



## Research Paper

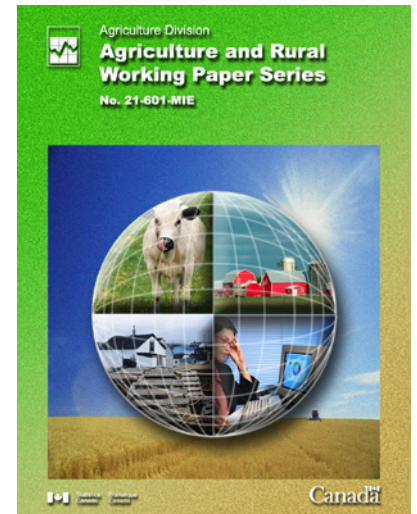
# A Geographic Profile of Canadian Livestock, 1991-2001

by Martin S. Beaulieu and Frédéric Bédard

Agriculture Division  
Jean Talon Building, 12th floor, Ottawa, K1A 0T6

Telephone: 1 800-465-1991

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## **A Geographic Profile of Canadian Livestock, 1991-2001**

**Prepared by**  
**Martin S. Beaulieu, MSc, Analyst**  
Analysis and Development Section

**Frédéric Bédard, MSc, Geomatics Specialist**  
Spatial Analysis and Geomatics Application

**Statistics Canada, Agriculture Division**  
**Jean Talon Building, 12th floor**  
**Tunney's Pasture**  
**Ottawa, Ontario K1A 0T6**

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**The responsibility of the analysis and interpretation of the results is that of the authors and not of Statistics Canada.**



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***Note of appreciation:*** Canada owes the success of its statistical system to a longstanding partnership between Statistics Canada and the citizens, businesses and governments of Canada. Accurate and timely statistical information could not be produced without their continued co-operation and good will.

## Highlights

The 2001 Census of Agriculture showed that the number of livestock farms continued to decline despite record cattle and hog inventories. Fewer farms combined with unprecedented inventories resulted in substantial growth in the average size of livestock farms.

Using geographical information systems (GIS), this study provides a ‘snapshot’ of where livestock and poultry were at the time of both the 1991 and 2001 Censuses of Agriculture. It analyzes livestock concentrations, or densities, in terms of the total livestock population, regardless of the different types of animals raised.

The report shows the following:

- As of May 15, 2001, 16.3% of Canada’s livestock was located in high-density areas, that is, regions with a concentration of more than 70 “animal units” for every square kilometre of farmland. There was more livestock in such high-density areas than a decade ago.
- Quebec, Alberta and Ontario had the highest numbers of livestock in high-density areas, a total of 1.9 million animal units among the three.
- Just over 38% of the livestock in Quebec was located in a high-density area, 32.2% of the livestock in British Columbia and 24.2% of the livestock in Ontario.
- The most prevalent type of livestock in high-density areas varied by province: beef cattle in Alberta; dairy cattle and hogs in Quebec; and dairy cattle in Ontario.
- The percentage of cattle, both beef and dairy, as well as hogs, in high-density areas has increased during the past decade.
- In 2001, seven regions in Canada stood out as areas with large numbers and high concentrations of livestock: Lethbridge County in Alberta; the counties of Huron, Perth, Wellington, Oxford, and the Waterloo Regional Municipality in Ontario; and the Fraser Valley Regional District in British Columbia. Densities have also increased during the past 10 years in all six areas.
- Livestock concentration is not necessarily due solely to larger livestock populations. Some high-density areas appear to be the result of limited numbers of livestock located on a small farmland base.
- Livestock concentrations are declining in some high-density areas. Of the 30 regions in Canada with the highest livestock densities, 18 were in Quebec. Ten of those in Quebec reported declines in livestock densities over the past 10 years.

There is no indication if, or when, the trend toward larger farm size and larger inventories of livestock will stop. Concentrations in any given area are related partially to the capacity of the resource base in that area, both the land and water, to sustain more livestock. Further work is required before any determination can be made as to whether concentrations in certain regions have reached a point at which they could pose an ecological threat.

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## Introduction

Canadian farmers have been raising more cattle, hogs and poultry than ever before during the past five years, despite the biggest decline in the number of farms in 30 years, according to the 2001 Census of Agriculture.

The census counted 246,923 farms in Canada on May 15, 2001, down almost 11% since 1996, the fastest percentage decline between censuses since 1971. Many of the farms that disappeared raised livestock.

At the same time, however, farmers reported record inventories of both cattle and hogs. As a result, the average size of livestock farms grew substantially.

Between 1991 and 2001, the number of cattle on Canadian farms increased 19.9% to a record 15.6 million head, mostly due to an expansion in beef cattle. In 1991, the average cattle farm had 89 head; by 2001, it had 127. Most of the increase was in Alberta, where the census counted nearly 1.9 million more cattle in 2001 than in 1991.

Canada also had more pigs than ever. The census counted 13.9 million hogs in 2001, up 36.6% from 1991. During this period, larger farms gained prominence as many smaller operations went out of business. About 14,000 farms that were raising pigs in 1991 had disappeared by 2001. In 1991, the average hog farm had 345 animals; by 2001, the average had soared to around 900.

Quebec and Ontario were still first and second in terms of numbers in 2001. Between them, they had more than one-half of all the hogs in Canada.

This study provides a ‘snapshot’ of the geographic distribution of livestock and poultry at the time of the 2001 Census of Agriculture. It compares this snapshot to the situation on Census Day 1991 to determine how concentrations have changed during the 1990s. Livestock inventories reported in the Census of Agriculture are expressed in generic “animal units”. This method makes it possible to analyse livestock concentration, or densities, in terms of the total livestock population, regardless of the different types of animals raised on Canadian farms.

## Methods, coverage and limitations

### Animal units

In order to determine livestock density, we used the concept of ‘animal units’ to create equivalence among different types of livestock, regardless of type, age or end use. This concept is often used in regulations, codes of practice and municipal by-laws related to livestock production.<sup>1</sup>

This concept, originally developed in the United States in the 1960s, is based on the number of animals that would produce the 73 kilograms of nitrogen required to fertilize one acre of corn for one year. The number of animals of a given kind—such as broiler chickens or beef steers—in one animal unit is expressed as a coefficient. One beef cow, for example, equals approximately one animal unit, while four sows or 125 broiler chickens will be required for one unit. (See Appendix B for the coefficients used in this study.)

Individual totals were calculated at the enumeration area level for total livestock, cattle (beef and dairy), pigs, poultry and other livestock (such as elk, deer, bison and wild boars). Poultry included birds such as

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<sup>1</sup> For details, see Beaulieu et al. (2001)  
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broilers, pullets and pullet chicks, laying hens and turkeys. Less common poultry (such as geese, ducks) and less common birds (such as ostriches, game birds and emus) were included in the 'other' category.

In the case of turkeys, inventories were reported without distinction of age or type of production. Turkey animal unit coefficients were adjusted at the provincial level to compensate for the predominance of one type of bird, such as broilers versus heavy-weight broilers.

### **Livestock density on farmland area**

Livestock density refers to the number of animal units per km<sup>2</sup> (100 hectares) of farmland. Farmland includes all cropland, summerfallow, and improved and unimproved pasture. Appendix C presents a map showing the proportion of farmland to total land.

To calculate the livestock density within each Census Consolidated Subdivision (CCS) in the Prairie provinces or each Census Division (CD) in the other provinces, the number of animal units was divided by the total farmland area in each CD or CCS.

### **Density classes**

Regions were typed into one of 10 classes of livestock densities based on the statistical distribution of the number of animals reported. The lowest density class was defined as less than 25 animal units per square kilometre. Densities of between 25 and 70 animal units per square kilometre were classified as medium density. Areas with a livestock density of more than 70 animal units per square kilometre were designated as high density.

### **Livestock operations**

A livestock operation is a census farm (see definition in Appendix A) that produces at least one of the following products intended for sale: cattle, pigs, sheep, horses, alternative livestock, hens, chickens, turkeys, less common birds, milk or cream, eggs, wool, furs and meat.

### **Geographical information systems (GIS) methods**

**Centroids:** In order to build a map, data had to be transformed into a layer of geographic points, expressed in terms of longitude and latitude (X, Y) co-ordinates. This raised two issues. First, the geographical references collected or assigned to census farms were the addresses of the headquarters, mapping using these co-ordinates would raise the issue of confidentiality. Second, the exact location of the field used for pasture or manure disposal or the barn in which the animals were housed did not necessarily match the location of the headquarters.

To deal with these issues, farms were aggregated together inside the boundary of a region. A few key factors influenced the decision to select a specific geographical level: if too small, data would need to be suppressed, aggregated to a higher level or merged with close neighbouring units to protect confidentiality; if too large, the map would lose precision.

Unrepresentative hot spots (high livestock density areas) and cold spots (low livestock density areas) may be induced simply from the substantial differences in the size of individual region.

