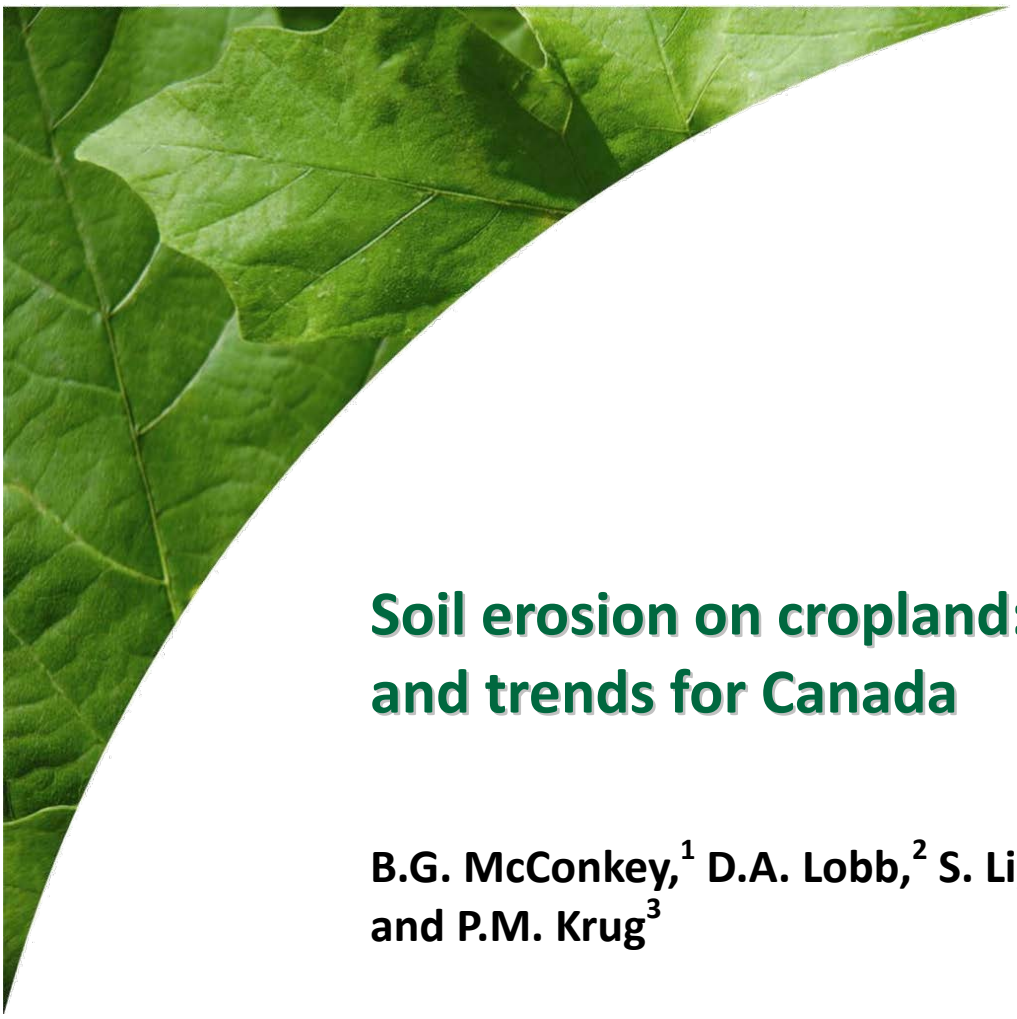

Soil erosion on cropland: introduction and trends for Canada

B.G. McConkey,[1] D.A. Lobb,[2] S. Li,[1] J.M.W. Black[1] and P.M. Krug[3]

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PREFACE

The Canadian Councils of Resource Ministers developed a Biodiversity Outcomes Framework[1] in 2006 to focus conservation and restoration actions under the *Canadian Biodiversity Strategy*.[2] *Canadian Biodiversity: Ecosystem Status and Trends 2010*[3] was a first report under this framework. It assesses progress towards the framework's goal of "Healthy and Diverse Ecosystems" and the two desired conservation outcomes: i) productive, resilient, diverse ecosystems with the capacity to recover and adapt; and ii) damaged ecosystems restored.

