



**Examining Need, Capacity, and  
Barriers to Accessing Food Animal  
Veterinary Services in Underserved  
Areas of Rural Ontario**

**Jurisdictional Review**

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# i Introduction

Veterinary capacity in rural and remote communities is a long-standing problem that has continuously affected livestock producers and veterinarians, not only in northern Ontario but in various other regions across the country and internationally (OVMA, 2013; Prince et al., 2006). Recent sources have suggested that an analysis surrounding strategies to support veterinary attraction and retention in rural and remote areas of Ontario is necessary as the demand for veterinary services in rural areas is predicted to increase (OVMA, 2013). Although there is a lack of literature surrounding this gap in veterinary capacity within northern Ontario, other regions across Canada and the United States have explored similar problems, yielding results that demonstrate a severe gap in veterinary capacity within numerous rural regions (ABVMA & ABVTA, 2021; Boissoneault & Epp, 2018; Prince et al., 2006; Remsburg et al., 2007).

The issue of veterinary capacity in northern Ontario is multifaceted, and therefore the solution will require a variety of programs and strategies, facilitated by various stakeholders, including government organizations, academia, producers, and veterinarians. By examining current initiatives from around the world, that have been effective in attracting and retaining veterinarians in rural communities, recommendations for future programs and strategies can be made.

Planning for agriculture in the North requires more than just providing land, it requires the consideration of all aspects of the agri-food system that work together to create a healthy agricultural industry. Although the Ontario government has pushed for farming in the north, there has been little attention to the lack of necessary services for producers. To ensure a robust agricultural industry, food animal veterinarians must be considered in planning decisions as they provide essential veterinary care for food animal producers. This jurisdictional review will provide critical information about veterinary attraction and retention strategies, helping to support the continuation of a healthy agri-food system in northern Ontario.

## ii Purpose

The purpose of this jurisdictional review is to explore policies and programs that aim to attract and retain veterinary professionals to rural and remote communities within Ontario, aiding in access to veterinary care for producers and contributing to a robust agri-food system in the North. An inventory of current programs and strategies from North America, as well as internationally, will be assembled to assist in finding a solution to low veterinary capacity in the north.



## iii Objectives

The objectives of this jurisdictional review are:

- To assess the need for veterinary services within underserved areas in Ontario
- To explore current policy surrounding livestock farming in the north
- To collect information on existing programs and strategies within Canada, North America, and internationally that aid in providing veterinary care for the food animal sector in rural and remote regions
- To outline current veterinary assistance programs and strategies within Canada so that their success can be later evaluated
- To present information on existing programs and strategies that can be used to create recommendations and strategies that function more effectively for the future

# 1. Background

Agriculture across Ontario is incredibly diverse, with concentrations in southern Ontario, eastern Ontario, and in some parts of northern Ontario. Livestock farmers in rural and remote regions of Ontario need reliable access to veterinary services in order to ensure optimal health and welfare of their animals (Prince et al., 2006). Veterinary services are essential for a successful agri-food sector; however, certain regions of Ontario have few veterinary clinics, which makes it difficult for livestock producers in these areas to receive routine or emergency services in a timely manner.

## 1.2 Agricultural Development in Northern Ontario

Northern Ontario is divided into twelve districts or regions: Algoma, Cochrane, Greater Sudbury, Kenora, Manitoulin, Nipissing, Rainy River, Sudbury, Thunder Bay, Timiskaming, Parry Sound, and Muskoka. (Chapagain, 2017) Although together these regions make up over 80% of the province's land area, only 6% of the population resides in the north, just over 13.2 million people (Chapagain, 2017; Statistics Canada, 2018) According to the Census of Agriculture, in 2016 there was a total of 1,985 farms across all of Northern Ontario, representing only 4% of Ontario's farms (Statistics Canada, 2018). Considering the abundance of space in northern Ontario, and the need to increase national food production by 70% by the year 2050, many consider northern Ontario to be a place of great potential for economic development, including the agricultural sector (Chapagain, 2017; Food and Agricultural Organization of the United Nations, 2009).

The Government of Ontario has expressed an interest in expanding the province's agri-food sector in the north, as an opportunity to increase the production of local food (Ontario Ministry of Agriculture, Food and Rural Affairs [OMAFRA], 2016). In partnership with Beef Farmers of Ontario, an organization dedicated to representing over 19,000 of Ontario's beef farmers, the province has promoted the expansion of Ontario's beef industry through the Northern Livestock Pilot and Beef North program (Beef North, 2021; OMAFRA, 2016). Together the action plan and Beef Farmers of Ontario help to promote sustainable expansion

and economic assistance aimed at helping producers to expand or start their businesses into the north, where farmland is significantly more affordable than in southern Ontario (Beef North, 2021; OMAFRA, 2016). However, with a push for northern expansion within the beef industry, comes an increased need for essential services by livestock producers, including veterinary care, which like most healthcare professions, is already limited in Ontario's rural and remote regions (Government of Ontario, 2021). A lack of veterinarians in rural Ontario, partnered with a greater distance between farms in the north, has created gaps in veterinary coverage, causing underserved areas or regions with limited to no veterinary services available for livestock producers.

## 2. Underserved Areas

Although it is hard to identify exactly which areas are experiencing a lack of veterinary service, it is helpful for this jurisdictional review to understand where these gaps are located. The following areas have been highlighted as having little to no vet coverage (Personal Communication with Gord Mitchell, NPAHN, 2021).

1. **Sudbury West:** the area does not currently have a permanent veterinarian and relies on Manitoulin Island Vet Services for veterinary care.
2. **Cochrane South:** the Matheson area currently has no local veterinarian. The neighbouring Temiskaming vet service will do limited calls for the area, however, there are no emergency services.
3. **Timmins:** Do not have a full-time veterinarian, as the current veterinarian only does a few calls a year.
4. **North Parry Sound and East Nipissing:** The Powassan and Bodfield areas use a veterinarian from Sturgeon Falls, which is 70 km away because the local veterinarian mainly focuses on small animals.

In addition, some areas within rural Ontario currently have adequate veterinary coverage, however their veterinarians will likely be retiring soon without veterinarians to take over their practices. Locations with veterinarians approaching retirement include Hearst; Kapuskasing; Cochrane North; Dryden; Bruce Peninsula; Algoma; Temiskaming and Renfrew County.



## 2.1 Livestock Demographics in the North and Veterinary Service

Livestock demographics in the north are different than other regions of the province, particularly when compared to those of southern Ontario. As a result of the characteristically large distances between farms in northern Ontario, it can be challenging for veterinarians to service rural areas. Statistics provided by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) on the total number of cattle, pigs, and sheep in each region of Ontario can help to illustrate the differences in the distribution of livestock across the province. This data demonstrates that in 2020, the number of total livestock in northern Ontario was 50-90% less than other regions of Ontario (OMAFRA, 2020). With so many fewer animals, and correspondingly fewer farms, veterinarians in northern Ontario are not only left with less business but are forced to travel greater distances to reach a sufficient number of clients.

In 2013 the Ontario Veterinary Medical Association (OVMA) conducted a census to collect data on the ratio of bovine veterinarians to beef and dairy farms across Ontario. The findings from the study were used to predict gaps in veterinary service for specific regions. Although the study mainly focused on southern Ontario, an important aspect of the research included an examination of the number of dairy and beef farms that would be necessary to retain a full-time bovine veterinarian within a single region (OVMA, 2013). The OVMA proposed that a bovine veterinarian could not successfully operate within a single region if there were less than 75 dairy and beef farms. From this information, it was predicted that areas in northern and eastern Ontario would suffer from a gap in veterinary service as a result of a lack of farms, while other regions, including southern Ontario, would be oversaturated with bovine veterinarians (OVMA, 2013).

## 2.2 Reasons for the Lack of Veterinary Services

The underlying reasons for regional gaps in veterinary service are complex and relate to socio-economic characteristics of the clientele (number and type of farms), veterinary business (operational costs, revenue models, staff retention), and local infrastructure (schools, hospitals, public services, and amenities), in addition to other personal economic (school debt,

wage/salaries) and social factors (lifestyle preferences, family opportunities and supports) (Gwinner et al., 2006; Andrus et al., 2006a, b; Truchet et al., 2018; Boissonneault and Epp, 2018; Lem, 2019). There are also considerable logistical, operational, and financial challenges in serving large geographical areas with smaller populations, as well as challenges in attracting veterinarians to rural and remote areas (Lem, 2019).

Demographics and culture have also been identified as barriers to care, where differing opinions between animal owners and veterinarians regarding the cultural roles of animals, expectations of care, and individual experiences, impact access to veterinary care (Boissonneault and Epp, 2018; Wasson and Wieman, 2018). For example, self-sufficiency, stoicism, and trust are cultural issues that have been identified as barriers to accessing care among rural Canadian farmers (Wasson and Wieman, 2018). Collectively, these social and economic barriers appear to be driving regional gaps in veterinary service and challenge the sustainability and growth of veterinary practices in less urban areas of Ontario.

## **3. Review of Current Policies and Plans**

The following section will review key provincial policies that provide a framework for northern economic development and play an important role in the expansion of the livestock sector in northern Ontario. The policies describe goals for increased development of the agri-food sector in the north, which require increased need for veterinary care for livestock in rural and remote regions of Ontario.

### **3.1 Growth Plan for Northern Ontario**

The Growth Plan for Northern Ontario (the “Growth Plan”), released in 2011, is a 25-year strategy, prepared under the Places to Grow Act, that promotes economic growth and development in Northern Ontario and focuses on increasing investment and population growth in northern communities (Ministry of Municipal Affairs and Housing [MMAH], 2018). The role of the Growth Plan is to ensure that provincial goals align to support investment and growth within northern communities the diversification of Ontario’s northern economy, as well

as the protection of the natural environment as communities grow (MMAH, 2018). Key goals of the Growth Plan are to build a productive and resilient region, encourage new economic sectors within the north, and support the growth of sustainable northern communities and a skilled workforce. The Growth Plan outlines important goals for the expansion of northern Ontario's agricultural sector through intensification of production to add to a sustainable agri-food system in the north while encouraging purchasing of locally produced foods (MMAH, 2018).

