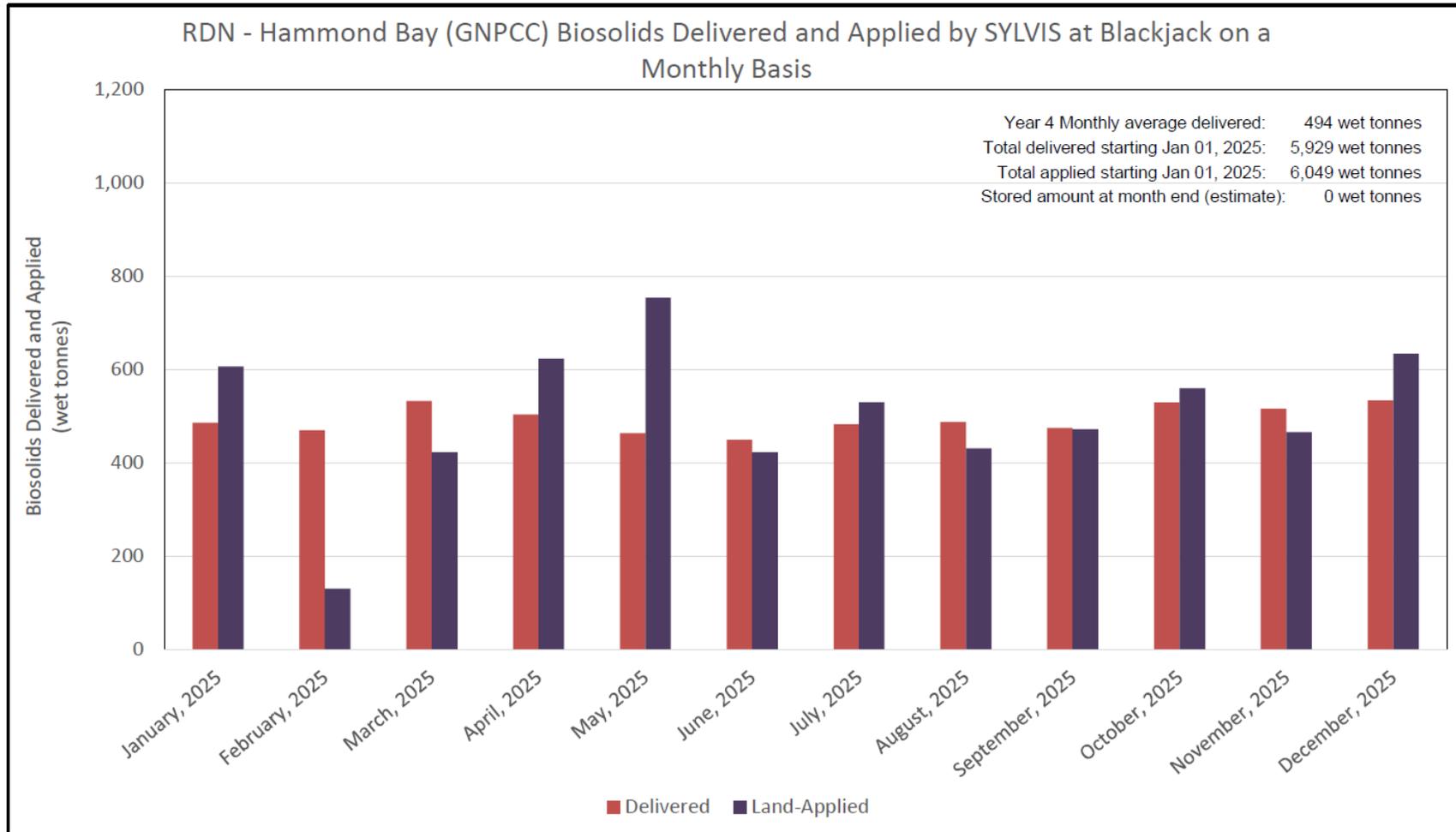


Figure 2: Blackjack application areas north of the lake fertilized with Regional District of Nanaimo biosolids in 2025.