The 22 recurring key findings that are presented in *Canadian Biodiversity: Ecosystem Status and Trends 2010* emerged from synthesis and analysis of technical reports prepared as part of this project. Over 500 experts participated in the writing and review of these foundation documents. This report, *Soil erosion on cropland: introduction and trends for Canada*, is one of several reports prepared on the status and trends of national cross-cutting themes. It has been prepared and reviewed by experts in the field of study and reflects the views of its authors.

Acknowledgements

Darrel Cerkowniak contributed several useful analyses and suggestions regarding land and activity data. We would also like to thank the reviewers of this report.

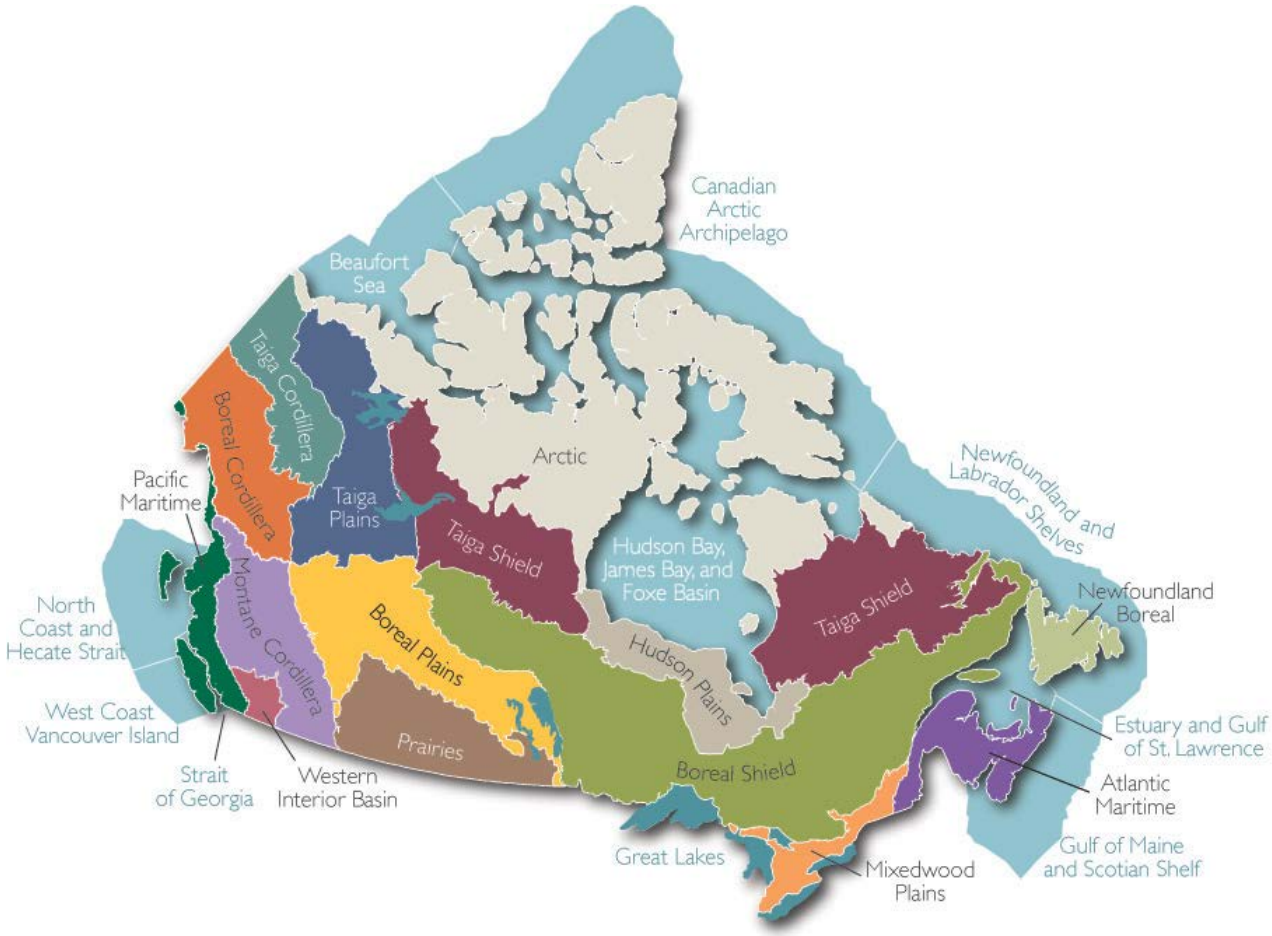
[1] Environment Canada. 2006. Biodiversity outcomes framework for Canada. Canadian Councils of Resource Ministers. Ottawa, ON. 8 p. http://www.biodivcanada.ca/default.asp?lang=En&n=F14D37B9-1