### **3.2 Northern Ontario Agri-Food Strategy**

The Northern Ontario Agri-Food Strategy was developed in 2016 by OMAFRA, and partnering ministries of the Ontario government. Four key goals are outlined in the strategy to direct and promote growth within the north (OMAFRA, 2016b). These include the balance of growth with environmental conservation and community concerns, diversification of the northern economy through agri-food systems, alignment of goals with the Growth Plan, and an increase in collaboration with First Nations and Métis people and communities (OMAFRA, 2016b). Unlike the Growth Plan, which focuses on twelve different economic sectors of growth, the Northern Ontario Agri-Food Strategy focuses solely on the growth and development of agriculture, aquaculture, and food-processing sectors (OMAFRA, 2016b). Directions for growth are divided into categories including the strengthening of northern agriculture and aquaculture production, northern food processing development, promotion of local northern food consumption, and increased opportunity for the participation of Indigenous Peoples in the northern agri-food sector (OMAFRA, 2016b).

### **3.3 Northern Livestock Pilot - Ontario Ministry of Agriculture, Food, and Rural Affairs**

The Northern Livestock Pilot Action Plan was created in 2016 by the Government of Ontario, in partnership with Beef Farmers of Ontario and northern municipalities, to develop a successful livestock sector in Northern Ontario's Great Clay Belt (OMAFRA, 2016a). The framework of the Growth Plan and the Northern Ontario Agri-Food Strategy set the base for

the Northern Livestock Pilot Action Plan. The Northern Livestock Pilot uses pilot sites ideal for pasture livestock production within the Great Clay Belt area, between Cochrane and Hearst, to demonstrate and promote the potential for expansion of the livestock industry within the north (OMAFRA, 2016a). Environmental, social, and economic sustainability are the key guiding principles of the Northern Livestock Pilot as well as the continued importance of improved relationships with Indigenous communities. The research, demonstration of success, and lessons learned through the pilot will be useful in livestock production across all of northern Ontario (OMAFRA, 2016a).

### **3.4 Veterinary Oversight of Antimicrobial Use**

In 2018, Health Canada made changes to regulations surrounding antimicrobial use, requiring that all antimicrobials must be prescribed by a registered veterinarian (Canadian Veterinary Medical Association [CVMA], 2018). As a result of increased knowledge surrounding antimicrobial stewardship, the Canadian Veterinary Medical Association (CVMA), in partnership with Veterinary Pharmaceutical Stewardship Advisory Group (VPSAG) and the Canadian Council of Veterinary Registrars (CCVR), developed the Veterinary Oversight of Antimicrobial Use – A Pan-Canadian Framework for Professional Standards for Veterinarians. The purpose of the document was to outline veterinary professional standards that would guide the creation of regulations by provincial veterinary licensing bodies (CVMA, 2018). In Ontario, the College of Veterinarians of Ontario (CVO) sets regulations for the use of antibiotics in food animals (CVO, 2015).

Another important aspect of the regulatory changes was the need for producers to have a veterinarian-client-patient relationship (VCPR) in order for a veterinarian to prescribe antimicrobials for a herd/flock or individual animal, as well as oversee the use and follow up (CVMA, 2018). For farmers in rural and remote Ontario who did not have an existing relationship with a veterinarian or veterinary clinic, as a result of limited veterinary services in the region or limited pre-existing use of veterinary services, a VCPR had to be established in order to access antimicrobials (CVMA, 2018).

## 4. Review of Assistance Programs and Initiatives

In recognition of the need for support for veterinary service in these areas, the Canadian and Ontario governments have implemented several funding programs, including the Veterinary Assistance Program (VAP), which is supported by the Ministry of Energy, Northern Development and Mines (MENDM, 2018). The VAP provides financial assistance to designated large animal veterinarians for travel to the farms, continuing education costs, and locum assistance, in an attempt to ensure access to large animal veterinary services (MENDM, 2018). The Federal Rural and Northern Immigration Pilot (RNIP, 2020), and the Northern Ontario Internship Program (NOHFC, 2020) also offer opportunities for small rural businesses (i.e., veterinary clinics) to offset the costs associated with attracting and retaining new staff. While in most cases, these programs have been in place for a number of years, a gap in veterinary capacity in these regions appears to remain; suggesting they may not be enough to maintain or increase capacity long-term.

The issue of serving rural and remote populations is not unique to Ontario; many other jurisdictions in Canada, and abroad, face similar challenges. Several studies have explored potential strategies to improve food animal veterinary capacity in remote and underserved regions (Leyland and Catley, 2002; Cummings, 2006; Gwinner et al., 2006; Prince et al., 2006; Windsor, 2009; Lowe, 2007; Remsburg et al., 2007; Sarita et al., 2015; Eccles, 2018; Boissonneault and Epp, 2018). The resounding conclusion is that multiple strategies must be employed at a number of levels (i.e., academia, government, industry) to be effective (Prince et al. 2006). An exploration of other programs and strategies is necessary to facilitate a discussion on future efforts to support veterinary services in rural and remote regions of Ontario.

## 4.1 Table 1 – Summary of Programs and Initiatives

The following table presents a summary of existing programs within Canada and North American that are in place to aid with encouraging veterinary practice in rural and remote regions. The scope is also broadened to include international programs dealing with the same issue of veterinary attraction and retention in rural areas. Lastly, this section includes programs within Ontario that come from similar industries such as dentistry and healthcare but could be useful in looking at solutions for veterinary care shortages.

The tables further divide each program/strategy into the type of strategy that is used. There are five types of interventions employed for improved rural retention: educational, financial, regulatory, personal, and professional.

### Definitions:

- a. **Educational strategies:** recruitment of rural students, training of students in rural schools, rural internship opportunities, and the education of producers on veterinary importance
- b. **Financial strategies:** grants and bursaries, debt repayment programs, and subsidies for veterinarians and producers.
- c. **Regulatory strategies:** the governing of veterinary and medical professionals through government guidelines and legislative changes
- d. **Personal strategies:** improved working conditions, mentorship opportunities, and improved lifestyle factors
- e. **Professional strategies:** career development opportunities, emerging veterinary techniques, and the use of other accredited professionals

Table 1: Veterinary Attraction and Retention Programs and Strategies

Program/ Strategy Name	Governing Body	Location	Program Type/Description	Strategy Type
Canada				
<b>Veterinary Assistance Program (VAP)</b>	Administered by the Ministry of Energy, Northern Development and Mines (MENDM)  In partnership with: Northern Producer Animal Health Network (NPAHN) and Designated Area Veterinary Association (DAVA)	Ontario	The VAP is a financial assistance program that helps rural veterinarians with the cost of travel reimbursement, continuing education costs, and locum assistance.  Veterinarians are reimbursed \$1.20 per kilometer travelled, within 70 kilometers of the practice location, up to a total of \$40,000 a year. Any travel that is beyond the 70-kilometer maximum, up to 250 kilometers, will have a 10-kilometer deduction taken from the reimbursement (Ministry of Northern Development and Mines, 2010).	Financial Assistance  Regulatory  Professional  Educational
i. Veterinary Services Committees (VSC):			Veterinary Service Committees are responsible for representing large animal owners within the region, suggesting program improvements, recruiting veterinary practices to their region, naming yearly contract vets, replacing veterinarians when necessary, and educating local producers about the program (Ministry of Northern Development and Mines, 2010).  22 veterinary services committees in regions across northern Ontario; (Algoma, Bruce Peninsula, Cochrane South, Cochrane/Glackmeyer, Dryden, East Parry Sound, Haliburton, Hearst, Kapuskasing, Manitoulin, Muskoka, North Hasting, North Parry Sound/East Nipissing, Rainy River, Renfrew, Temiskaming, Timmins, Thunder Bay, West Nipissing/East Sudbury, West Sudbury, West Parry Sound) (Northern Producer Animal Health Network, 2020)	

<b>People and Talent Program - Northern Ontario Internship Program</b>	Northern Ontario Heritage Fund Corporation (NOHFC)	Northern Ontario	Wage Subsidy: Funding available for businesses and municipalities in northern Ontario to hire interns  For businesses, the NOHFC will pay 50% of an intern's salary up to \$35,000/year (NOHFC, 2021b)	Financial  Educational
<b>INVEST North Program - Investment Launch Stream</b>	Northern Ontario Heritage Fund Corporation (NOHFC)	Northern Ontario	Funding in place to help with business start-up in northern Ontario (funding for capital expenses)  *Could include veterinary practices*  Funding up to 50% of project cost, up to \$200,000 (NOHFC, 2021a)	Financial
<b>Federal Rural and Northern Immigration Pilot (RNIP)</b>	Canadian Government	Canada	Community-driven program that offers a path to permanent residence for immigrants willing to move to selected rural communities (Government of Canada, 2020).  Participating communities include North Bay, ON; Sudbury, ON; Timmins, ON; Sault Ste. Marie, ON; Thunder Bay, ON; Brandon, MB; Altona/Rhineland, MB; Moose Jaw, SK; Claresholm, AB; Vernon, BC; West Kootenay (Trail, Castlegar, Rossland, Nelson), BC  **could be an opportunity for new vets in rural areas**	Regulatory
<b>Registered Veterinary Technicians (RVTs)</b>  i. Growing Forward Program G1 and G2 – now the Canadian Agricultural Partnership	Ontario Association of Veterinary Technicians (OAVT) and College of Veterinarians of Ontario (CVO)  Ontario Ministry of Agriculture, Food, and Rural Affairs	Ontario	OAVT and CVO looking at new opportunities to change the scope of practice and better utilize registered veterinary technicians (RVTs) in rural food animal veterinary practice through legislative reform (College of Veterinarians of Ontario & Ontario Association of Veterinary Technicians, 2018)  Ontario Association of Veterinary Technicians participated in the Growing Forward Program funded by OMAFRA, helped producers with resources including funding to grow their farms. OAVT helped with supporting RVTs entering the large animal field (OMAFRA, 2018).  **looking for information from OAVT**	Regulatory  Professional