Artificial hot spots could be produced for farm headquarters located directly beside or near a small town (which would delineate a small enumeration area). Conversely, artificial cold spots could be created by the diluting effect on intensive livestock operations of being located in a large region.

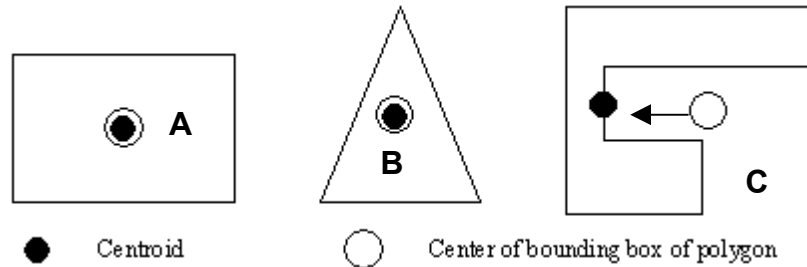
In this study, the Census Consolidated Subdivision (CCS see definition in Appendix A) was chosen as the geographical scale in the Prairie provinces. Census Division (CD) unit was chosen for the other provinces. CCS was chosen in the Prairie provinces to avoid losing too much precision due to the larger-size of CDs in these provinces.



### **Conversion on 1991 data to 2001 boundaries:**

The definition of the CDs/CCSs boundaries may have changed between the 1991 and 2001 Censuses. To rebase 1991 data into the 2001 geography, the first step was to establish longitude and latitude (X, Y) co-ordinates for each 1991 enumeration area's centroid (centre). Centroids were then associated to the 2001 CD/CCS polygon or region.

The centroid is always located inside the polygon and is usually the centre point of a polygon's bounding box (see examples A and B). However, for irregular shapes where the point falls outside the polygon, it is moved in the shortest horizontal direction required to put it inside the polygon (example C).



Source: Beaulieu et al. (2001).

### **Data sources and coverage**

This research uses a data set of Canadian census farms reporting livestock on the 1991 and 2001 Censuses of Agriculture. Farm operators were asked to report inventories of all livestock, including cattle, pigs, poultry, horses, sheep and lambs, and alternative livestock such as emus, ostriches, elk, deer, bison and wild boars.

In May 2001, 162,268 farmers reported livestock or 65.7% of all census farms. Ten years earlier, there were 185,264 farmers reporting livestock at Census time or 66.2% of all census farms.

### **Limitations**

**Inventory versus flow:** Livestock inventories on May 15, 2001, (June 4 in 1991), as reported by farmers on the Census of Agriculture, do not represent the number of animals that were on the farm during the whole year. No adjustment was made to estimate the average size of the herd, the total livestock production during the year or the number of livestock in confinement (in pens, for example) for the whole year or part of the year.

**Headquarters rule:** In order to build a map, data had to be transformed into a layer of geographic points, expressed in terms of longitude and latitude (X, Y) co-ordinates. Precise geographic co-ordinates are not reported on the Census. The geographical references collected or assigned to census farms were the addresses of the headquarters, mapping using these co-ordinates would raise the issue of confidentiality. The exact location of the field used for pasture or manure disposal or the barn in which the animals were housed does not necessarily match the location of the headquarters. The location of livestock may not be as accurately located as they would have been if geographic co-ordinates had been reported on the Census questionnaire.

**Census errors:** Data originating from a project as large and complex as the Census of Agriculture are subject to error despite extensive efforts deployed at census time to correct detected undercoverage, misreporting and data capture errors. The most common types of errors were related to coverage, missing responses, response errors, and processing errors that were not identified by subsequent checks. However, the Census of Agriculture had a high response rate estimated at over 96% and the data were of very good quality.

## Findings

### Livestock population

On May 15, 2001, there were 13.9 million animal units in Canada (Table 1). In terms of animal units, beef cattle dominated the livestock sector, accounting for almost two-thirds (63.3%) of the total, compared with 58.1% in 1991. Meanwhile, dairy cattle accounted for only 15.2% in 2001, down from 22.0% a decade earlier. In 2001, hogs accounted for 8.2% of the total, other livestock 7.7% and poultry 5.7%. Years of good prices and the upward trend of the cattle cycle may explain the 5.2% point increase in the share of beef cattle. Meanwhile, the number of dairy cattle and dairy farms has declined while milk production has continued to climb, the result of productivity gains and genetic improvements in the dairy herd.

**Table 1: Distribution of livestock, by province and type of animals, 1991 and 2001**

	Animal units (a.u.) in May 1991						Animal units (a.u.) in June 2001					
	Type of animal						Type of animal					
	Beef	Dairy	Hog	Poultry	Other	Total	Beef	Dairy	Hog	Poultry	Other	Total
<b>Canada</b>	6,928	2,624	1,068	623	676	11,920	8,831	2,126	1,139	790	1,068	13,954
<b>Atl.Prov.</b>	129	150	34	47	24	384	117	123	31	55	25	352
<b>Que.</b>	325	989	301	143	63	1,822	375	779	332	175	91	1,752
<b>Ont.</b>	926	922	307	230	157	2,541	903	767	294	282	198	2,443
<b>Man.</b>	658	111	134	48	70	1,021	886	85	221	57	114	1,363
<b>Sask.</b>	1,452	89	85	24	89	1,740	1,856	59	81	30	173	2,200
<b>Alta.</b>	3,035	215	183	59	199	3,691	4,249	171	165	78	363	5,026
<b>B.C.</b>	402	148	24	74	74	721	445	142	14	113	105	819
<b>Distribution of animal units within each province (Percent)</b>												
<b>Canada</b>	58.1	22.0	9.0	5.2	5.7	100	63.3	15.2	8.2	5.7	7.7	100
<b>Atl.Prov.</b>	33.7	39.0	8.9	12.1	6.3	100	33.4	35.0	8.8	15.7	7.1	100
<b>Que.</b>	17.8	54.3	16.5	7.9	3.5	100	21.4	44.4	19.0	10.0	5.2	100
<b>Ont.</b>	36.4	36.3	12.1	9.0	6.2	100	36.9	31.4	12.0	11.6	8.1	100
<b>Man.</b>	64.5	10.9	13.1	4.7	6.8	100	65.0	6.2	16.3	4.1	8.3	100
<b>Sask.</b>	83.5	5.1	4.9	1.4	5.1	100	84.4	2.7	3.7	1.3	7.9	100
<b>Alta.</b>	82.2	5.8	5.0	1.6	5.4	100	84.5	3.4	3.3	1.5	7.2	100
<b>B.C.</b>	55.8	20.5	3.3	10.2	10.3	100	54.3	17.3	1.8	13.8	12.9	100
<b>Distribution of animal units within each animal type (Percent)</b>												
<b>Canada</b>	100	100	100	100	100	100	100	100	100	100	100	100
<b>Atl.Prov.</b>	1.9	5.7	3.2	7.5	3.6	3.2	1.3	5.8	2.7	7.0	2.3	2.5
<b>Que.</b>	4.7	37.7	28.2	23.0	9.3	15.3	4.2	36.6	29.2	22.2	8.5	12.6
<b>Ont.</b>	13.4	35.1	28.7	36.8	23.2	21.3	10.2	36.1	25.8	35.8	18.5	17.5
<b>Man.</b>	9.5	4.2	12.5	7.6	10.3	8.6	10.0	4.0	19.4	7.2	10.6	9.8
<b>Sask.</b>	21.0	3.4	8.0	3.8	13.2	14.6	21.0	2.8	7.1	3.8	16.2	15.8
<b>Alta.</b>	43.8	8.2	17.1	9.5	29.4	31.0	48.1	8.0	14.5	9.8	34.0	36.0
<b>B.C.</b>	5.8	5.6	2.2	11.8	10.9	6.1	5.0	6.7	1.3	14.3	9.9	5.9

**Note:** Due to rounding, figures may not add up to totals.

**Source:** Statistics Canada, derived from the 1991 and 2001 Censuses of Agriculture.

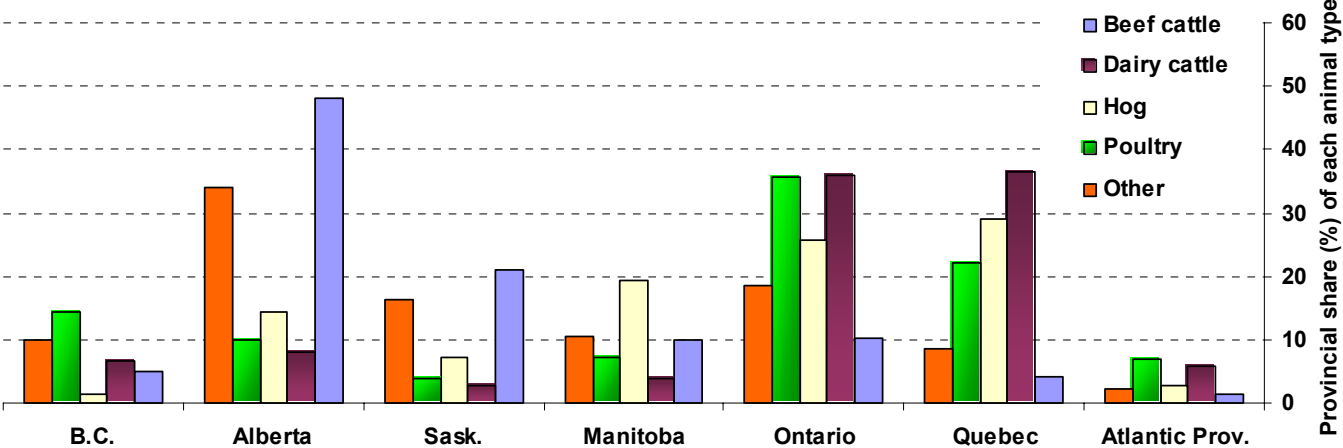
Between 1991 and 2001, hog inventories increased. However, the share of hogs, compared with other types of livestock, has slightly declined. Hogs accounted for 8.2% of all livestock in 2001, down from 9.0% a decade earlier.