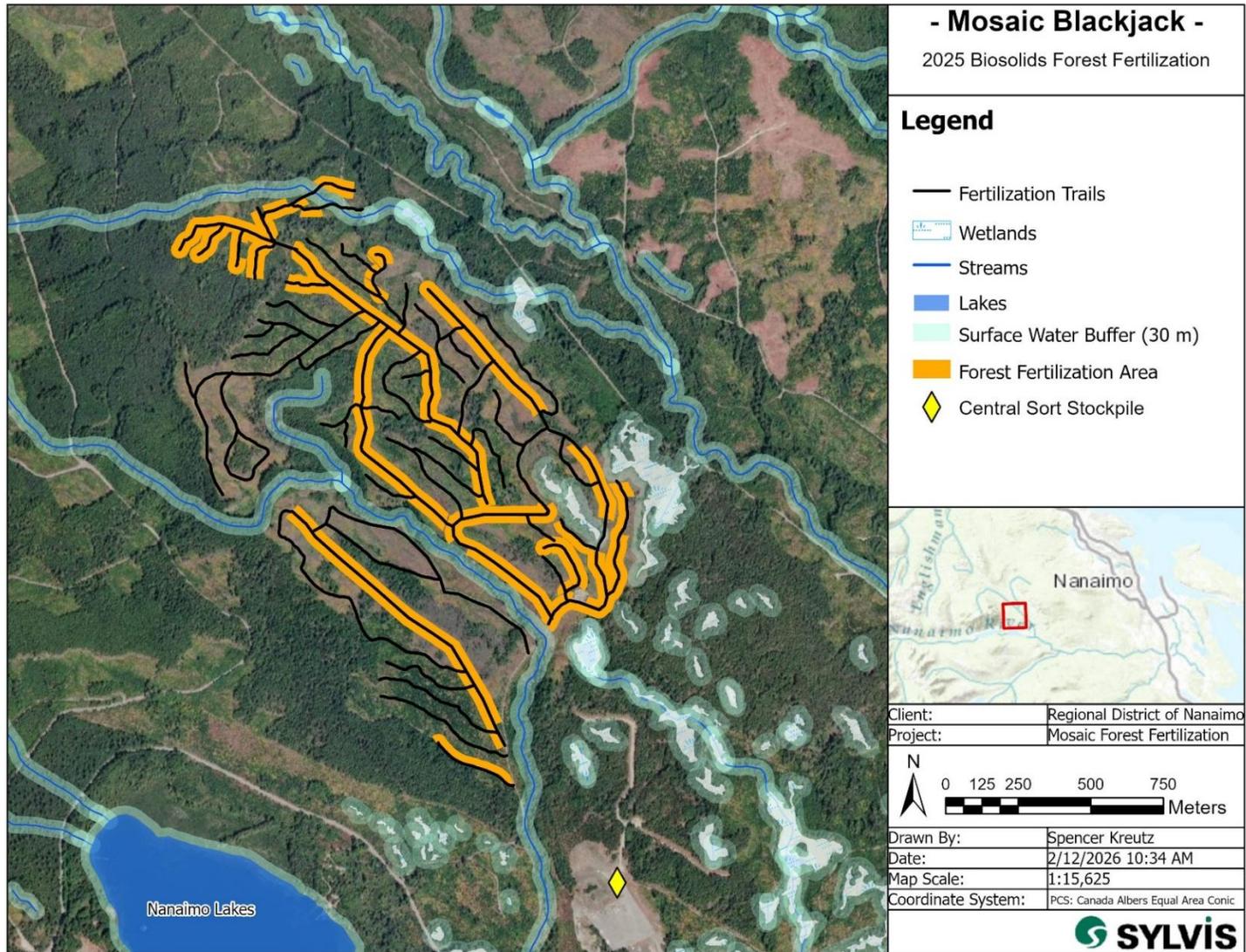
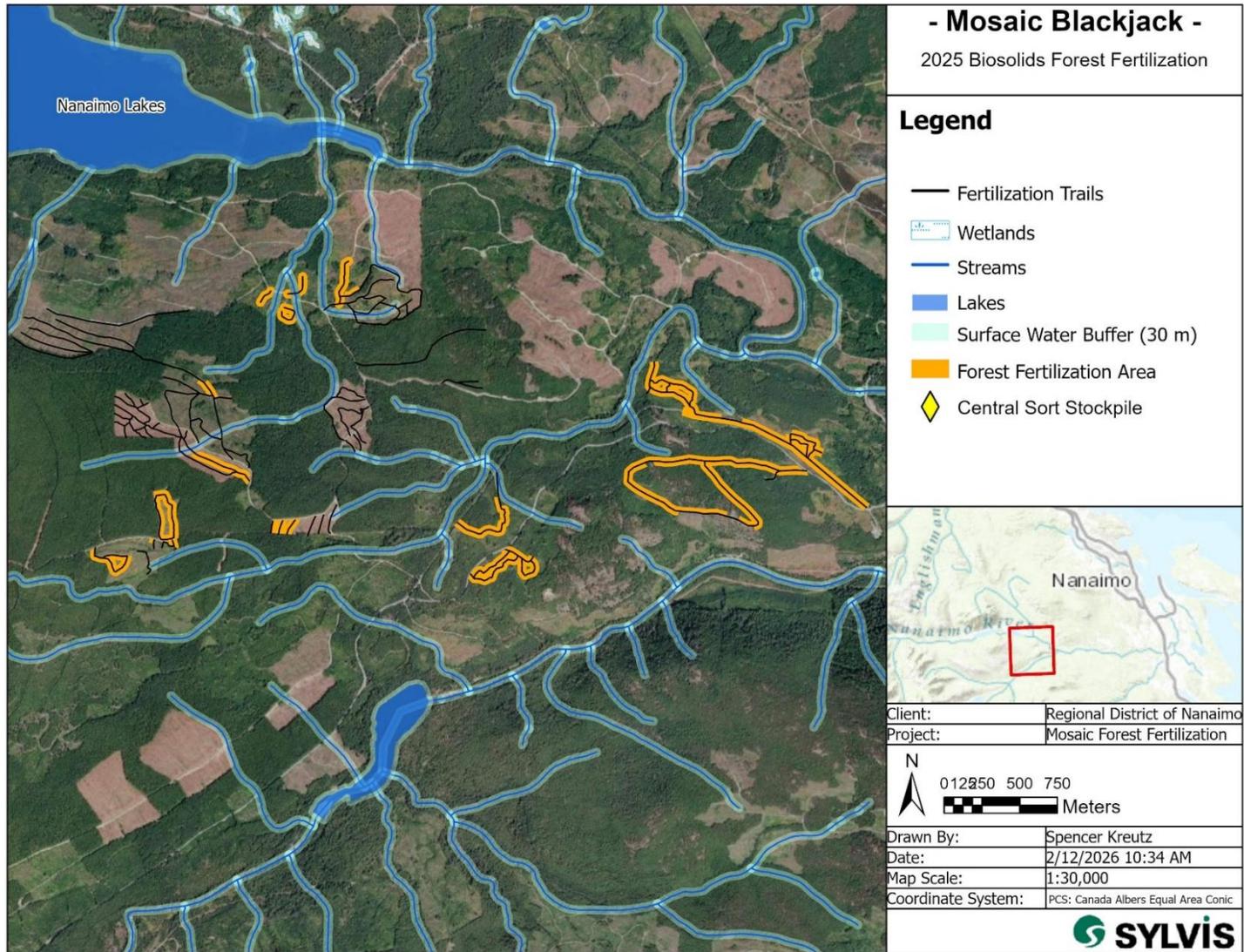