[2] Federal-Provincial-Territorial Biodiversity Working Group. 1995. Canadian biodiversity strategy: Canada's response to the Convention on Biological Diversity. Environment Canada, Biodiversity Convention Office. Ottawa, ON. 86 p. http://www.biodivcanada.ca/default.asp?lang=En&n=560ED58E-1

[3] Federal, Provincial and Territorial Governments of Canada. 2010. Canadian biodiversity: ecosystem status and trends 2010. Canadian Councils of Resource Ministers. Ottawa, ON. vi + 142 p. http://www.biodivcanada.ca/default.asp?lang=En&n=83A35E06-1

Ecological Classification System – Ecozones+

A slightly modified version of the Terrestrial Ecozones of Canada, described in the *National Ecological Framework for Canada*,[4] provided the ecosystem-based units for all reports related to this project. Modifications from the original framework include: adjustments to terrestrial boundaries to reflect improvements from ground-truthing exercises; the combination of three Arctic ecozones into one; the use of two ecoprovinces – Western Interior Basin and Newfoundland Boreal; the addition of nine marine ecosystem-based units; and, the addition of the Great Lakes as a unit. This modified classification system is referred to as "ecozones+" throughout these reports to avoid confusion with the more familiar "ecozones" of the original framework.[5]



[4] Ecological Stratification Working Group. 1995. A national ecological framework for Canada. Agriculture and Agri-Food Canada, Research Branch, Centre for Land and Biological Resources Research and Environment Canada, State of the Environment Directorate, Ecozone Analysis Branch. Ottawa/Hull, ON. 125 p. Report and national map at 1:7 500 000 scale.

[5] Rankin, R., Austin, M. and Rice, J. 2011. Ecological classification system for the ecosystem status and trends report. Canadian Biodiversity: Ecosystem Status and Trends 2010, Technical Thematic Report No. 1. Canadian Councils of Resource Ministers. Ottawa, ON. http://www.biodivcanada.ca/default.asp?lang=En&n=137E1147-1

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AGRI-ENVIRONMENTAL INDICATORS

As part of the National Agri-Environmental Health Analysis and Reporting Program, Agriculture and Agri-Food Canada has developed a suite of science-based agri-environmental indicators. These were first reported in 2000 (for 1981 to 1996), updated in 2005 (for 1981 to 2001), and most recently reported in 2010 (for 1981 to 2006) (Eilers et al., 2010). Three of these indicators are presented by ecozone[+] as part of the Technical Thematic Report Series for *Canadian Biodiversity: Ecosystem Status and Trends 2010*. They are residual soil nitrogen (Drury et al., 2011), wildlife habitat capacity (Javorek and Grant, 2011), and this report on soil erosion on cropland.

All three of these agri-environmental indicators use data from the Canadian Census of Agriculture database. This database categorizes the agricultural landscape into four main cover types: Cropland, Pasture (broken down into Improved and Unimproved Pasture), Summerfallow, and All Other Land (All Other Land includes, for example, barnyards, woodlots, lanes, windbreaks, marshes, and bogs) (Huffman et al., 2006; Statistics Canada, 2008). The soil erosion and residual soil nitrogen Technical Thematic Reports focus on the agricultural land in production and therefore only use the first three cover types in their calculations (Unimproved Pasture is not included in the soil erosion analysis). Javorek and Grant (2011), on the other hand, include the All Other Land cover type when reporting on wildlife habitat capacity on agricultural land. The definition of "Cropland" in the soil erosion report differs from that used by the Canadian Census of Agriculture in that it includes the Census of Agriculture categories of Cropland, Improved Pasture, and Summerfallow when referring to "Cropland". For these reasons, numbers presented for the total amount of agricultural land or Cropland or proportions of different cover types for an ecozone[+] or region may differ slightly between the three agricultural reports prepared as part of the Technical Thematic Report Series for *Canadian Biodiversity: Ecosystem Status and Trends 2010*. Additional discrepancies may exist due to the methodology used to maintain anonymity of the data (see Eilers et al., 2010 for more information).