Alberta had the greatest share of the national livestock population in 2001 (36.0%), followed by Ontario (17.5%), Saskatchewan (15.8%) and Quebec (12.6%).

Ontario and Quebec shares decreased over the 10-year period, while the shares of the Prairie provinces increased. The dismantling of grain transportation subsidies and decreasing grain prices were factors encouraging Prairie farmers to diversify from growing grain to raising more livestock.

Figure 1 shows that beef cattle were predominant in Alberta (48.1%) and Saskatchewan (21.0%). Dairy cattle were predominant in Quebec (36.6%) and Ontario (36.1%).

**Figure 1: Distribution of livestock, by province and type, May 2001**



**Source:** Statistics Canada, derived from the 2001 Census of Agriculture.

Quebec had 29.2% of all Canada’s hogs in 2001, the largest share, followed by Ontario (25.8%) and Manitoba (19.4%). Manitoba’s share was up from 12.5% in 1991, while Ontario’s share fell from 28.7% a decade ago. The rapid expansion of hog production in Manitoba was fuelled by the establishment of a large processing plant in Brandon and higher transportation costs to ship grain outside the province.

About 36% of the poultry population was located in Ontario, and the second largest in Quebec (22.2%).

Over 60% of the “other” livestock, which includes sheep, horses and alternative livestock, were in the Prairie provinces.

## Livestock density

In 2001, 43.1% of farm animals – 6 million animal units – were located in low-density areas. In these areas, there were less than 25 animal units per square km of farmland. About 41% of the livestock were in medium-density areas (between 25 and 70 animal units per square km). Just over 16% of livestock was located in high-density areas. High-density areas had more than 70 animal units per square km of farmland (Table 2).

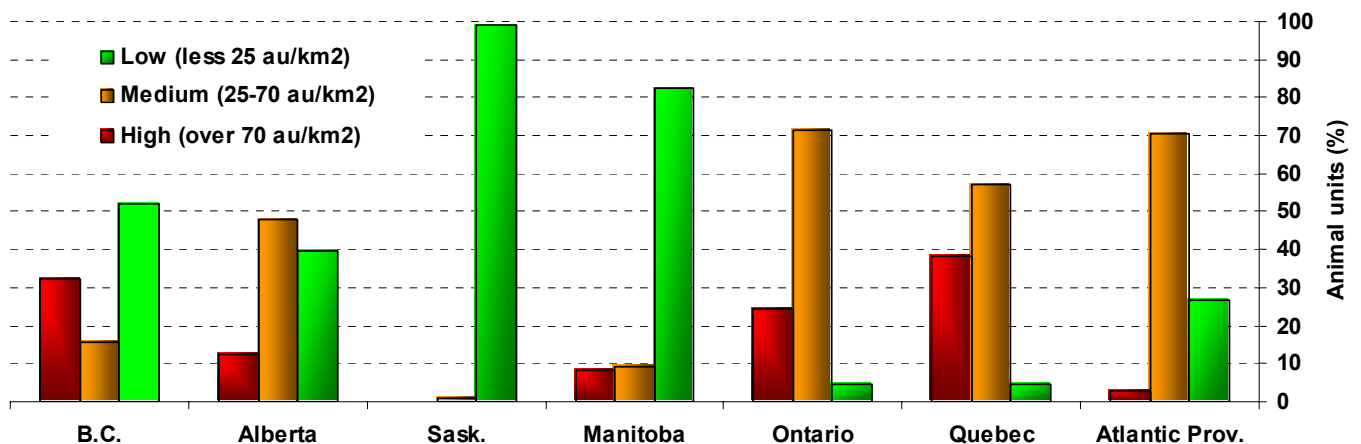
The national share of livestock in high-density areas was up 3.4% from a decade ago. Within each province, the trend was to have more livestock in medium- or high-density areas.

Virtually all livestock in Saskatchewan (99.0%) was in low-density areas. Manitoba also had a high proportion of livestock in low-density areas (82.3%) followed by British Columbia (52.1%). The Prairie provinces have relatively more farmland available to raise livestock and consequently lower animal densities (Figure 2).

The largest shares of livestock in medium-density areas were in Ontario (71.2%), Atlantic provinces (70.7%) and Quebec (57.2%). Shares declined in two provinces during the 1990s: British Columbia's share fell from 29.8% to 15.7%, while Quebec's declined from 64.1% to 57.2%.

About 38% of Quebec livestock populations were in high-density areas in 2001. British Columbia followed with 32.2% and Ontario with 24.2%. In these provinces, high-density areas were predominant where there was either a high population of livestock and/or relatively less farmland available. Between 1991 and 2001, the share of livestock in high-density areas has increased in Alberta (+12.4%), Manitoba (+8.4%) and Quebec (+4.7%).

**Figure 2: Distribution of livestock, by province and density, May 2001**



**Source:** Statistics Canada, derived from the 2001 Census of Agriculture.

**Table 2: Distribution of livestock, by province and livestock density, 1991 and 2001**

	Animal units (a.u.) in May 1991				Animal units (a.u.) in June 2001			
	Livestock density			Total	Livestock density			Total
	Low	Medium	High		Low	Medium	High	
	(thousand a.u.)				(thousand a.u.)			
<b>Canada</b>	5,317	5,071	1,532	11,920	6,008	5,678	2,269	13,954
<b>Atl.Prov.</b>	60	278	45	384	94	249	9	352
<b>Que.</b>	45	1,168	608	1,822	82	1,003	667	1,752
<b>Ont.</b>	111	1,817	614	2,541	111	1,740	592	2,443
<b>Man.</b>	940	81	0	1,021	1,121	127	114	1,363
<b>Sask.</b>	1,739	0	0	1,740	2,177	22	0	2,200
<b>Alta.</b>	2,180	1,511	0	3,691	1,995	2,408	623	5,026
<b>B.C.</b>	241	215	265	721	427	129	263	819
	<b>Distribution of animal units within each province (Percent)</b>							
<b>Canada</b>	44.6	42.5	12.9	100	43.1	40.7	16.3	100
<b>Atl.Prov.</b>	15.7	72.5	11.8	100	26.7	70.7	2.6	100
<b>Que.</b>	2.5	64.1	33.4	100	4.7	57.2	38.1	100
<b>Ont.</b>	4.4	71.5	24.1	100	4.6	71.2	24.2	100
<b>Man.</b>	92.0	8.0	0.0	100	82.3	9.3	8.4	100
<b>Sask.</b>	100.0	0.0	0.0	100	99.0	1.0	0.0	100
<b>Alta.</b>	59.1	40.9	0.0	100	39.7	47.9	12.4	100
<b>B.C.</b>	33.4	29.8	36.8	100	52.1	15.7	32.2	100

**Note:** Due to rounding, figures may not add up to totals.

**Source:** Statistics Canada, derived from the 1991 and 2001 Censuses of Agriculture.

### Livestock type and density

About 36% of beef cattle were in medium-density areas and 9.2% in high-density areas in 2001 (Table 3). Dairy cattle were more likely to be found in medium- and high-density areas with respectively 60.7% and 28.3% of dairy cattle in these areas. In the 1991-2001 period, the share of beef cattle in high-density areas gained 5.8%. The proportion of dairy cattle in high-density areas rose too, up 4.9% from ten years earlier.

Hog populations were almost evenly distributed in the three density classes. In 2001, 36.4% of all hogs were in medium-density areas, while 37.0% were in high-density areas. The share of hogs in high-density areas rose from 33.4% in 1991.

Just over 45% of poultry stocks were in medium-density areas and 41.2% in high-density areas.