Figure 3: Blackjack application areas south of the lake fertilized with Regional District of Nanaimo biosolids in 2025.



APPENDIX THREE – PHOTOGRAPHS



Photograph 1: Upgraded secondary biosolids storage site on the south portion of forest fertilization site. (May 2025)



Photograph 2: Aerial photograph comparing fertilized (dark green) and unfertilized (light green) forest stands as a result of applying biosolids onto a forest block. (July 2025)



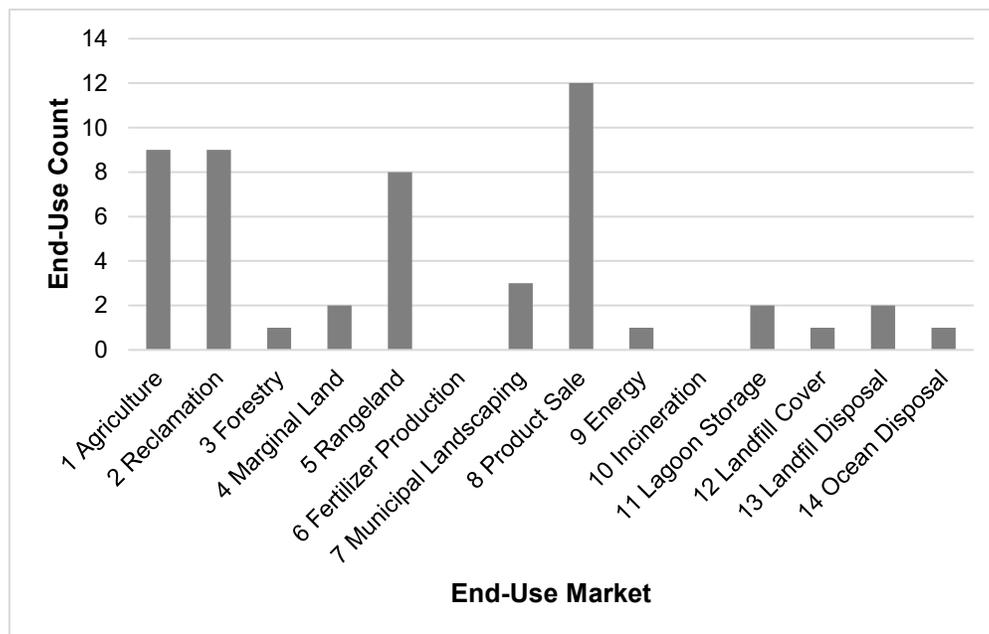
Photograph 3: Bull elk (*Cervus canadensis roosevelti*) utilizing a biosolids-fertilized forest stand. (October 2025)