INTRODUCTION

Soil erosion is the movement of soil. Erosion on cropland occurs naturally through the action of wind and water, which can be accelerated by some farming activities (for example, summer fallow, row cropping). High rates of wind erosion can occur on all landforms whereas the water erosion increases with slope and slope length. Erosion is also caused directly by the farming practice of tillage, which causes the progressive downslope movement of soil, resulting in soil loss from hilltops and soil accumulation at the base of hills. Soil erosion is a major threat to the sustainability of agriculture in Canada. It removes topsoil, reduces soil organic matter, and contributes to the breakdown of soil structure. These effects in turn adversely affect soil fertility, the movement of water into and from the soil surface and ultimately crop yields and profitability. Yields from severely eroded soils may be substantially lower than those from less

eroded soil in the same field. Erosion can also have significant off-farm adverse impacts on the environment through the physical transport and deposition of soil particles and through the nutrients, pesticides, pathogens, and toxins that are released by erosive processes or carried by eroded sediments.

The soil erosion indicator is a risk indicator developed by Agriculture and Agri-Food Canada based on calculated rates of soil loss due to wind, water, and tillage erosion. These values are reported in five classes: very low (less than 6 t/ha/yr), low (6 to 11 t/ha/yr), moderate (11 to 22 t/ha/yr), high (22 to 33 t/ha/yr), and very high (greater than 33 t/ha/yr). Under current conditions areas in the very low risk class are generally considered capable of sustaining long-term crop production and maintaining agri-environmental health. The other four classes represent the risk of unsustainable conditions that call for soil conservation practices to support crop production over the long term and to reduce water quality impacts.

ANALYSIS

Soil erosion was calculated using landform data and the associated topographic data in the National Soil Database (Agriculture and Agri-food Canada, 2008). Each Soil Landscapes of Canada (SLC) polygon is characterized by one or more representative landforms, and each landform is characterized by hillslope segments (upper, mid, and lower slopes and depression), and each hillslope segment is characterized by a slope gradient and slope length. Soil erosion risk by wind, water, and tillage erosion was assessed individually as soil loss on the most severely eroding segment of a landform – the upper slope segment for wind and tillage erosion, the mid slope segment for water erosion. This was done to identify the most erosion affected portion of the field that would control the changes in management needed for the whole field. The final soil erosion indicator is assessed as an average soil loss over the total area of the upper and mid slope segments. The methods are discussed in Eilers et al. (2010).

Wind erosion was only estimated and included in the soil erosion risk for the Prairies and Boreal Plains ecozones[+] (and the small area of Cropland[6] in the Boreal Shield Ecozone[+] that adjoins Cropland in the Boreal Plains Ecozone[+]). The Cropland in these ecozones[+] has the greatest wind erosion risk due to its relatively dry climate and vast expanses of cultivated land with little protection from the wind. The contribution to erosion risk from wind erosion was judged to be insignificant for Cropland for other parts of Canada, although wind erosion may be significant in those parts in occasional years on the most sandy and peaty soils that are well exposed to wind.

Water erosion estimates are based on that from rill and inter-rill erosion from rainfall and do not include gully erosion that occurs in waterways. Although very localized, the erosion from gully erosion can be huge and a larger source of sediment than that from erosion on the

[6] Cropland, as discussed throughout this report, also includes areas defined as Improved Pasture and Summerfallow in the Census of Agriculture.

Cropland contributing runoff. The erosion from snowmelt was not included and assumed to be less than that from rainfall over long term for most areas of Canada.