**Table 3: Distribution of livestock, by type and livestock density, 1991 and 2001**

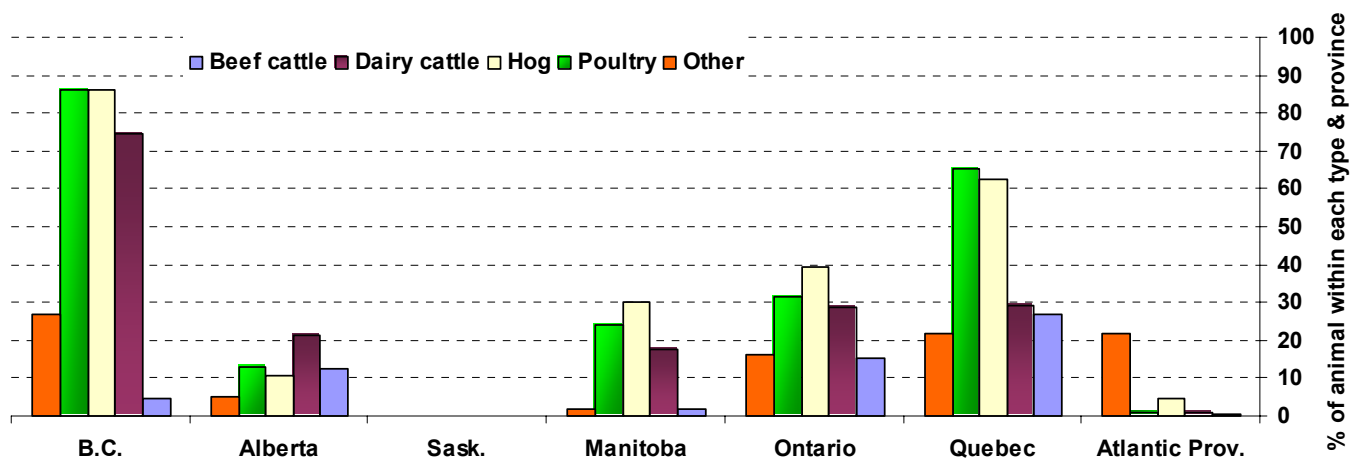
	Animal units (a.u.) in May 1991				Animal units (a.u.) in June 2001			
	Livestock density			Total	Livestock density			Total
	Low	Medium	High		Low	Medium	High	
Livestock density (thousand a.u.)								
<b>All type</b>	5,317	5,071	1,532	11,920	6,008	5,678	2,269	13,954
<b>Beef</b>	4,249	2,441	238	6,928	4,850	3,168	814	8,831
<b>Dairy</b>	327	1,681	616	2,624	232	1,291	602	2,126
<b>Hogs</b>	322	389	357	1,068	303	415	421	1,139
<b>Poultry</b>	105	270	249	623	106	358	325	790
<b>Other</b>	314	290	72	676	517	446	105	1,068
<b>Distribution of animal units within each type (Percent)</b>								
<b>All type</b>	44.6	42.5	12.9	100	43.1	40.7	16.3	100
<b>Beef</b>	61.3	35.2	3.4	100	54.9	35.9	9.2	100
<b>Dairy</b>	12.5	64.1	23.5	100	10.9	60.7	28.3	100
<b>Hogs</b>	30.2	36.4	33.4	100	26.6	36.4	37.0	100
<b>Poultry</b>	16.8	43.3	39.9	100	13.5	45.3	41.2	100
<b>Other</b>	46.5	42.9	10.7	100	48.4	41.8	9.9	100

**Note:** Due to rounding, figures may not add up to totals.

**Source:** Statistics Canada, derived from the 1991 and 2001 Censuses of Agriculture.

Figure 3 shows the distribution of livestock in high-density areas by livestock type and province. In British Columbia, 86.3% of the provincial hog and poultry inventories were concentrated in high-density areas. Almost three-quarters of British Columbia dairy cattle were in high-density areas. Quebec had over 60% of its hog and poultry populations in high-density areas. In Ontario, about one-third of hogs, poultry and dairy cattle were in these areas. Hog or poultry operations are more likely to be found in high-density areas. These farms are more likely to purchase their feed grains, thus requiring a relatively small amount of land to operate.

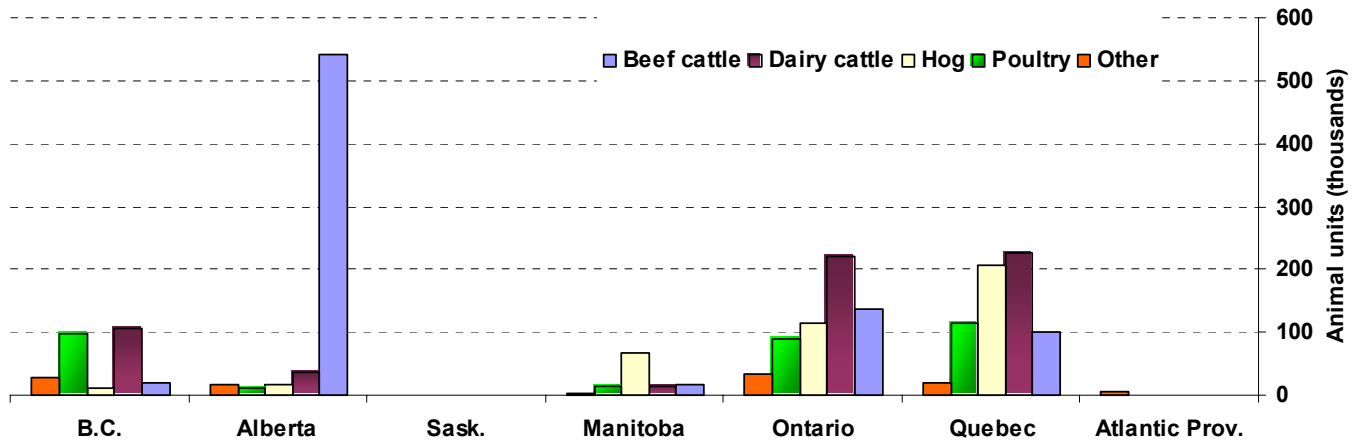
**Figure 3: Proportion of livestock in high-density areas, by livestock type and province, May 2001**



**Source:** Statistics Canada, derived from the 2001 Census of Agriculture.

Figure 4 presents the inventories (in animal units) of different types of livestock found in high-density areas and their distribution within each province. The largest livestock populations found in high-density areas were beef cattle in Alberta, dairy cattle in Quebec and Ontario, followed by hogs in Quebec.

**Figure 4: Numbers of livestock in high-density areas, by livestock type and province, May 2001**



**Source:** Statistics Canada, derived from the 2001 Census of Agriculture.

### Top 30 regions with highest number of animal units in 2001

Table 4 presents the top 30 regions with the largest number of animal units on May 15, 2001. More than half (17 areas) were in Alberta. They accounted for 18.7% of all Canadian livestock. Lethbridge topped the list with 427,000 animal units or 3.1% of all livestock.

Ontario had nine census divisions in this top 30 list. About 9% of the national livestock population, or 1.3 million animal units were in these areas. Huron County had the largest number of animal units followed by the counties of Perth, Wellington, Bruce, and Oxford. These areas also had significant densities of livestock (over 63 animals per square km).

The Fraser Valley Regional District in British Columbia stood out as a region with a large number of animal units (over 177,500 animal units) and the largest concentration of livestock. Livestock density was up 61 animals per square km from 10 years earlier, reaching 365 animals per square km in 2001.

The other areas with large numbers of animal units and significant increases in livestock density were: Lethbridge (+82 animals per square km) and Ponoca County (+25 animals per square km) in Alberta. Livestock density also increased during the decade in Ontario’s counties of Huron (+13 animal units per square km), Perth (+7 animal units per square km) and Oxford (+6 animal units per square km).