APPENDIX FOUR – REVIEW OF BIOSOLIDS TECHNOLOGY IMPROVEMENTS & MANAGEMENT ADVANCEMENTS

The RDN is interested in understanding how biosolids are managed in other jurisdictions across Canada and in keeping up-to-date on emerging treatment technologies. A high-level review of improvements in biosolids processing technologies and management programs across Canada was conducted in 2023 and is updated annually, the summary is provided below.

Fourteen biosolids management methods and uses were found across BC and Canada. Biosolids management by 38 municipalities in British Columbia are presented in Figure B 1. Reported values are counts of municipalities and are not based on the tonnage of biosolids managed; if a municipality manages biosolids through multiple methods then each method is presented as an individual result.

Figure B 1: Biosolids products and markets in British Columbia.

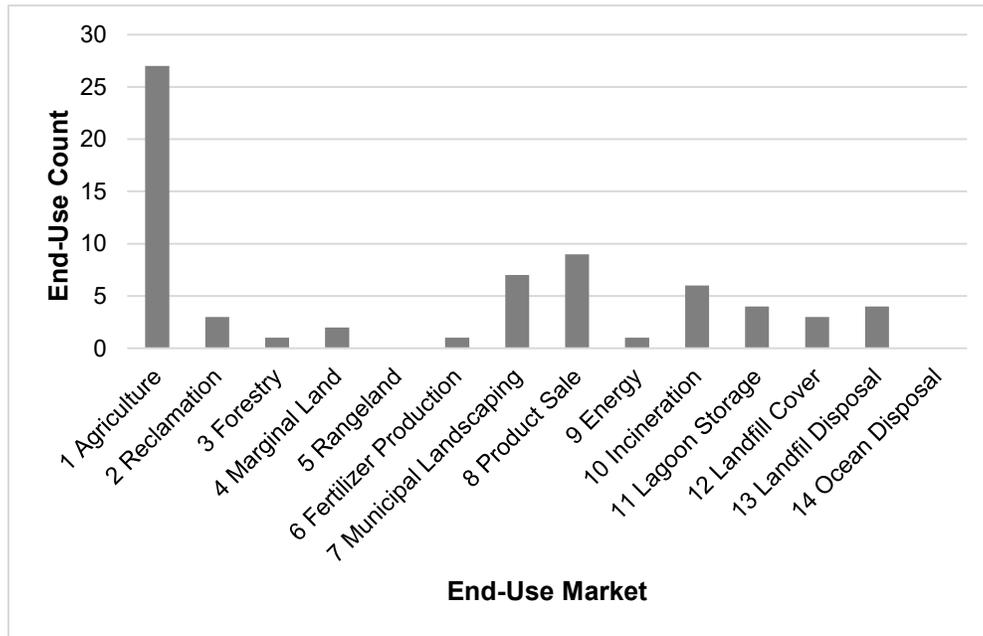


Most BC municipalities are managing biosolids and biosolids-derived products in land application markets (end-use markets 1-8). Numerous small biosolids generators are managed in large composting facilities which produce compost for sale or for use in mine reclamation. The RDN's current management programs using biosolids in forest fertilization is similar to land application processes in other BC jurisdictions, and the distribution of soils fabricated using biosolids (biosolids growing medium (BGM) and non-BGM) aligns with many other BC municipalities. Changes in biosolids management in BC in 2025 were an increase in agricultural and rangeland applications.

SYLVIS conducted a high-level review and update of biosolids management across the rest of Canada. Basic management information for the most populous city or cities in each province or territory was gathered using information readily available through internet research. Biosolids

management by 69 Canadian municipalities outside of BC are presented in Figure B 2. Similar to the figure above, counts represent municipalities and are not based on tonnage produced; if a municipality manages biosolids through multiple methods then each method has been included as an individual result.