<b>Bovine Education Trust</b>	Ontario Veterinary College (OVC) with the Ontario Association of Bovine Practitioners (OABP)	Ontario	<p>Educational experience program for hands on experience, external electives, and summer placements for students focusing on bovine medicine</p> <p>Start-up funding through OMAFRA's Veterinary Clinical Education Program</p> <p>\$2000 per student in the Food Animal or Rural Community Practice Stream</p> <p>(OVC, 2021; Ontario Association of Bovine Practitioners, 2021)</p>	Educational/ Academic  Financial
<b>Municipal Awareness</b>	Rural Ontario Municipal Association (ROMA)	Ontario	<p>Responsible for making the provincial and federal governments aware of problems affecting rural communities across Ontario (Rural Ontario Municipal Association, 2021).</p> <p>ROMA Could advocate for communities impacted by a lack of veterinarian</p> <p><b>**more information required, could be interesting opportunity**</b></p>	Regulatory  Educational
<b>Veterinary Technician Program</b>	Collège Boréal	Collège Boréal, Sudbury	<p>Veterinary technician course offered in Sudbury at Collège Boréal ( Collège Boréal, 2021)</p> <p><b>*Could help with veterinary technician retention in rural regions as students will study close to their rural communities*</b></p>	Educational/ Academic  Personal
<b>Sheep Flock Health Clubs Pilot Program</b>	Ontario Sheep with Dufferin Veterinary Services	Ontario	<p>Establishing sheep flock health clubs around Ontario</p> <p>Sheep flock clubs provide farmers with veterinary advice, information about veterinary services, and reliable veterinarians in their area. For a small subscription fee, producers have access to health club information.</p> <p>Improvements to sheep health and welfare through increased producer knowledge on disease recognition and prevention</p> <p>(Draft document from Ontario Sheep)</p>	Educational  Professional
<b>Action Plan: Reinforcement and Maintenance of Veterinary Services in Agricultural Environments</b> <i>(Relève et Maintien des</i>	Government of Quebec and the Quebec Ministry of Agriculture, Fisheries and Food - <i>Ministère de l'Agriculture, des Pêcheries et de l'Alimentation</i>	Quebec	<p>Created short, medium, and long-term strategies for attraction and retention of food animal veterinarians in rural regions of Quebec (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2019).</p> <p>Identified 6 regions of Quebec that are vulnerable to veterinary care: 'Fragile Regions'</p>	Educational/ Academic  Regulatory  Professional

<p><i>Services Vétérinaires en Milieu Agricole)</i></p> <p>– Programme Intégré de Santé Animale du Québec (PISAQ)</p>	<p><i>du Québec (MAPAQ)</i></p> <p>In partnership with: Association of Veterinary Practitioners of Quebec (AMVPQ); Association of Veterinarians in the Animal Industry of Quebec (AVIA); Faculty of Veterinary Medicine at the University of Montreal (FMV); Order of veterinary surgeons of Quebec (OMVQ); Union of agricultural producers (UPA)</p>		<p>The Action Plan identifies 9 strategies with intended actions and identifiers of success:</p> <ol style="list-style-type: none"> <li>1. Stimulate regional support of the veterinary profession by increasing the understanding of regional authorities</li> <li>2. Increase visibility of the veterinary profession in regions that are deemed to be vulnerable to veterinary care.</li> <li>3. Increase student awareness of food-animal veterinary medicine through early exposure to the profession.</li> <li>4. Increase the number of students accepted to veterinary programs who show interested in food animal veterinary medicine and facilitate their acceptance.</li> <li>5. Modify the training of veterinary students to better prepare them for the practice of food animal veterinary in rural areas.</li> <li>6. Promote the attraction and retention of certain types of food animal veterinarians including part-time and retirement-aged veterinarians, and foreign veterinary professionals.</li> <li>7. Promote strategies to increase favourable working conditions for veterinarians in ‘fragile regions’, for example mentoring of new graduates in food animal practice.</li> <li>8. Encourage the implementation of new food animal veterinary practice methods in rural regions (telemedicine, increase responsibility of veterinary technicians)</li> <li>9. Monitor the changes in recruitment and retention of food animal veterinary services in ‘fragile regions’</li> </ol>	<p>Personal</p>
<p><b>Provincial Veterinary Field Services</b></p>	<p>Government of New Brunswick</p>	<p>New Brunswick</p>	<p>Government-funded large animal veterinarians, located in 6 regions in New Brunswick: Bathurst, Moncton, Sussex, Frederickton, Wicklow, Grand Falls</p> <p>Services are scheduled through the government of New Brunswick website (Government of New Brunswick, 2021)</p>	<p>Regulatory</p>

<b>Veterinary Travel Compensation</b>		Nova Scotia	Vets paid extra to go and serve remote areas in Nova Scotia <sup>1</sup>	Financial
<b>Feedlot Health – Bovine Post-Mortem</b>	Feedlot Health Management Services and TELUS Agriculture	Western Canada	Feedlot consulting service that uses digital post-mortems as a primary tool. The use of RVTs to carry out post-mortem examinations, taking detailed pictures to send to veterinarians (Feedlot Health Management Services, 2021).	Professional
<b>Veterinary Professional Workforce Project (VPWP)</b>	Alberta Veterinary Medical Association (ABVMA) and Alberta Veterinary Technologist Association (ABVTA)	Alberta	Workforce study, working groups for: education and retention of veterinary professionals in western Canada and Registered Veterinary Technician utilization  (Alberta Veterinary Medicine Association & Alberta Veterinary Technician Association, 2021)	Professional
<b>Doctor of Veterinary Medicine - University of Calgary Veterinary Medicine (UCVM)</b>	University of Calgary and Government of Alberta	Calgary, Alberta	In 2019, \$7.2 million was given to the University of Calgary Veterinary Medicine program by the provincial Government to increase enrollment numbers in the DVM. This was done to meet the needs of Alberta’s rural communities and increase access to veterinary care (Ferguson, 2019).  UCVM focuses on preparing students from Alberta to work within their home communities. Production animal health is an area of major focus. Just over ¼ of accepted students in 2020 were interested in production animal health. (University of Calgary, 2021)	Educational/ Academic  Financial
<b>Veterinary Student Bursary</b>	Northern Alberta Development Council (NADC)	Alberta	The NADC Veterinary Student Bursary is given to students who agree to work in Northern Alberta in a large animal clinic after graduation (Northern Alberta Development Council, 2021b).  There are 2 bursary options: <ul style="list-style-type: none"> <li>- The \$6000 (\$6000 per year up to four years) bursary is provided to students who agree to work anywhere in northern Alberta</li> <li>- The \$12,000 (\$12,000 a year up to four years) bursary is provided to students who agree to work in a specified area of rural Alberta and</li> </ul>	Financial

			are sponsored by a current veterinarian in the area.	
North America				
<b>National Veterinary Medical Service Act</b>	United States Department of Agriculture (USDA)	United States	USDA covers costs of tuition and other living expenses incurred while in veterinary school (debt repayment). Students must agree to work in remote areas of the USA in order to receive benefits (Jensen et al., 2009).	Financial
<b>Veterinary Medicine Loan Repayment Program (VMLRP)</b>	United States Department of Agriculture (USDA)	United States	<p>United States Department of Agriculture will help to repay student loans if veterinarians agree to work in an area with a veterinary shortage for at least 3 years. USDA will pay up to \$75,000 for loan repayment, \$25,000 per year (National Institute of Food and Agriculture, 2021).</p> <p>A map of veterinary shortage areas shows states where veterinarians are needed the most, sorted by priority and type of shortage</p> <ul style="list-style-type: none"> <li>- Can search by state to see each region where veterinarian shortages are located (Washington State is the only state without a shortage)</li> <li>- This map is helpful as the application forms for the VMLRP are attached for each region</li> </ul>	Financial
International				
<b>Voluntary Bonding Scheme for Veterinarians</b>	New Zealand Government	New Zealand	<p>Loan Repayment/Financial incentives provided by the New Zealand government for 30 recent graduates from Massey University with a production animal focus (Ministry for Primary Industries., 2020).</p> <p>The program objective is to attract and retain veterinarians in underserved areas of rural New Zealand</p> <p>5-year program – a total of \$55,000 paid out to veterinarian (\$33,000 after the first 3 years, \$11,000/year for the 4<sup>th</sup> and 5<sup>th</sup> years)</p>	Financial