The change in risk of soil erosion over time was calculated by considering the effects of changes in land use and land management practices across Canada, such as fluctuations in Cropland areas, shifts in cropping systems used (crop rotations, including forages and summer fallow), and tillage systems used (conventional, conservation tillage, and no-till). This information was obtained from the Census of Agriculture for 1981, 1986, 1991, 1996, 2001, and 2006 (Statistics Canada, 1983; Statistics Canada, 1988; Statistics Canada, 1993; Statistics Canada, 1998; Statistics Canada, 2003; Statistics Canada, 2008) and also linked to each SLC mapping area. Cropping and tillage practices in the census database are grouped in classes (for example, grain corn after soybean under conventional tillage, grain corn after soybean under no-till, etc.). The proportion of Cropland falling into each of the risk classes outlined above was calculated for Canada and for each ecozone+. Changes over time in the percent value for each class in each area provides an indication of whether the overall risk of erosion is increasing or decreasing.

Limitations

The erosion risk represents that due to long-term weather. Therefore, an area with very low erosion risk is expected to have very low rates when averaged over time. However, during extreme rainstorm or windstorm events, much higher erosion rates can be experienced.

The erosion risk from landslides is not estimated. Erosion from non-agricultural activities was not considered in this analysis. Although the area is relatively small, erosion from wind and water can be very severe on landscapes undergoing infrastructure construction and cause important off-site damage.

RESULTS

Canada

Due to climate, there are only important areas of Cropland in 8 of the 15 terrestrial ecozones+ in Canada – the Pacific Maritime, Western Interior Basin, Montane Cordillera, Boreal Plains, Prairies, Boreal Shield, Mixedwood Plains, and Atlantic Maritime (Figure 1). There are minor areas of Cropland in the Newfoundland Boreal, Taiga Plains, and Boreal Cordillera. For the latter two ecozones+, Cropland area is so limited that it is not feasible to make meaningful estimates or interpretations of erosion risk so they were excluded from this analysis. Only 6.7% of Canada's land area is Cropland.[7] The Prairies is the only ecozone+ where Cropland is the dominant land use (54% of area). Cropland is also a major land use in the Mixedwood Plains

[7]Cropland, as discussed throughout this report, also includes areas defined as Improved Pasture and Summerfallow in the Census of Agriculture, and thus the statistics reported here may differ from other thematic reports. See the Agri-environmental indicators section on page 1 for more information.

(40%) and Boreal Plains (11%). In all other ecozones[+], Cropland makes up less than 5% of the land area and it amounts to less than 0.5% of total zonal area for the Newfoundland Boreal, Boreal Shield, Montane Cordillera, and Pacific Maritime. Nevertheless, even where Cropland is a minor land use it is usually located adjacent to important population centres and transportation corridors so its potential environmental impact on human population is far greater than its relatively small proportion of total land area. Cropland will often locally occupy the majority of land in particular landscapes, such as well drained relatively level soils in valleys, and be completely absent in other landscapes, such as steep slopes. Therefore, Cropland management will have large local impact on soil erosion in a few particular landscapes within the ecozone[+] while having little or no influence on the state of many other landscapes within the ecozone[+]. The relationship between erosion and biodiversity is complex and not well studied. The degradation and instability caused from erosion is usually considered detrimental to biodiversity.