Figure B 2: Biosolids products and markets in Canada outside of British Columbia.



Similar to BC, most municipalities are managing biosolids and biosolids-derived products in land application markets (markets 1-8). According to the limited data gathered, the RDN’s forest fertilization project continues to be one of two forest fertilization projects in the country, while the BGM project is one of three similar projects. There were no significant changes found in biosolids management in Canada outside of BC in 2025.

Currently there are numerous innovative wastewater solids treatment technologies under development in the world. Many of these technologies can replace digestion at a wastewater treatment plant but can also accept digested biosolids. A selection of these technologies is presented in the following table.

Table A 1: Example innovative wastewater processing technologies.

Technology	Acronym	Product & Value
Precision membranes	-	Prevent fouling and increase flow
Ultraviolet light radiation	-	Degradation of PFAS
Heat drying	-	Dried Class A biosolids
Pyrolysis	-	Biochar
Gasification	-	Renewable natural gas (RNG)
Hydrothermal liquefaction	HTL	Biocrude, hydrochar
Super critical water oxidation	SCWO	CO ₂ , inert ash

Thermal hydrolysis	-	Class A biosolids
Advanced Oxidation Processes	AOPs	Biosolids, degradation of organic pollutants and odors
Artificial Intelligence/ Machine Learning	AI	Increased plant efficiency and decreased downtime
Ultraviolet light-emitting diode reactors	UV LED	Disinfection process during treatment process

Filters are an essential process in all forms of wastewater treatment, from initial screening to remove large contaminants through to media filtration to remove suspended particulates. In 2025, the manufacturing of precision membranes progressed significantly. Improved uniformity in pore size allows for higher flow rates and less energy consumption which decrease fouling while producing a similar filtered output. These precision membranes offer superior functionality in systems with high solids content and oil contamination.

Per- and polyfluoroalkyl substances (PFAS), termed “forever chemicals” because of their persistence, have received significant media attention related to biosolids in recent years due to the land application of industrially-impacted biosolids. Those biosolids were generated where industries use large amounts of PFAS leading to elevated concentrations in their biosolids. It is important to note that the RDN’s municipal wastewater treatment plants receive significantly different inputs and would therefore having correspondingly low PFAS concentrations. While ultraviolet (UV) light has long been used as a method for disinfection, researchers are now advancing the use of UV light to degrade PFAS molecules into water, fluoride, and simple organic compounds.

Some of these technologies have been implemented in Canada, while others have not. A non-exhaustive list of innovative technologies implemented and planned at Canadian sites is presented in the following table.

Table A 2: Canadian examples of innovative wastewater solids processing technologies.

Technology	Location	Feedstock	End-Use Market	Stage
Lystek - thermal hydrolysis	Ontario, Saskatchewan, Manitoba	digested biosolids	agriculture	commissioned & under construction
N-Viro alkaline stabilization	Alberta, Nova Scotia, Prince Edward Island, Ontario	biosolids	agriculture, fertilizer	commissioned
heat drying	Metro Vancouver	biosolids	agriculture, fertilizer	-
hydrothermal liquefaction (HTL)	Metro Vancouver	biosolids	unknown	design
Pyrolysis	Ontario, Quebec, CRD	biosolids	syngas, biochar	under development & consideration
Gasification	CRD	biosolids	unknown	potential future option

The Lystek thermal hydrolysis process produces a number of products including a liquid Class A biosolids which is appropriate for use in agricultural regions but is less suited to Vancouver Island. The N-Viro alkaline stabilization process uses a considerable amount of lime to stabilize wastewater solids. Heat drying can reduce the mass of wet biosolids by 90% or more, reducing transport costs, but is expensive to implement and operate. Other thermal conditioning and treatment technologies for biosolids (pyrolysis, gasification, HTL) are less mature and are not currently implemented, even at pilot scale, in Canada though some pilots are planned.

The RDN's current approach of anaerobic digestion and centrifuge-dewatering, while not innovative, is reliable and predictable. RDN's forest fertilization program is relatively uncommon at the national scale and represents an innovative end-use of the RDN's biosolids. RDN's fabricated soil production aligns with the second most common biosolids management use across Canada. The findings of this section are based on limited research and investigation; should the RDN wish to understand more about how its program compares to other biosolids management programs, both in Canada and elsewhere, SYLVIS would be pleased to carry this out under a separate scope of work.