			**a 2019 review proposed that the program was necessary for veterinary retention in rural areas of New Zealand and was effective**	
<b>Financial Aid Program/ Subsidies</b>	Governments of France, Spain, and Scotland	France, Spain, and Scotland	Governments provide financial aid to farmers (small and medium-sized farms) to help pay for the cost of veterinary services (Federation of Veterinarians of Europe, 2020).  Veterinary clinics in the region benefit from partially funded operational costs	Financial
<b>District Veterinary Organization (DVO)</b>	Government of Sweden	Sweden	The DVO is funded by the government, they pay for the veterinary clinic, equipment as well as some service costs (Federation of Veterinarians of Europe, 2020).  *Although this system operates in rural areas of Sweden, there is still a shortage of veterinarians to work in these areas*	Financial
<b>State-Employed Veterinarians</b>	Municipal/ Regional Governments	Norway, Sweden, and Finland	Veterinary services are financed by the municipality or region. Veterinarians are hired and paid by the municipality they work in. Ensures that veterinarians are paid appropriately and alleviates the stress of running their own veterinary practice  (Federation of Veterinarians of Europe, 2020)	Financial
<b>Internship Program</b>	Government of France	France	Government-funded internship programs for veterinary students in the agricultural sector. Skill and confidence building for students (Federation of Veterinarians of Europe, 2020).  **80% success rate for retention of students within the livestock sector**	Educational/ Academic
<b>Flock Health Clubs</b>	Flock Health Ltd	United Kingdom – England,  (Similar idea being tried in Ontario with Ontario Sheep – noted above)	Sheep flock health clubs were created in England to help create a better sheep farmer-veterinarian relationship (Noble et, al., 2020)  Most clubs that were surveyed had over 75% attendance rate of meetings... lead to increased use of regular veterinary services used by sheep farmers (increased Parasite management, vaccination rates, testing, and antibiotic use)	Educational Professional

			**improvements to relationships between sheep farmers and veterinarians in England was shown as a result of flock health clubs**	
<b>Highlands and Islands Veterinary Service Scheme (HIVSS)</b>	Scottish Government	Scotland	Support in the form of grants for large animal rural veterinary practices to cover some services for disease prevention. The Scottish government covers a portion of the fees for the producer, paid directly to the veterinarian, for preventative medicine and disease eradication (Federation of Veterinarians of Europe, 2020)  *Helps to generate demand for veterinarians in rural areas and covers costs for farmers*	Financial

<sup>1</sup> Insufficient information, requires further research

## 4.2 Table 2 – Summary of Programs and Initiatives used in Other Medical Industries

In recognition of the need for support for veterinary service in these areas, the Canadian and Ontario governments have implemented several funding programs, including the Veterinary Assistance Program (VAP), which is supported by the Ministry of Energy, Northern Development and Mines (MENDM, 2018). The VAP provides financial assistance to designated large animal veterinarians for travel to the farms, continuing education costs, and locum assistance, in an attempt to ensure access to large animal veterinary services (MENDM, 2018). The Federal Rural and Northern Immigration Pilot (RNIP, 2020), and the Northern Ontario Internship Program (NOHFC, 2020) also offer opportunities for small rural businesses (i.e., veterinary clinics) to offset the costs associated with attracting and retaining new staff. While in most cases, these programs have been in place for a number of years, a gap in veterinary capacity in these regions appears to remain; suggesting they may not be enough to maintain or increase capacity long-term.

The World Health Organization has published numerous reviews and reports summarizing evidence of best practices (WHO, 2010). These reviews highlight that there is strong evidence of the benefit of: admission and curricular changes to prioritize an interest in, and understanding of, rural health in graduates; subsidizing relocation and living costs to improve living conditions of rural workers; supporting workplaces to maintain a safe and well-equipped working environment; establishing peer networks and develop career development programs for rural workers, and; adopting public recognition measures, awards, and titles to intrinsically motivate workers (WHO, 2010).

An exploration of the programs and strategies employed by other medical sectors can help to understand strategies that can be used for attraction and retention of veterinarians. The following table outlines some of the programs that have been used within other medical fields to attract and retain professionals to rural communities in Ontario.

*Table 2 – Summary of Programs and Initiatives used in Other Medical Industries*

<b>Program/ Strategy Name</b>	<b>Governing Body</b>	<b>Location</b>	<b>Program Type/Description</b>	<b>Strategy Type</b>
Canada				
<b>Society of Rural Physicians of Canada</b>	Society of Rural Physicians of Canada (SRPC)  In partnership with College of Family Physicians of Canada (CFPC),	Canada	Working in partnership with the Royal College of Physicians and Surgeons of Canada (RCPSC), the Society of Obstetricians and Gynaecologists of Canada (SOGC), and Canadian Association for Graduate Studies (CAGS) to provide healthcare for rural Canadians in rural hospitals (Society of Rural Physicians of Canada, 2021).  A professional organization that helps with supporting rural doctors, promoting rural medical education, researching rural health issues, supporting rural communities, and developing strategies for rural health delivery (Society of Rural Physicians of Canada, 2020).	Educational/ Academic  Personal
Rural Outreach and Mentorship Initiative (ROMI)			The organization has a specific committee for current and future medical students who are interested in practicing in rural and remote areas of Canada.	

Rural Residency Catalogue			<p>ROMI is a program that provides free 1-on-1 mentorship for high-school students who are from rural and remote regions of Canada and are interested in medicine. Students are paired with a medical student at a participating Canadian University.</p> <p>The Rural Residency Catalogue is a resource for current medical students interested in completing their residency in a rural or remote community within Canada.</p> <p>The catalogue provides prospective students with information about residency programs within each province, the community in which they are located, and information about the community (Society of Rural Physicians of Canada, 2021).</p>	
<b>Northern and Rural Recruitment and Retention Initiative (NRRR) – HealthForce Ontario</b>	Ontario Ministry of Health and Ministry of Long-Term Care	Ontario	<p>The NRRR Initiative provides physicians with financial incentives to start a practice in rural and remote communities of Ontario (Government of Ontario, 2021).</p> <p>Financial incentives include grants from \$80,000 to \$117,600, depending on the remoteness of the community. Grants are paid out over a four-year term.</p>	Financial
Rural Family Medicine Locum Program (RFMLP)	HealthForce Ontario		<p>Provides reimbursed financial costs of training specifically for locum doctors in rural and northern Ontario</p>	
<b>Rural Ontario Medical Program (ROMP)</b>	Rural Ontario Medical Program (Organization)	Ontario	<p>The Rural Ontario Medical Program assists in placing medical students into 65 rural communities across Ontario.</p> <p>ROMP selects preceptors (medical professionals) who not only teach students during their placement but also provide students with information about the rural communities where they will be working and what it is like to live there. They also help to cover some of the costs of living including travel and accommodation expenses (Rural Ontario Medical Program, 2021).</p>	Educational Personal



<b>Remote Areas Program</b>	Ontario Dental Association (ODA)	Ontario	The ODA recruits’ dentists, dental hygienists, and dental assistants to 30 rural and remote communities in northern Ontario.  Dental professionals are paid by the ODA and financial benefits are given to workers to cover the costs of travel and accommodation (Ontario Dental Association, 2021).	Financial Regulatory
<b>Northern Ontario School of Medicine (NOSM)</b>	Northern Ontario School of Medicine with Lakehead University and Laurentian University	Ontario	University is dedicated to the training of healthcare professionals to service rural and remote regions as well as indigenous communities and underserved communities in northern Ontario (Northern Ontario School of Medicine, 2021).  Located in Thunder Bay and Sudbury.	Educational/ Academic
<b>Northern Alberta Development Council Bursaries</b>	Northern Alberta Development Council	Alberta	Bursaries are provided to students in a variety of medical fields including medical, dental, and nurse practitioner students, who agree to work in northern Alberta (Northern Alberta Development Council, 2021a).  A variety of bursaries are available with various amounts up to \$24,000/year depending on the medical field.	Financial

## 5. Programs and Strategies (by group)

As discussed above, it is thought that there are mainly five types of interventions employed for improved rural retention: educational, financial, regulatory, personal, and professional. The following section will further examine the programs summarized in Tables 1 and 2 by classifying them into sections based on the different types of programs and strategies employed for the recruitment and retention of veterinarians and other medical professionals in rural and remote regions.

### 5.1 Financial

The first category of strategies that are commonly used to recruit veterinary and medical professionals to rural and remote regions is financial. Financial strategies include monetary compensation through reimbursements or subsidies to help incentivize working in rural

regions. Financial incentives are often given to veterinarians and producers to help cover costs associated with providing veterinary care in rural regions. Typical types of financial strategies include grants, debt repayment programs, and subsidies for wages, veterinary service costs, travel, and accommodation.

### **5.1.1 Grants and Bursaries**

There are a variety of programs within Canada that give grants and bursaries to students who are interested in food animal veterinary medicine, and veterinarians and other medical professionals who are willing to relocate to work in rural areas of the country (Government of Ontario, 2021; Northern Alberta Development Council, 2021b; OABP, 2021; OVC, 2021). Grants and bursaries are provided by the federal, provincial, and municipal governments, professional organizations, and medical/veterinary associations as incentivization to work in the rural food animal industry. The following programs provide examples of how grants and bursaries can be used to support an increase in veterinary/medical capacity.

#### **Grants and Bursaries to Assist Veterinary Students**

Through the Bovine Education Trust, the Ontario Ministry of Agriculture Food and Rural Affairs provides grants for students attending the Ontario Veterinary College at the University of Guelph. The ministry provides \$2,000 per student in the food animal or rural community practice stream who are interested in practicing bovine medicine in rural regions of Ontario (Ontario Association of Bovine Practitioners, 2021; OVC, 2021).

In 2019 the Government of Alberta provided a grant of \$7.2 million to the University of Calgary to help support an increased acceptance rate of veterinary students into the University for the following four years (Ferguson, 2019). The purpose of the grant was to aid the province in increasing veterinary capacity in Alberta's rural and remote areas by greatly increasing the number of veterinary students graduating from the University of Calgary (Ferguson, 2019).

The Veterinary Student Bursary in Alberta, funded by the northern Alberta development council, gives bursaries to current veterinary students who agree to work in remote regions of Alberta upon graduation (Northern Alberta Development Council, 2021b). The total of the grants fluctuates depending on the rurality of the community in which the veterinarian is working. Bursaries of \$6,000 are given to students who agree to work anywhere in northern Alberta, and \$12,000 bursaries are given to students who agree to work with a veterinarian in a specified area of northern Alberta (Northern Alberta Development Council, 2021b). The program is not limited to veterinarians, as the council also provides a number of similar bursaries for students in a variety of medical fields who agree to work in northern Alberta upon graduation (Northern Alberta Development Council, 2021a).