**Table 4: Regions with highest number of animal units in 2001**

Rank	Region	Animal in 2001		Farm area		Livestock Density			
		(Animal units)	Share %	(km <sup>2</sup> )	Share %	1991	2001	difference	
	Canada	13,954,500	100	674,800	100				
1	Alberta	Lethbridge County	427,000	3.1	2,980	0.4	62	143	82
2	Ontario	Huron County	204,100	1.5	2,910	0.4	57	70	13
3	Alberta	Newell County No. 4	196,200	1.4	5,900	0.9	20	33	13
4	Alberta	Ponoka County	195,500	1.4	2,700	0.4	47	72	25
5	Alberta	Red Deer County	188,300	1.3	3,980	0.6	34	47	13
6	B.C.	Fraser Valley R.D.	177,500	1.3	490	0.1	304	365	61
7	Ontario	Perth County	177,400	1.3	2,040	0.3	80	87	7
8	Alberta	Foothills No. 31	163,400	1.2	3,730	0.6	24	44	20
9	Ontario	Wellington County	161,000	1.2	1,910	0.3	81	84	3
10	Alberta	Wheatland County	156,900	1.1	4,520	0.7	23	35	11
11	Ontario	Bruce County	155,600	1.1	2,470	0.4	63	63	0
12	Alberta	Willow Creek No. 26	139,800	1.0	4,470	0.7	22	31	9
13	Ontario	Oxford County	139,800	1.0	1,800	0.3	72	78	6
14	Alberta	Mountain View County	137,400	1.0	3,880	0.6	32	35	4
15	Alberta	Rocky View No. 44	126,800	0.9	4,340	0.6	26	29	4
16	Ontario	Grey County	125,900	0.9	2,400	0.4	54	52	-1
17	Alberta	Vermilion River C. No.24	125,800	0.9	5,690	0.8	17	22	5
18	Alberta	Lacombe County	125,700	0.9	2,780	0.4	38	45	8
19	Alberta	Special Area No. 2	120,700	0.9	8,320	1.2	9	15	5
20	B.C.	Peace River R.D.	115,100	0.8	8,630	1.3	10	13	3
21	Ontario	Waterloo R.M.	113,800	0.8	910	0.1	122	125	2
22	Alberta	Taber	112,800	0.8	4,060	0.6	14	28	13
23	Ontario	Middlesex County	112,600	0.8	2,510	0.4	48	45	-3
24	Alberta	Cypress County	103,000	0.7	10,080	1.5	9	10	2
25	B.C.	Cariboo Regional District	99,700	0.7	4,000	0.6	26	25	-1
26	Alberta	Stettler County No. 6	99,400	0.7	3,890	0.6	20	26	6
27	Alberta	Wetaskiwin County No. 10	99,300	0.7	2,780	0.4	35	36	1
28	Alberta	Clearwater County	96,200	0.7	3,230	0.5	33	30	-3
29	B.C.	Thompson-Nicola R.D.	92,800	0.7	3,810	0.6	21	24	3
30	Ontario	Stormont, Dundas and Glengarry United Counties	92,000	0.7	2,010	0.3	55	46	-9

**Note:** Due to rounding, figures may not add up to totals.

**Source:** Statistics Canada, derived from the 1991 and 2001 Censuses of Agriculture.

### Top 30 regions with highest livestock densities in 2001

Table 5 summarizes the top 30 regions identified as having the highest concentration of livestock on May 15, 2001. About 2.3 million animal units, or 16.2% of all Canadian livestock, were in these 30 regions (Table 5).

Quebec had 667,600 animal units in 18 census divisions. Livestock densities have declined in 10 areas since 1991. Between 1991 and 2001, densities increased in Francheville, Brome-Missisquoi, Robert-Cliche, Drummond and Acton's census divisions. These areas had more than 28,000 animal units.

Ontario had 592,000 animal units in four census divisions (Perth, Oxford, Wellington counties and the Waterloo Regional Municipality). During the 1990s, livestock concentrations increased in all these areas.

The three regional districts in British Columbia – Fraser Valley, Greater Vancouver and Cowichan Valley – were in the top 10 list with highest livestock densities. These three areas accounted for 263,400 animal units or 1.9% of all livestock inventories in May 2001. Densities have significantly increased in these areas during the 1990s.

In 2001, Lethbridge, which topped the previous list with the highest number of animal units, was in the fifth position in terms of density with 143 animal units per square km.

**Table 5: Regions with highest livestock density in 2001**

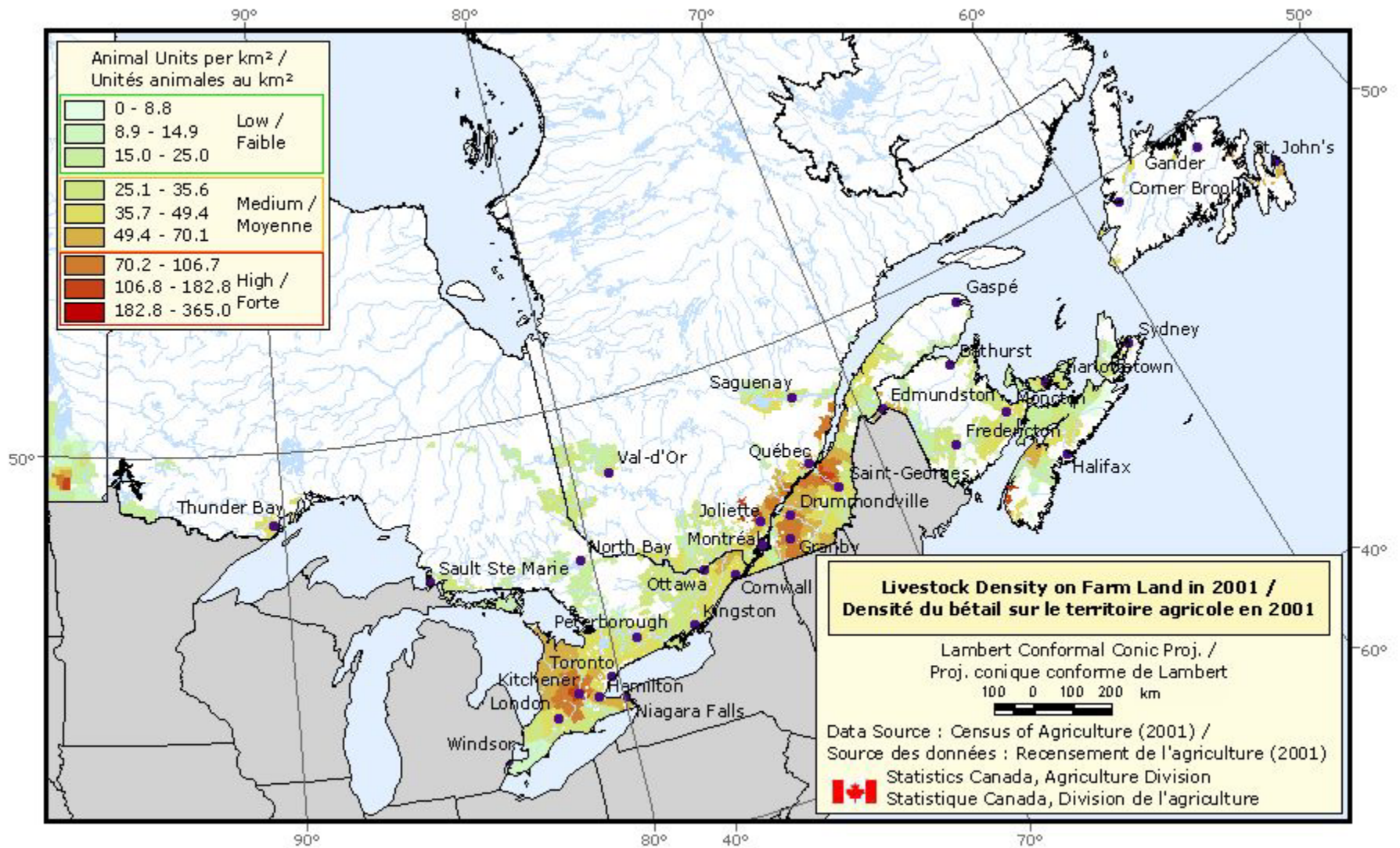
Rank	Region	Animal in 2001		Farm area		Livestock Density			
		(Animal units)	Share %	(km <sup>2</sup> )	Share %	1991	2001	difference	
Canada		13,954,500	100	674,800	100				
1	B.C.	Fraser Valley R.D.	177,500	1.3	490	0.1	304	365	61
2	B.C.	Greater Vancouver R.D.	71,500	0.5	390	0.1	179	183	4
3	Quebec	La Nouvelle-Beauce	80,800	0.6	510	0.1	162	157	-5
4	N.S.	Digby County	7,300	0.1	50	0.0	77	145	68
5	Alberta	Lethbridge County	427,000	3.1	2,980	0.4	62	143	82
6	Manitoba	La Broquerie	38,300	0.3	300	0.0	39	129	90
7	Quebec	Matawinie	19,500	0.1	150	0.0	135	126	-9
8	Ontario	Waterloo R.M.	113,800	0.8	910	0.1	122	125	2
9	Quebec	Desjardins	14,200	0.1	120	0.0	97	118	22
10	B.C.	Cowichan Valley R.D.	14,400	0.1	130	0.0	84	107	22
11	Manitoba	Hanover	76,100	0.5	720	0.1	62	106	44
12	Quebec	La Haute-Yamaska	34,600	0.2	370	0.1	95	94	-1
13	Quebec	Acton	35,200	0.3	380	0.1	90	92	3
14	Quebec	Rouville	32,900	0.2	360	0.1	91	91	0
15	Quebec	La Jacques-Cartier	3,900	0.0	40	0.0	125	88	-37
16	Ontario	Perth County	177,400	1.3	2,040	0.3	80	87	7
17	Quebec	Bellechasse	64,800	0.5	750	0.1	98	87	-11
18	Quebec	Iles-de-la-Madeleine	500	0.0	10	0.0	155	86	-69
19	Ontario	Wellington County	161,000	1.2	1,910	0.3	81	84	3
20	Quebec	Lotbiniere	63,200	0.5	800	0.1	80	79	-1
21	Quebec	Drummond	66,900	0.5	850	0.1	72	79	7
22	Quebec	Maskinonge	31,400	0.2	400	0.1	79	78	-1
23	Ontario	Oxford County	139,800	1.0	1,800	0.3	72	78	6
24	Quebec	Les Maskoutains	87,700	0.6	1,130	0.2	82	77	-4
25	Quebec	Charlevoix-Est	7,400	0.1	100	0.0	60	77	17
26	Quebec	Brome-Missisquoi	55,500	0.4	720	0.1	63	77	14
27	Quebec	Robert-Cliche	28,500	0.2	370	0.1	66	77	11
28	Quebec	Francheville	32,200	0.2	420	0.1	62	76	14
29	Quebec	Charlevoix	8,400	0.1	110	0.0	76	73	-2
30	Alberta	Ponoka County	195,500	1.4	2,700	0.4	47	72	25