## **Professional Grants**

Although this paper focuses on the issue of veterinary capacity in northern Ontario, other successful strategies employed in the medical field are significant in developing a solution. The Northern and Rural Recruitment and Retention Initiative (NRRR) by HeathForceOntario provides grants to physicians who are willing to relocate to rural and remote regions of Ontario and start a practice (Government of Ontario, 2021). Grants are paid out by the Ontario Ministry of Health over a four-year period with incentives starting at \$80,000 to a maximum of \$117,600 depending on the remoteness of the community (Government of Ontario, 2021). Similarly, dentists are recruited to northern Ontario through the Ontario Dental Association's Remote Areas Program (Ontario Dental Association, 2021). Dentists, dental hygienists, and dental assistants are paid by the Ontario Dental Association to practice in rural parts of the province and are given financial benefits to cover the costs of travel and accommodation (Ontario Dental Association, 2021).

The INVEST North Program funded by the Northern Ontario Heritage Fund Corporation provides funding for investment in northern economic development (NOHFC, 2021a). The program's Investment Launch Stream helps to fund capital expenses including the costs of business start-ups in rural regions of northern Ontario. The NOHFC provides businesses with funding up to 50% of project costs up to a maximum of \$200,000 (NOHFC, 2021a). The investment contributions by the NOHFC could be used for veterinarians to establish a veterinary practice in northern Ontario.

## 5.1.2 Debt Repayment Programs

Another important financial strategy that is used to incentivise the relocation of veterinary professionals to rural and remote regions is financial assistance through debt repayment. Debt repayment programs are often used in other countries to assist in covering the large amounts of student debt incurred during veterinary school (Jensen et al., 2009; National Institute of Food and Agriculture, 2021; Ministry for Primary Industries, 2020).

In the United States, there are two main veterinary debt repayment programs funded through the United States Department of Agriculture, that provide financial compensation to veterinary graduates who practice in rural and remote parts of the country (Jensen et al., 2009; National Institute of Food and Agriculture, 2021). The amount of student debt for graduating veterinary students in the United States can be high with debts surpassing \$150,000 for most students, potentially increasing the attraction of veterinary students to debt repayment programs (American Veterinary Medical Association, 2020). The first debt repayment program is the National Veterinary Medical Service Act. This program covers general costs of tuition and other debts incurred while in school if the student agrees to work in remote areas of the US after graduation (Jensen et al., 2009). The second program is the Veterinary Medicine Loan Repayment Program (VMLRP). This program is similar, however recent graduates must agree to work in designated areas within the country that have demonstrated veterinary shortages. During the VMLRP, veterinary students are given up to \$75,000 towards their student debt if they agree to work in a pre-determined area (National Institute of Food and Agriculture, 2021). To receive the full benefit, which is paid out in sums of \$25,000 annually, veterinarians must work within their designated area for at least three years (National Institute of Food and Agriculture, 2021). A unique aspect of this program is a map of the country that demonstrates where veterinarians are most needed. Veterinary shortages are highlighted by state allowing veterinarians to search for positions that they can apply for through the website (National Institute of Food and Agriculture, 2021).

In New Zealand, the Voluntary Bonding Scheme for Veterinarians, funded by the New Zealand Government, provides thirty graduates a year from Massey University with financial incentives to help with student debt repayment (Ministry for Primary Industries, 2020).

The program pays a total of \$55,000 to veterinarians over the course of five years if they are working rurally. Veterinarians must work for a minimum of three years before they receive their first payouts of \$33,000 from the program. After this, \$11,000 a year is paid out for the remaining two years (Ministry for Primary Industries, 2020). A 2019 review of the Voluntary Bonding Scheme program found that the program was highly effective in veterinary retention in rural areas of New Zealand (Ministry for Primary Industries, 2020).

### **5.1.3 Subsidies and Reimbursements**

Subsidies are another type of financial strategy that is used to keep the cost of veterinary care low and affordable for producers in rural regions. Subsidies are mainly provided to veterinarians or producers by the government or public organizations to assist in keeping service costs and the cost of operations lower (Federation of Veterinarians of Europe, 2020; Ministry of Northern Development and Mines, 2010; NOHFC, 2021b). Money may be granted directly to the veterinarians so they can offer lower costs to their clientele, or to producers to assist them in paying for veterinary services.

#### **Veterinary Subsidies**

In Ontario, the provincial government grants money through the Veterinary Assistance Program (VAP) to veterinarians to cover some of the costs associated with practicing medicine in rural Ontario (Ministry of Northern Development and Mines, 2010). This helps food animal veterinarians to charge lower service fees to their clients while still making enough money to support their practice. The main component of the VAP, administered by the Ministry of Energy, Northern Development and Mines, is a subsidy to reimburse the cost of travel associated with veterinary care in rural regions of the province (Ministry of Northern Development and Mines, 2010). Veterinarians are reimbursed \$1.20 per kilometer travelled, within 70 kilometers of the practice location, up to a total of \$40,000 a year. Any travel that is beyond the 70-kilometer maximum, up to 250 kilometers, will have a 10-kilometer deduction taken from the reimbursement (Ministry of Northern Development and Mines, 2010).

The Northern Ontario Heritage Fund Corporation's (NOHFC) People and Talent Program offers a Northern Ontario Internship Program Wage Subsidy that provides wage subsidies to businesses and municipalities in northern Ontario to hire interns. For businesses, which can include veterinary practices, the NOHFC will pay 50% of an intern's salary up to \$35,000 per year (NOHFC, 2021b).

International governments and organizations also offer subsidies to veterinarians in rural regions to help cover the costs of veterinary services. In Sweden, the District Veterinary Organization (DVO), is government funded and helps veterinarians in rural areas of the country with the costs of clinic upkeep and equipment through subsidies (Federation of Veterinarians of Europe, 2020). Similarly in Scotland, the Highlands and Islands Veterinary Service Scheme provides monetary support directly to rural veterinary practices to cover services for disease prevention. The subsidies allow for lower service costs for producers in Scotland while allowing vets to make a fair wage. The scheme has been proven to generate a higher demand for veterinary services in rural regions of Scotland, as a result of lower fees for producers (Federation of Veterinarians of Europe, 2020).

### **Subsidies for Producers**

Although much less common, some governments offer subsidies for producers to help cover veterinary costs. In France, Spain, and Scotland, the governments provide financial aid in the form of subsidies to farmers in rural regions to help cover the costs of veterinary care (Federation of Veterinarians of Europe, 2020). In Scotland the Highlands and Islands Veterinary Services Scheme provides select rural producers with grants to subsidize all costs associated with travel and veterinary services (Federation of Veterinarians of Europe, 2020). Veterinarians in these areas also benefit as they see an increase in veterinary services requested by farmers as a result of the subsidies (Federation of Veterinarians of Europe, 2020)

## 5.2 Educational

The next category of programs and strategies used to help with veterinary and medical capacity in rural regions is educational strategies. These can include the recruitment of rural veterinary and medical students within veterinary and medical programs, the creation of veterinary and medical schools in rural areas, and internship opportunities for students to practice working in rural and remote regions, and (Collège Boréal, 2021; Federation of Veterinarians of Europe, 2020; NOHSC, 2021b; Ontario Association of Bovine Practitioners, 2021; OVC, 2021; Society of Rural Physicians of Canada, 2021). Educational strategies can also include the education of other stakeholders including producer groups and the government on the issues of veterinary capacity (Ministry of Northern Development and Mines, 2010; Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2019; Noble et al., 2020).

### 5.2.1 Student Education

The education of veterinary students to help prepare them for the unique situation of working in rural areas is an important component for increasing veterinary capacity (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2019). In 2019, the government of Quebec created an Action Plan, Relève et Maintien des Services Vétérinaires en Milieu Agricole, to help reinforce and maintain veterinary services in agricultural areas of the province. An important aspect of the Program is increasing student awareness and knowledge of rural food animal veterinary medicine by exposing students early in their degree to rural veterinary practice (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2019). To help better prepare students for working in rural environments, the University of Montreal Doctor of Veterinary Medicine program modified training of veterinary students to better reflect the realities of practicing food animal medicine in rural areas of the province (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2019). In order to expose current veterinary students to rural veterinary practice strategies such as internships and placements and increased opportunities for education in rural areas is necessary.

## Internships and Placements

The first strategy that is widely used to expose veterinary students to livestock and rural veterinary practice is internships and placements. Internships across Canada and internationally are funded by educational institutions, government, and professional groups (Federation of Veterinarians of Europe, 2020; NOHSC, 2021b; Ontario Association of Bovine Practitioners, 2021; OVC, 2021).

In Ontario, the Bovine Education Trust, funded through OMAFRA's Veterinary Clinical Education Program, provides hands-on experience for Ontario Veterinary College (OVC) students through placements focusing on bovine medicine (Ontario Association of Bovine Practitioners, 2021; OVC, 2021). Although the DVM program at the University of Guelph offers students the opportunity to specialize in large animal medicine, the Bovine Education Trust offers additional summer placement opportunities and external electives for students specifically interested in bovine veterinary medicine (Association of Bovine Practitioners, 2021). Similarly, the People and Talent Program offered through the Northern Ontario Internship Program pays for student interns to travel and work in northern Ontario (NOHFC, 2021b). Although the program is not directly for veterinary students, the Northern Ontario Heritage Fund Corporation offers an opportunity for students to try working in businesses in rural northern Ontario in an attempt to increase the northern economy (NOHFC, 2021b).

In France, the government funds an internship program for veterinary students who are interested in the agricultural sector. The program provides students with important skill-building opportunities and helps to build early confidence working with large animals (Federation of Veterinarians of Europe, 2020). An evaluation of the program demonstrated an 80% success rate in the retention of students within the livestock sector after participating in the internship program (Federation of Veterinarians of Europe, 2020).

Although not directly related to veterinary medicine, educational strategies to attract students in other medical professions to rural regions also include opportunities for internships and placements. The Society of Rural Physicians of Canada (SRPC), in partnership with the College of Family Physicians of Canada (CFPC), funds the Rural Outreach and Mentorship Initiative (ROMI) (Society of Rural Physicians of Canada, 2021). ROMI was created for



medical students who are specifically interested in practicing medicine in rural and remote areas of Canada. The program provides high school students who are from rural areas of Canada with the opportunity for 1-on-1 mentorship with a current medical student (Society of Rural Physicians of Canada, 2021). Another similar program that is offered by the Rural Ontario Medical Program (ROMP), a professional organization, assists in placing medical students into 65 rural communities across Ontario in an attempt to increase the number of rural physicians. ROMP selects preceptors, medical professionals from rural communities to mentor medical students interested in working in rural medicine (Rural Ontario Medical Program, 2021).

## **Education in Rural Areas**

Training veterinary and medical professionals directly in rural areas may be key to retaining students to work in rural areas after graduation. The Veterinary Technician Program at Collège Boréal in Sudbury trains registered veterinary technicians from rural communities who are interested in working in the north (Collège Boréal, 2021). Another similar institution is the Northern Ontario School of Medicine (NOSM) which was established by Lakehead University and Laurentian University to train health care professionals to service rural and remote regions of Ontario (Northern Ontario School of Medicine, 2021). The campuses are located in northern Ontario in Thunder Bay and Sudbury. Medical students from the University are more likely to serve in rural and remote areas after graduation as they have been trained to work with indigenous and underserved communities in northern Ontario (Northern Ontario School of Medicine, 2021).

### **5.2.2 Producer Education on Veterinary Medicine**

The education of livestock producers on the importance of veterinary medicine for their animals plays an important role in increasing business for large animal veterinary practitioners in rural regions. Producer education can help to increase the use of veterinary services such as routine health visits and preventative medicine and decrease the need for emergency care (Noble et al., 2020).

In Ontario, part of the VAP is the Veterinary Services Committees (VSC) that offer education for producers on the importance of veterinary care (Ministry of Northern Development and Mines, 2010). There are twenty-two VSCs across northern Ontario located in rural regions (Northern Producer Animal Health Network, 2020). VSCs act as a reliable place for producers to get information on veterinary services, and large animal veterinary practices that offer services in their areas (Ministry of Northern Development and Mines, 2010; Northern Producer Animal Health Network, 2020).

Another interesting strategy for producer education is the creation of flock health clubs. Flock Health Clubs were created in the United Kingdom by a veterinary consultancy company to help producers access reliable information about veterinary care (Noble et al., 2020). Of the clubs in England that were surveyed, most had an attendance rate of over 75% and local veterinarians reported increased use of routine veterinary services including increased parasite management, vaccination rates, testing, and antibiotic use. The flock clubs have also helped to improve relationships between sheep farmers and veterinarians in England (Noble et al., 2020). Ontario Sheep, in partnership with Dufferin Veterinary Services, has established Sheep Flock Health Clubs as a pilot project, based on the United Kingdom model, to help educate producers on the importance of routine veterinary services. Sheep flock clubs provide farmers with veterinary advice, information about veterinary services, and reliable veterinarians in their area. For a small subscription fee, producers have access to health club information on disease recognition and prevention, improving sheep health and welfare (Draft document from Ontario Sheep, 2021).

### **5.2.3 Awareness of Veterinary Capacity**

The last educational strategy that can be used to increase veterinary capacity in rural and remote regions of the province is the education of stakeholders including the government and ministries to increase awareness of the veterinary shortage in northern Ontario. Part of the Quebec Action Plan, mentioned above, is the importance of increasing visibility of the veterinary profession and increase regional support by the government and authorities of the veterinarians (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2019).

An opportunity to raise awareness of veterinary shortages in northern Ontario is through the Rural Ontario Municipal Association (ROMA) (Rural Ontario Municipal Association, 2021). ROMA is responsible for making Provincial and Federal governments aware of problems that affect rural communities across Ontario (Rural Ontario Municipal Association, 2021). This could be an opportunity for the Association to advocate for rural veterinary services and demonstrate the necessity for government intervention on veterinary capacity in rural and remote regions of Ontario.

## **5.3 Professional**

Professional strategies for attraction and retention are usually employed by the industry, which in the case of veterinary capacity would be professional groups in the veterinary and livestock industries. Strategies can be divided into sections based on the industry that has established strategies. In this case, strategies are divided into veterinary-specific strategies organized by veterinary organizations and professionals and producer strategies.

### **5.3.1 Veterinary Strategies**

Professional strategies for veterinary capacity look at ways that the veterinary industry can alleviate gaps in service through the use of new techniques to provide services, career development strategies, or the use of other, similarly trained professionals (College of Veterinarians of Ontario & Ontario Association of Veterinary Technicians, 2018; Ministry of Northern Development and Mines, 2010; Ministère de l’Agriculture, des Pêcheries et de l’Alimentation, 2019).

### **New Practice Methods**

The implementation of new methods of practice for veterinarians in rural and remote regions is an important strategy in decreasing gaps in veterinary care (Ministère de l’Agriculture, des Pêcheries et de l’Alimentation, 2019). Several new techniques and methods have been developed over the last few years to help veterinarians provide better service in rural regions

of the country (Feedlot Health Management Services, 2021 Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2019).

The Quebec Action Plan encourages the implementation of new animal veterinary practice methods in rural regions such as an increase in telemedicine and the increased use of registered veterinary technicians (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2019).

Similarly, the Ontario Association of Veterinary Technicians and the College of Veterinarians of Ontario have considered changing the scope of work for Registered Veterinary Technicians (RVTs) in Ontario to help with closing some of the gaps in veterinary care (College of Veterinarians of Ontario & Ontario Association of Veterinary Technicians, 2018). Increased responsibility for RVTs would help to increase veterinary capacity in rural areas and alleviate stress by allowing veterinarians to work fewer hours.

Telemedicine is an emerging technology in the field of veterinary medicine and has been used increasingly by veterinarians to reach rural clientele from farther distances (Sarita et al., 2015). Feedlot Health Management Services, an Alberta-based company, uses photography to complete digital post-mortems of bovine animals (Feedlot Health Management Services, 2021). The process is done by a Registered Veterinary Technician who is trained to perform the post-mortem and take detailed pictures to send back to the veterinarian. Images are later used to diagnose causes of death in animals on feedlots across western Canada (Feedlot Health Management Services, 2021).

## **Industry Development**

Career development for veterinary professionals is another important strategy in veterinary retention in rural Ontario. In 2020, the Alberta Veterinary Medicine Association (AVMA) and the Alberta Veterinary Technician Association (AVTA) performed a Veterinary Professional Workforce Study that included veterinary professionals and other stakeholders to look at the issue of veterinary capacity in western Canada (Alberta Veterinary Medicine Association & Alberta Veterinary Technician Association, 2021). The project used working groups to identify key issues that were contributing to the recruitment and retention of veterinarians in rural regions. Of these issues, lack of career development opportunities and insufficient

compensation were key factors that were contributing to the attrition rates of veterinary professionals (Alberta Veterinary Medicine Association & Alberta Veterinary Technician Association, 2021). As demonstrated through the Workforce Study, veterinary professionals must be key stakeholders in determining solutions to veterinary capacity in rural areas.

The Ontario Veterinary Assistance Program (VAP) offers veterinarians the opportunity for continued education by providing funding to cover the costs of training (Ministry of Energy, Northern Development and Mines, 2010). The Ministry of Energy, Northern Development and Mines will cover up to 50% of costs associated with continuing education and attending conferences for Participating Veterinary Practices in the Veterinary Assistance Program (MENDM, 2010). Up to \$2,000 is available to veterinarians per conference or new designation (MENDM, 2010).

### **5.3.2 Producer Strategies**

Although it is less prevalent in the livestock industry, producers use professional industry groups to assist in finding reliable veterinary services. The Sheep Flock Health Clubs Pilot Program is overseen by Ontario Sheep, a professional group that aims to assist producers in finding accurate information about veterinarians in the area, despite the shortage of veterinarians in many rural communities. The Health Clubs work directly with sheep farmers, veterinarians, students, and pharmaceutical companies to provide continued veterinary care (Draft document from Ontario Sheep).

## **5.4 Regulatory**

Another strategy that has been proven to be effective in increasing veterinary capacity in rural regions is regulatory. Regulatory strategies include the governing of vets and other medical professionals through the government, ministries, and professional organizations. Examples of regulatory strategies include government-regulated employees, regulation of professionals through organizations and associations, and the regulation of educational programs.

## 5.4.1 Government-Regulated Employees

The regulation of veterinarians at a government level can originate from guidelines set by federal, provincial, or municipal government officials and ministries or through legislative changes made to increase the capabilities of veterinary professionals. A common example to demonstrate the mandating of professionals to increase veterinary and other medical capacities provincially is government-funded/regulated employees (Government of Canada, 2020; Government of New Brunswick, 2021; Federation of Veterinarians of Europe, 2020).

In New Brunswick, veterinarians are hired and paid through the Provincial Veterinary Field Services program (Government of New Brunswick, 2021). Government-funded large animal veterinarians are located in six rural regions across the province to provide veterinary care to rural livestock. Producers are able to schedule veterinary services through the Ministry of Agriculture, Aquaculture and Fisheries website and see a full list of fees for each type of veterinary service offered (Government of New Brunswick, 2021). Veterinarians who are employed by the government benefit from a stable clientele and shorter working hours as a result of distributed hours between other government veterinarians (Government of New Brunswick, 2021).