**Note:** Due to rounding, figures may not add up to totals.

**Source:** Statistics Canada, derived from the 1991 and 2001 Censuses of Agriculture.

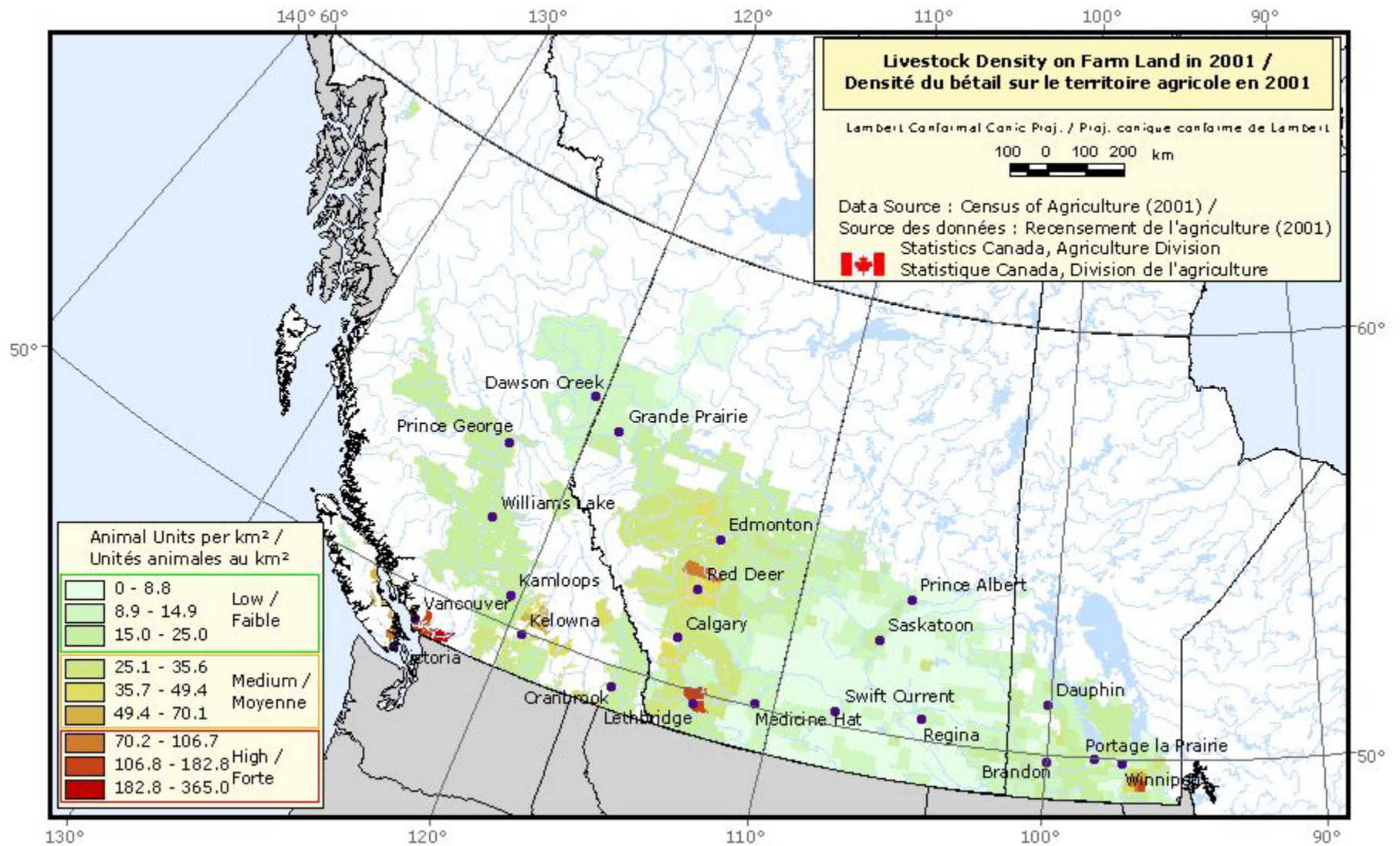
The following maps show livestock densities in May 2001. Maps showing changes in livestock densities between the 1991 and 2001 Censuses are presented in Appendix C.

**Map 1: Livestock density, Eastern Canada, May 2001**





Map 2: Livestock density, Western Canada, May 2001



## Conclusion

The 2001 Census of Agriculture showed that farm numbers continued to decline, continuing a downward trend that started in the 1940s. However, this long-term trend alone does not portray fully the dynamic nature of the agriculture sector.

Farmers reported record inventories of both cattle and hogs as of May 15, 2001. Fewer farms on which these livestock were raised, combined with unprecedented inventories, resulted in substantial growth in the average size of livestock farms.

National and provincial statistics are of limited value in showing livestock densities and changes in the location of the livestock populations. Using geographical information systems (GIS), this study provided a ‘snapshot’ of where livestock and poultry were located at the time of both the 1991 and 2001 Censuses of Agriculture. Furthermore, using the concept of “animal units”, it is possible to produce a complete portrait of all livestock.

In 2001, 16.3% of livestock was located in high-density livestock areas. However, far more livestock was located in high-density areas than a decade earlier. The proportion of livestock in high-density areas has increased in Alberta, Manitoba and Quebec. The shares of cattle (both beef and dairy) and hogs in high-density areas have also increased during the 1990s.

Some areas have both a large number and a high concentration of animal units. In 2001, Lethbridge County in Alberta; the counties of Huron, Perth, Wellington, Oxford, and the Waterloo Regional Municipality in Ontario; and the Fraser Valley Regional District in British Columbia stand out as areas with large numbers and high densities of livestock. In these areas, densities have also increased in the last decade.

Livestock concentration is not necessarily linked to large livestock populations. Some high-density areas appear to be the result of a rather limited amount of livestock associated with an even smaller farmland base. This situation applies to a province such as Quebec. Interestingly, the list of the 30 regions in Canada with the highest livestock densities shows that 18 were in Quebec. Ten of those 18 reported declines in livestock densities during the 1990s.

There is no indication of any halt to the trend towards larger farm size and larger livestock inventories. Concentrations of livestock in a given area are partially related to the capacity of the resource base (particularly on the land and water) in that area to sustain more livestock. Additional research would be required to assess whether livestock concentrations in certain regions pose any environmental risk.

This study did not assess whether large livestock farms contributed the most to the increase in concentration of livestock in some areas. Initial research<sup>2</sup> on livestock density cannot conclude that large livestock farms were solely responsible for high livestock densities in specific rural areas. Further work would be required to link growth in livestock densities with increases in average farm size.

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<sup>2</sup> Beaulieu (2001).  
Catalogue no. 21-601-MIE

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## Appendix A: Definitions

### Census Consolidated Subdivision (CCS)

A Census Consolidated Subdivision is a grouping of Census Subdivisions (see below). Generally the smaller, more urban census subdivisions, such as towns and villages, are combined with the surrounding larger, more rural census subdivisions, in order to create a geographic level between the Census Subdivision and the Census Division.<sup>3</sup>

### Census Division (CD)

Census Division is the general term applied to intermediate geographic areas established by provincial law between the municipality (Census Subdivision) and the provincial levels. Census divisions represent counties, regional districts, regional municipalities and other types of provincially legislated areas.<sup>4</sup>

### Census farm

A census farm is an agricultural operation that produces at least one of the following products intended for sale: crops (field crops, tree fruits or nuts, berries or grapes, vegetables, seed); livestock (cattle, pigs, sheep, horses, alternative livestock, etc.); poultry (hens, chickens, turkeys, less common birds, etc.); animal products (milk or cream, eggs, wool, furs, meat); or other agricultural products (greenhouse or nursery products, Christmas trees, mushrooms, sod, honey, maple syrup products).

The definition of a census farm was expanded in 1996 to include commercial poultry hatcheries and operations that produce only Christmas trees.<sup>5</sup>

### Census of Agriculture

The Census of Agriculture, conducted every five years, produces a snapshot of Canadian agriculture by providing statistics at national, provincial and sub-provincial levels on crop areas, number of livestock, number and value of farm machines, farm operating expenses and receipts, purchase of capital assets, weeks of paid labour, and land management practices.<sup>6</sup> The 2001 Census of Agriculture was conducted on May 15, 2001. The 1991 Census of Agriculture was conducted on June 4, 1991.