State Employed Veterinarians are also used in Norway, Sweden, and Finland to provide veterinary services to rural and remote regions (Federation of Veterinarians of Europe, 2020). Veterinary services are governed and financed by the municipal or regional government in which they are located. Municipalities are responsible for hiring and paying large animal veterinarians, ensuring that veterinarians are paid appropriately, and alleviating the stress of running a veterinary practice (Federation of Veterinarians of Europe, 2020).

A different strategy for government regulation of employees is through the Federal Rural and Northern Immigration Pilot. This program offers Canadian immigrants a path to permanent residence if they agree to work in one of the selected rural communities that demonstrate a need for professional employees (Government of Canada, 2020). Although the program is not exclusively for veterinary attraction, it is used as a strategy to attract professionals, who are new to the country, to rural and remote regions (Government of Canada, 2020).

## Legislative Regulation

Legislative changes have been suggested to update the regulations that govern the practice of RVTs in Ontario. The College of Veterinarians of Ontario (CVO) and the Ontario Association of Veterinary Technicians (OAVT) are looking at possible changes to current RVT regulation to help cover gaps in veterinary care. Changes would provide new opportunities to change the scope of practice and better utilize RVTs in rural food animal veterinary practice through legislative reform (College of Veterinarians of Ontario & Ontario Association of Veterinary Technicians, 2018)

The possibility of making changes to RVT designation has also been explored by other Canadian provinces. The Quebec Action Plan discussed the need to encourage increased responsibility for RVTs in rural regions and the Alberta Veterinary Professional Workforce Project proposed similar changes in the increased use of RVTs to help support veterinarians working in rural areas of Alberta (Alberta Veterinary Medicine Association & Alberta Veterinary Technician Association, 2021; Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2019).

### 5.4.2 Regulation of Educational Programs

One strategy that people have expressed as an area of opportunity for increasing the number of veterinarians in rural and remote regions of Canada is the regulation of veterinary education programs to increase the number of students accepted into veterinary schools. The Quebec Action Plan for veterinary recruitment and retention emphasized increasing the number of students accepted to the University of Montreal veterinary medicine program. The increase in students would be focused mainly on students who come from rural areas and those who show an interest in food animal veterinary medicine. The regulation of students accepted to the Doctor of Veterinary Medicine program would help to facilitate the acceptance of students who would be most likely to work in the rural livestock sector after graduation (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2019).

In an attempt to increase the overall number of vets working in northern Alberta, the University of Calgary was given money from the provincial government to increase the number of

veterinary students accepted into the DVM program each year. \$7.2 million was given to the university to increase the acceptance of first-year students by 30 students for the next four years (Ferguson, 2019).

### **5.4.3 Organizational Regulation**

Regulatory strategies can also be employed by professional organizations and associations to help increase veterinary capacity in rural areas. The VAP has Veterinary Services Committees, run through the Northern Producer Animal Health Network, that help with the regulation of veterinary recruitment in their regions (Ministry of Energy, Northern Development and Mines, 2021). Veterinary Service Committees (VSCs) are responsible for recruiting veterinary practices to their region, naming yearly contract vets, and replacing veterinarians when the current veterinarian leaves or retires (Ministry of Energy, Northern Development and Mines, 2021). The regulation of veterinarians through the VSCs helps to ensure that livestock producers in the area are able to access reliable veterinary care.

## **5.5 Personal**

The final approach to veterinary recruitment and retention is personal strategies. Although it is not the primary focus of many programs, personal strategies are imperative in increasing veterinary capacity in rural regions. It has been noted that a key factor in the reluctance of medical and health professionals in relocating to rural and remote regions is a result of social and psychological factors, including stress, isolation, limited facilities, and limited opportunities for partners and children (Behera, 2017). Some strategies look at recruiting veterinary and medical professionals to rural regions by enticing them through personal strategies. Some of these include presenting prospective professionals with information about life in the community, amenities, and opportunities for family members, and creating a less stressful work environment (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2019).



## 5.5.1 Work Conditions

Creating favourable working conditions for veterinarians in rural communities is important for the retention of veterinarians. The Alberta Veterinary Workforce Project highlighted the health and wellness of veterinarians as an area of concern. Long working hours caused by the perpetual need for rural veterinarians to be on-call and resulting stress has caused suicide rates in veterinarians to be higher than any other profession (Alberta Veterinary Medicine Association & Alberta Veterinary Technician Association, 2021). One of the key strategies outlined in the Quebec Action Plan for veterinary attraction and retention is the importance of promoting strategies for increasing favourable working conditions for veterinarians in rural regions. Strategies to improve work conditions can include shorter working hours, higher rates of pay, and mentorship for new graduates of veterinary programs (Ministère de l'Agriculture, des Pêcheries et de l'Alimentation, 2019). An example of this is State-Employed Veterinarians in Norway, Sweden, and Finland. In this program, veterinary services are governed and financed by the municipality or region in which they are located. This helps to alleviate stress from veterinarians of running their own practice and ensures that they receive proper compensation for their work (Federation of Veterinarians of Europe, 2020).

## 5.5.2 Attraction of Students and Veterinarians

A significant part of attracting veterinarians to rural and northern Ontario lies in selling the unique lifestyle of living in the north. As noted in research by Caldwell et al. (2019) exploring farmer attraction in northern Ontario, many barriers to attraction were related to false perceptions of northern communities and limited knowledge of the region. Overcoming these myths and profiling the unique attributes of the north are imperative for broad attraction of new migrants. Although there are no programs within Ontario that look at attracting veterinarians to the north for personal reasons, there are some examples in the medical field that could be applicable in veterinary medicine (Rural Ontario Medical Program, 2021; Society of Rural Physicians of Canada, 2021). The Society of Rural Physicians of Canada (SRPC) created the Rural Residency Catalogue as a resource for medical students who are interested in completing their residency in a rural or remote community. The catalogue provides prospective students with information about residency programs within each province, the community in which

they are located, and information about the community (Society of Rural Physicians of Canada, 2021). The catalogue can help students who are not originally from rural areas of Canada to understand more about rural communities across the country and features of the communities that might attract people to the region (Society of Rural Physicians of Canada, 2021). Similarly, the Rural Ontario Medical Program (ROMP) chooses preceptors who act as mentors for medical students placed into rural communities. The mentors provide students and young professionals with information about the community they will be working in and help to find lodging for students (Rural Ontario Medical Program, 2021). Having connections in rural communities can be very important for attracting professionals to a new place, which is a big part of the Rural Ontario Medical Program (Rural Ontario Medical Program, 2021).

### **5.5.3 Retention of Rural Veterinarians**

A key factor in improving veterinary capacity in rural regions of Ontario is the retention of veterinarians who are originally from rural areas. The Veterinary Technician Program at Collège Boréal allows students who are from northern Ontario to study closer to their hometowns, increasing the likelihood that they will stay in northern Ontario after graduating (Collège Boréal, 2021). Similar strategies are employed through the Northern Ontario School of Medicine (NOSM). Medical students who are from Thunder Bay and Sudbury and the surrounding areas can train in northern Ontario and are more likely to stay for personal reasons knowing that they enjoy the rural lifestyle (NOSM, 2021).

## 6. Conclusion

Veterinary capacity in northern Ontario is a complex issue that will require a solution that combines a number of different programs and strategies. Numerous stakeholders including the provincial government, ministries, local governments, professional organizations and associations, educational institutions, veterinary students, veterinarians, and producers, will need to take part in developing strategies. As highlighted above, a variety of different strategies should be employed to increase veterinary recruitment and retention in rural areas. Financial, educational, professional, regulatory, and personal strategies should be considered in order to enhance access to food animal veterinary services. This jurisdictional scan highlights the need to further analyze the uptake, costs, and success of current Ontario-based veterinary recruitment and retention programs and strategies. A feasibility study may be necessary to understand the capability of current programs within Ontario of solving gaps in food animal veterinary care within the north.

Planning for a robust agricultural sector must take all aspects of the agri-food system into consideration, including veterinary services to support food animal producers. Although land use planning plays a key part in agricultural sustainability, without professionals who provide supporting services for agricultural workers such as veterinarians, the agri-food system is incomplete. Veterinary professionals must be considered in the planning framework for the Northern agricultural sector to protect farmers, ensuring a sustained livelihood for food animal producers. A lack of veterinary capacity in northern Ontario impacts food animal producers, in turn impacting the larger agricultural industry in the north.



# References

Alberta Veterinary Medicine Association and Alberta Veterinary Technician Association. (2021). Veterinary Professional Workforce Project (VPWP) Final Report.

American Veterinary Medical Association. (2020). Student AVMA: Facing Your Veterinary Medical Education. <https://www.avma.org/membership/SAVMA/financing-your-veterinary-medical-education>

Andrus, D.M., K.P. Gwinner, and J.B. Prince. (2006). Job satisfaction, changes in occupational area, and commitment to a career in food supply veterinary medicine. *JAVMA*. 228:1884-1893.

Beef Farmers of Ontario. (2020). Expanding Ontario's beef industry. <https://www.beefnorth.com/>

Behera, M.R., C. Prutipinyo, N. Sirichotiratana, and C. Viwatwongkasem. 2017. Interventions for improved retention of skilled health workers in rural and remote areas. *Ann Trop Med PubHealth*. 10:16-21.

Boissoneault, C., and T. Epp. (2018). Reflections on the provision of veterinary services to underserved regions: A case example using northern Manitoba, Canada. *Can Vet J*. 59: 492-499.

Canadian Veterinary Medical Association. (2018). Veterinary Oversight of Antimicrobial Use – A Pan-Canadian Framework for Professional Standards for Veterinarians. <https://www.canadianveterinarians.net/documents/pan-canadian-framework>

Chapagain, T. (2017). Farming in Northern Ontario: Untapped Potential for the Future. *Agronomy*, 7(3), 59. <https://doi.org/10.3390/agronomy7030059>

Collège Boréal. (2021). Veterinary Care Technician. <https://www.collegeboreal.ca/en/programs/agriculture-and-related-fields/vetq-veterinary-care-technician-sudbury>

College of Veterinarians of Ontario. (2015). Ontario Veterinary Stewardship of Antibiotic Use in Food-Producing Animals.

College of Veterinarians of Ontario, & Ontario Association of Veterinary Technicians. (2018). Achieving a Modern Approach to the Regulation of Veterinary Medicine in Ontario. <https://cvo.org/CVO/media/College-of-Veterinarians-of-Ontario/Resources%20and%20Publications/Reports/ConceptReportFeb2018.pdf?ext.pdf>

Federation of Veterinarians of Europe. (2020). Shortage of veterinarians in rural and remote areas summary report. [https://fve.org/cms/wp-content/uploads/Shortage\\_Vets\\_Rural\\_Areas10July2020.pdf](https://fve.org/cms/wp-content/uploads/Shortage_Vets_Rural_Areas10July2020.pdf)

Feedlot Health Management Services. (2021). What's New with Feedlot Health by TELUS Agriculture. <https://www.feedlothealth.com/feedlot-health-whats-new/>

Ferguson, C. (2019). UCalgary Faculty of Veterinary Medicine Granted \$7.2 Million from Province to Expand Program. University of Calgary. <https://ucalgary.ca/news/ucalgary-faculty-veterinary-medicine-granted-72-million-province-expand-program>

Food and Agricultural Organization of the United Nations. (2009). How to Feed the World in 2050. [http://www.fao.org/fileadmin/templates/wsfs/docs/expert\\_paper/How\\_to\\_Feed\\_the\\_World\\_in\\_2050.pdf](http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf)

Gaudet, A. (2015). Roles and opportunities for technicians in digital imaging technology to perform necropsies. 48: 185-187. Proceedings from the American Association of Bovine Practitioners Annual Meeting

Government of Canada. (2020). Rural and Northern Immigration Pilot. <https://www.canada.ca/en/immigration-refugees-citizenship/services/immigrate-canada/rural-northern-immigration-pilot/community-partners.html>

Government of New Brunswick. (2021). Veterinary Field Services. [https://www2.gnb.ca/content/gnb/en/departments/10/agriculture/content/livestock/veterinary\\_services.html](https://www2.gnb.ca/content/gnb/en/departments/10/agriculture/content/livestock/veterinary_services.html)

Government of Ontario, Ministry of Health and Long-Term Care. (2021). HealthForceOntario Northern and Rural Recruitment and Retention Initiative Guidelines - Northern Health Programs - Health Care Professionals - MOHLTC.

Gwinner, K.P., J.B. Prince, and D.M. Andrus. (2006). Attracting students into careers in food supply veterinary medicine. JAVMA. 228:1693-1704.

Jensen, K. L., English, B. C., Menard, R. J., & Holland, R. E. (2009). Livestock producers' views on accessing food-animal veterinary services: Implications for student recruitment, training, and practice management. *Journal of Veterinary Medical Education*, 36(1), 30–38. <https://doi.org/10.3138/jvme.36.1.30>

Lem, M. (2019). Barriers to accessible veterinary care. *Can Vet J*. 60:891-893.

Leyland, T. and A. Catley. (2002). Community-based animal health delivery systems: Improving the quality of veterinary service delivery. Proceedings of the OIE Seminar “Organization of Veterinary Services and Food Safety” at the World Veterinary Congress, Tunis.

- Lowe, P. (2007). *Unlocking Potential: A report on veterinary expertise in food animal production*. [https://eprint.ncl.ac.uk/file\\_store/production/157494/88D16007-9B91-460D-A5D9-94E17A5CACCA.pdf](https://eprint.ncl.ac.uk/file_store/production/157494/88D16007-9B91-460D-A5D9-94E17A5CACCA.pdf)
- Ministry of Municipal Affairs and Housing. (2011). *Growth Plan for Northern Ontario*. Government of Ontario.
- Ministry of Northern Development and Mines. (2010). *Veterinary Assistance Program Guidelines*. Government of Ontario. [https://www.mndm.gov.on.ca/sites/default/files/vap\\_4000e\\_program\\_guidelines\\_2.pdf](https://www.mndm.gov.on.ca/sites/default/files/vap_4000e_program_guidelines_2.pdf)
- Ministry for Primary Industries. (2020). *Review of Voluntary Bonding Scheme for Veterinarians*. Government of New Zealand. <https://www.mpi.govt.nz/dmsdocument/39689/direct>
- Ministère de l'Agriculture, des Pêcheries et de l'Alimentation. (2019) *Plan D'action: Relève et Maintien des Services Vétérinaires en Milieu Agricole*. Gouvernement de Québec. [https://www.mapaq.gouv.qc.ca/SiteCollectionDocuments/Formulaires/Plan\\_action\\_PISAQ\\_Groupe\\_releve\\_maintien\\_services.pdf](https://www.mapaq.gouv.qc.ca/SiteCollectionDocuments/Formulaires/Plan_action_PISAQ_Groupe_releve_maintien_services.pdf)
- National Institute of Food and Agriculture. (2021). *Veterinary Medicine Loan Repayment Program*. United States Department of Agriculture. <https://nifa.usda.gov/program/veterinary-medicine-loan-repayment-program>
- Noble, N., Occhiuto, F., Lovatt, F., Johnson, M., Jones, W., & Kaler, J. (2020). Impact of Flock Health Clubs. *Livestock*, 25(6), 301-307. <https://doi.org/10.12968/live.2020.25.6.301>
- Northern Alberta Development Council. (2021a). *NADC Bursary*. <https://nadc.ca/our-bursaries/nadc-bursary/>
- Northern Alberta Development Council. (2021b). *Veterinary Student Bursary*. <https://nadc.ca/our-bursaries/veterinary-student-bursary/>
- Northern Ontario Heritage Fund Corporation. (2021a). *Investment – Launch Stream*. Government of Ontario. <https://nohfc.ca/en/pages/programs/invest-north-program/investment-launch-stream>
- Northern Ontario Heritage Fund Corporation. (2021b). *People and Talent Program: Workforce Development Stream*. Government of Ontario. <https://nohfc.ca/en/pages/programs/people-talent-program/workforce-development-stream>
- Northern Ontario School of Medicine. (2021). *About NOSM*. <https://www.nosm.ca/about/about-nosm/>

Northern Producer Animal Health Network. (2020) What is NPAHN?

<https://northernproduceranimalhealthnetwork.ca>

Ontario Association of Bovine Practitioners. (2021). Education Trust. <http://oabp.ca/bovine-education-trust-bet/>

Ontario Dental Association. (2021). Remote Areas Programs . <https://www.oda.ca/>

Ontario Ministry of Agriculture Food and Rural Affairs. (2016a). Northern Livestock Pilot Action Plan. Government of Ontario. <http://www.omafra.gov.on.ca/english/policy/nlpap.htm>

Ontario Ministry of Agriculture Food and Rural Affairs. (2016b). Northern Ontario Agri-Food Strategy. Government of Ontario. <http://www.omafra.gov.on.ca/english/northernagrifood/noas.htm#Principles>

Ontario Ministry of Agriculture, Food, and Rural Affairs. (2018). Growing Forward 2. Government of Ontario. <http://www.omafra.gov.on.ca/english/about/growingforward/gf2-index.htm>

Ontario Veterinary College. (2021). Bovine Education Trust. <https://ovc.uoguelph.ca/bovineeducationtrust>

Ontario Veterinary Medical Association (OVMA). (2013). Ontario bovine veterinary practice census report. Internal OVMA report.

Prince, J.B., D.M. Andrus, and K. Gwinner. (2006). Future demand, probable shortages, and strategies for creating a better future in food supply veterinary medicine. *JAVMA*. 229:57-69.

Remsburg, D.W., D.T. Galligan, and J.D. Ferguson. (2007). A proposed novel food animal healthcare delivery system. *JAVMA*. 231:854-860.

Rural and Northern Immigration Pilot (RNIP). 2020. About the pilot. <https://www.canada.ca/en/immigration-refugees-citizenship/services/immigrate-canada/rural-northern-immigration-pilot.html>

Rural Ontario Medical Program. (2021). About Rural Ontario Medical Program. <https://romponline.com/about-rural-ontario-medical-program-romp/>

Rural Ontario Municipal Association. (2021). Advocacy. Association of Municipalities Ontario. <https://www.roma.on.ca/advocacy>

Sarita, D. R.D. Singh, R.S. Ghasura, M.K. Sharma, and M.C. Sharma. (2015). Telemedicine: A new rise of hope to animal health care sector. A Review. *Ag. Reviews* 36:153-158.

Society of Rural Physicians of Canada. (2020). About Us. <https://www.srpc.ca/about-the-srpc>

Society of Rural Physicians of Canada. (2021). Rural Residency Catalogue. [https://www.srpc.ca/resources/Documents/Student%20page/Rural%20Residency%20Catalogue%202021\\_Final.pdf](https://www.srpc.ca/resources/Documents/Student%20page/Rural%20Residency%20Catalogue%202021_Final.pdf)

Statistics Canada. (2018). Table 32-10-0012-01 Number of persons in the total population and the farm population, for rural areas and population centres classified by sex and age. DOI: <https://doi.org/10.25318/3210001201-eng>

Truchet, S., N. Mauhe, and M. Herve. (2018). Veterinarian shortage areas: what determines the location of new graduates? *Rev. Ag. Food Environ.* 98:255-282.

University of Calgary. (2021). Doctor of Veterinary Medicine. <https://www.ucalgary.ca/pubs/calendar/current/vm-4-1.html>

Wasson, E. and A. Wieman. (2018). Mental health during environmental crisis and mass incident disasters. *Veterinary Clinic North American Food Animal Practice.* 34:375-388.