### Confidentiality

*The Statistics Act* requires that all census information be kept confidential. No person or institution outside Statistics Canada (including other government departments and agencies, the courts and the RCMP) can access census information provided by individual respondents. For this study, all tabulated data and maps were subject to confidentiality restrictions. A series of computerized checks was performed to suppress data that could result in the disclosure of information concerning a particular agricultural operation or individual. Any area with a 20-kilometre radius that contained very few farms was not displayed separately, but was simply suppressed from the maps.

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3. For details, see Statistics Canada (1999b), pp. 178–180.

3. For details, see Statistics Canada (1999b), pp. 180–182.

5. For details, see Statistics Canada (1997), p. xxxi.

6. For details, see Statistics Canada (1999b), pp. 178–180.

**Enumeration area**

An enumeration area is the geographic area canvassed by one census representative. It is the smallest standard geographic area for which census data are reported. Canada's entire surface area is divided into enumeration areas.<sup>7</sup>

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7. For details, see Statistics Canada (1999b), pp. 210-212.

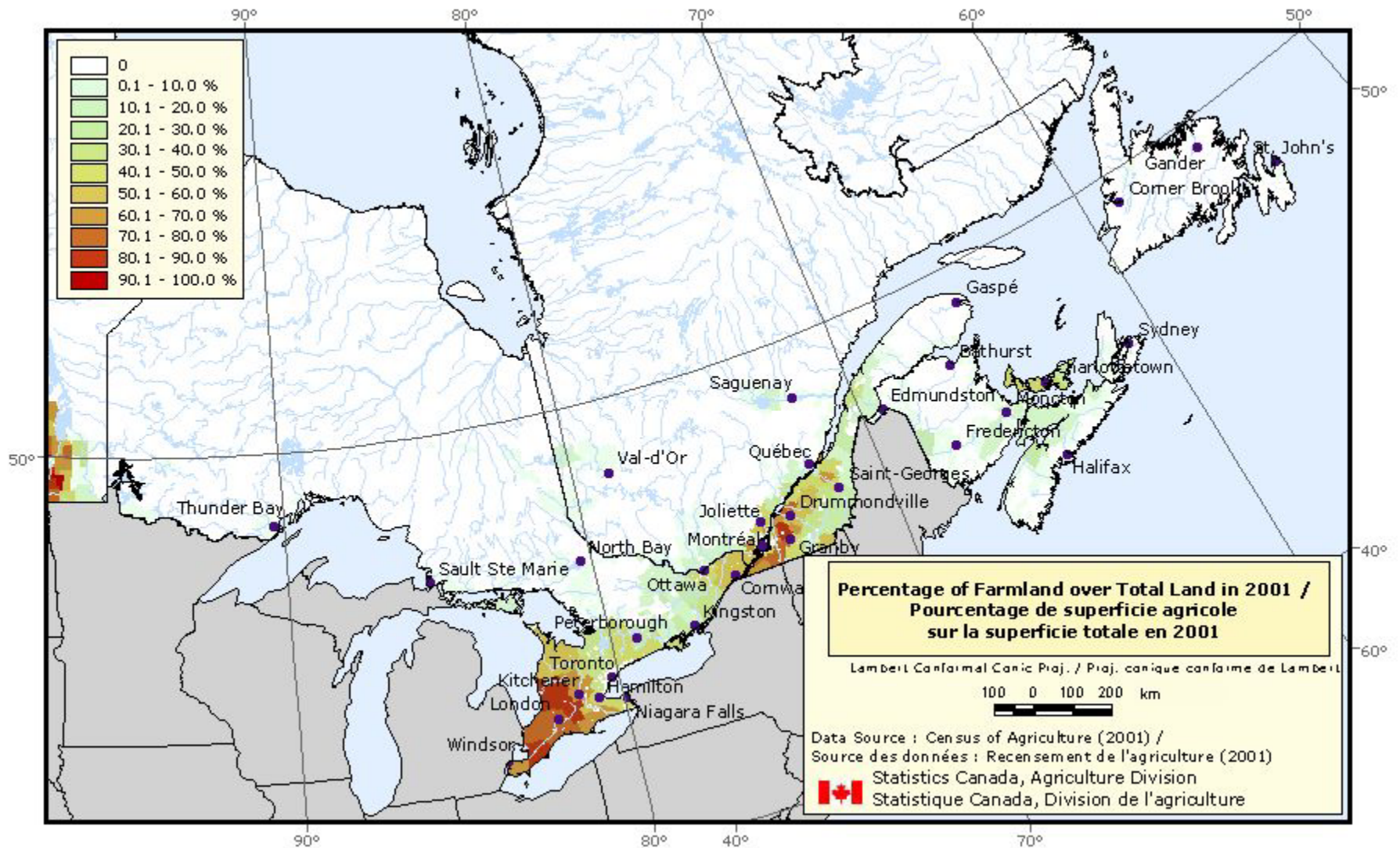


## Appendix B : Animal unit coefficients

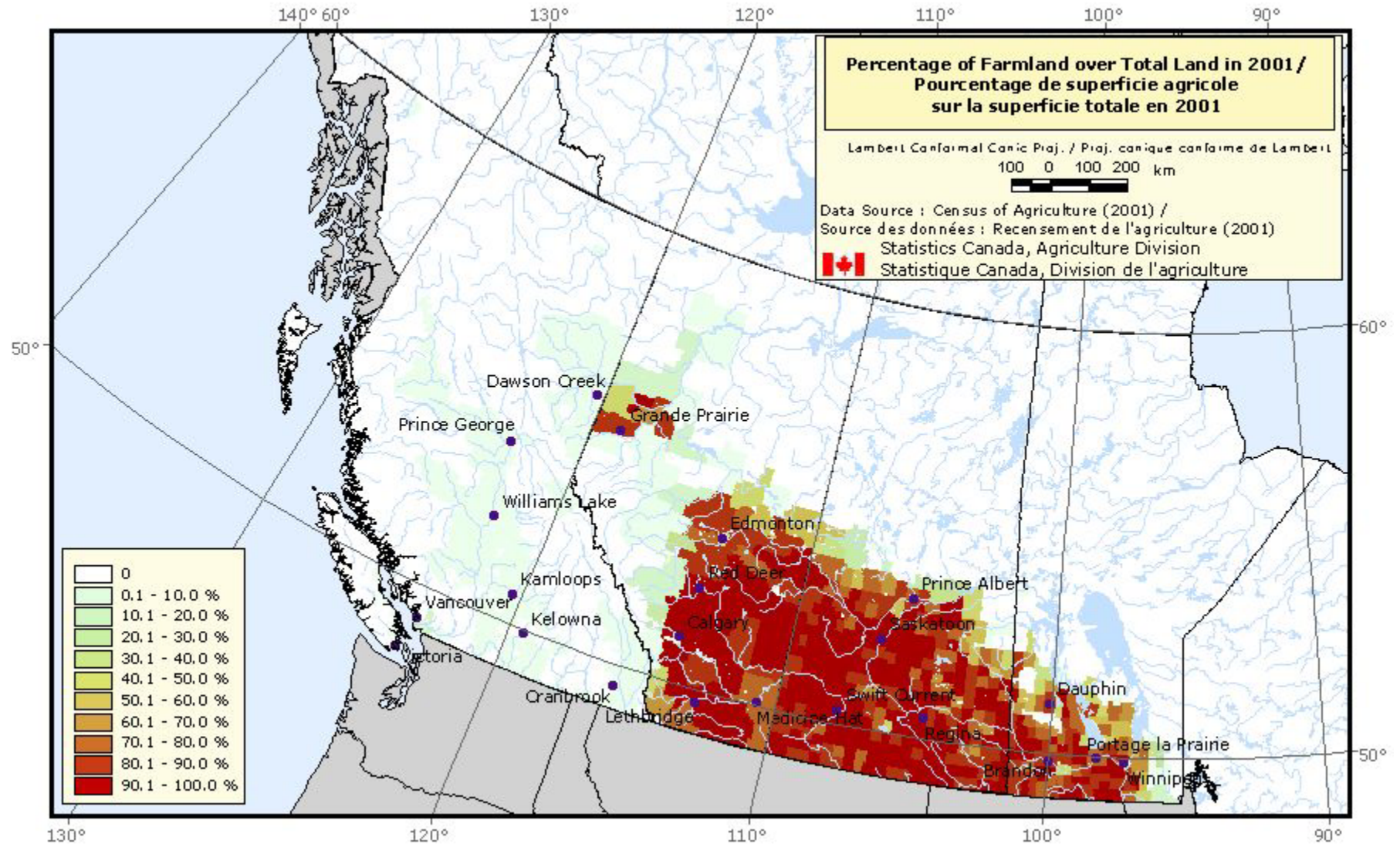
<b>Beef cattle</b>			<b>Dairy cattle</b>		
	variable name	coefficient		variable name	coefficient
	cows	bfcows		mlkcow	1.333
	calves	calfu1		calfu1	0.303
	heifers	bfheif		mlkheif	1.000
	feeder heifers	fdheif		steers	0.833
	steers	steers		bulls	1.333
	bulls	bulls			
<b>Pig</b>			<b>Poultry</b>		
	boars	boars		broilers	broiler
	sows	sows		pulets	pulets
	nursing pigs	nurpig		laying hens	layhen
	growing pigs	grwpig		turkeys	turkey
<b>Other livestock and poultry</b>					
	horses	horses		wild boars	otherpig
	goats	goats		rams	rams
	rabbits	rabbit		ewes & wethers	ewes
	mink	mink		lambs	lambs
	foxes	fox		other sheep	othersh
	bisons	bison		duck	duck
	deers	deer		ostriches	ostrich
	elks	elk		emus	emu
	llamas	lamas		other chicken	otherch
	other cattle	othercat			

**Note:** Animal units are calculated by multiplying number of animals by the specific coefficient for each type of animal.

**Appendix C Map C1: Proportion of farmland over total land, Eastern Canada, May 2001**

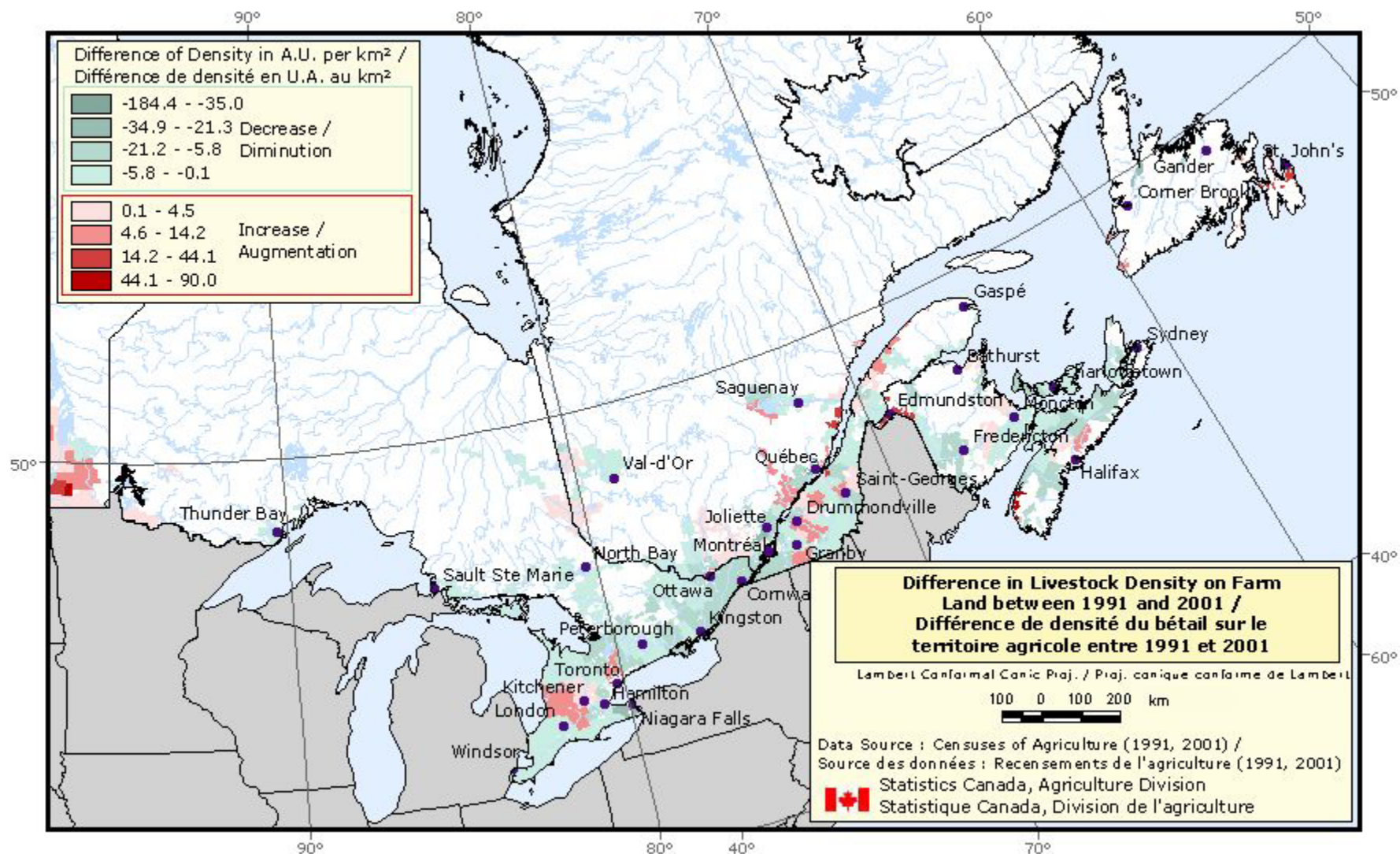


## Appendix C Map C2: Proportion of farmland over total land, Western Canada, May 2001

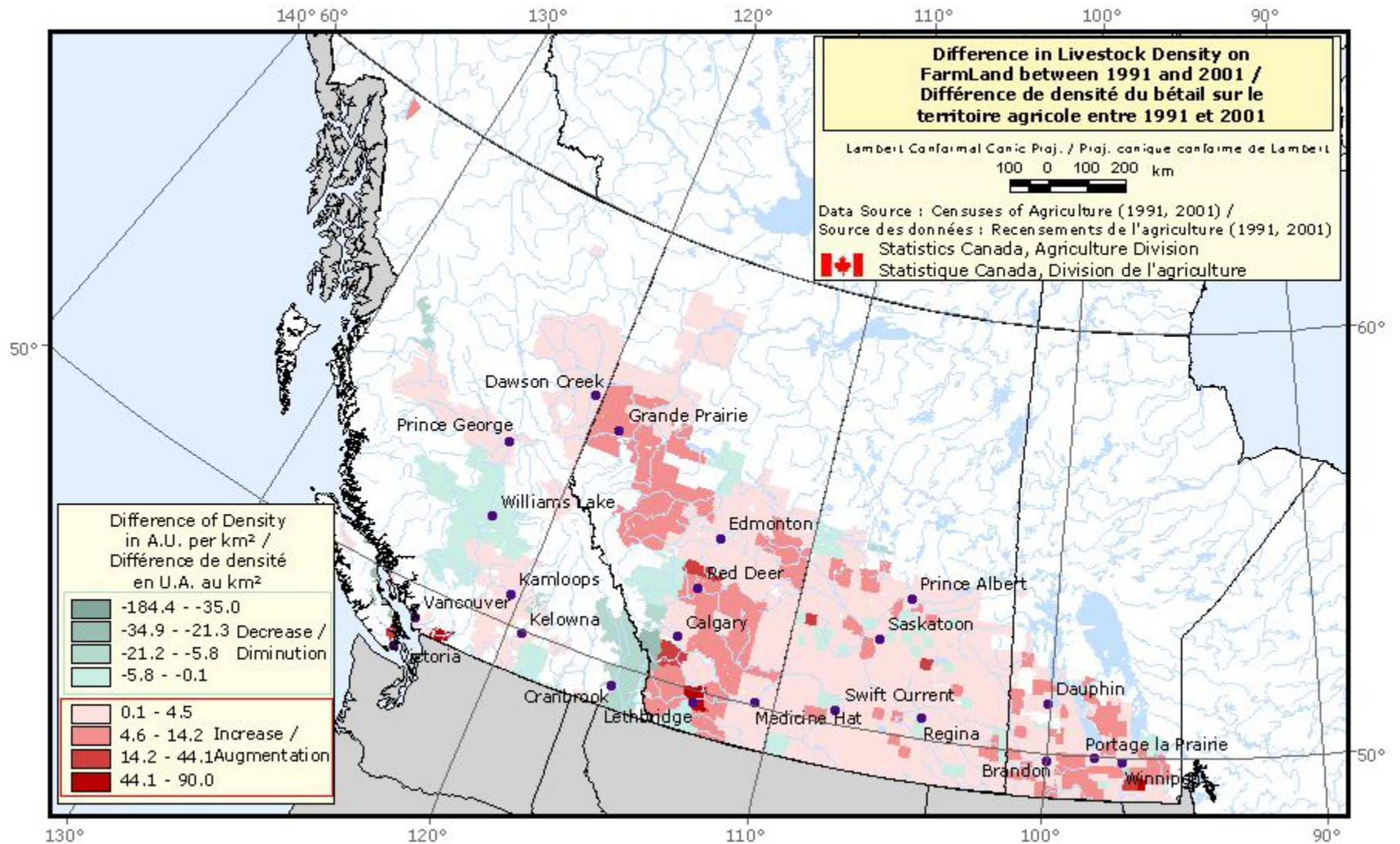




## Appendix C Map C3: Livestock density, Eastern Canada, 1991-2001



## Appendix C Map C4: Livestock density, Western Canada, 1991-2001





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