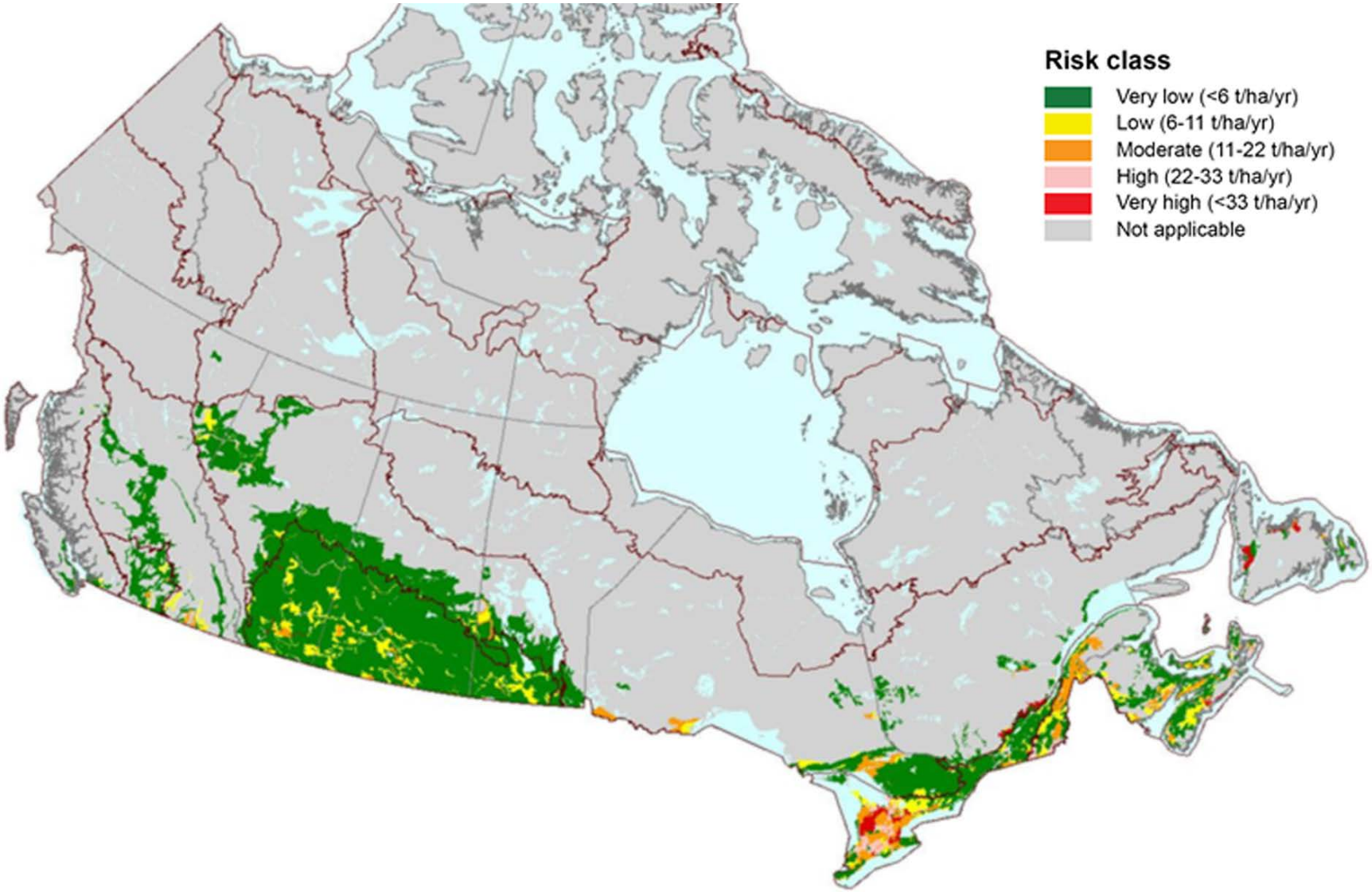

Figure 1. Cropland in Canada by soil erosion risk class, 2006.
All SLC polygons containing >5% Cropland were included in the analysis and are shown here.

Soil erosion continues to be a threat to agricultural sustainability in Canada. Nevertheless, on average, soil loss from the combined effects of wind, water, and tillage decreased in all ecozones[+] between 1981 and 2006 (Figure 2). Over that period the proportion of Cropland in the very low risk class (sustainable) increased from 64 to 80%. The increase in land with very low risk was due to reduction in tillage intensity and conversion of some erodible landscapes from annual crops to perennial forage and tame pasture. The Boreal Plains and Prairies ecozones[+] contain 18 and 67%, respectively, of total Cropland in Canada so the important reductions in wind and tillage erosion risk in these regions dominate the national erosion risk situation. In those regions the practice of summerfallow (leaving the land bare for one entire growing season) has also decreased markedly in the last 25 years and this has effectively reduced erosion risk. In 2006, 10% of Cropland remained in the moderate to very high risk classes, reflecting high levels of water erosion in the Mixedwood Plains and Atlantic Maritime ecozones[+].

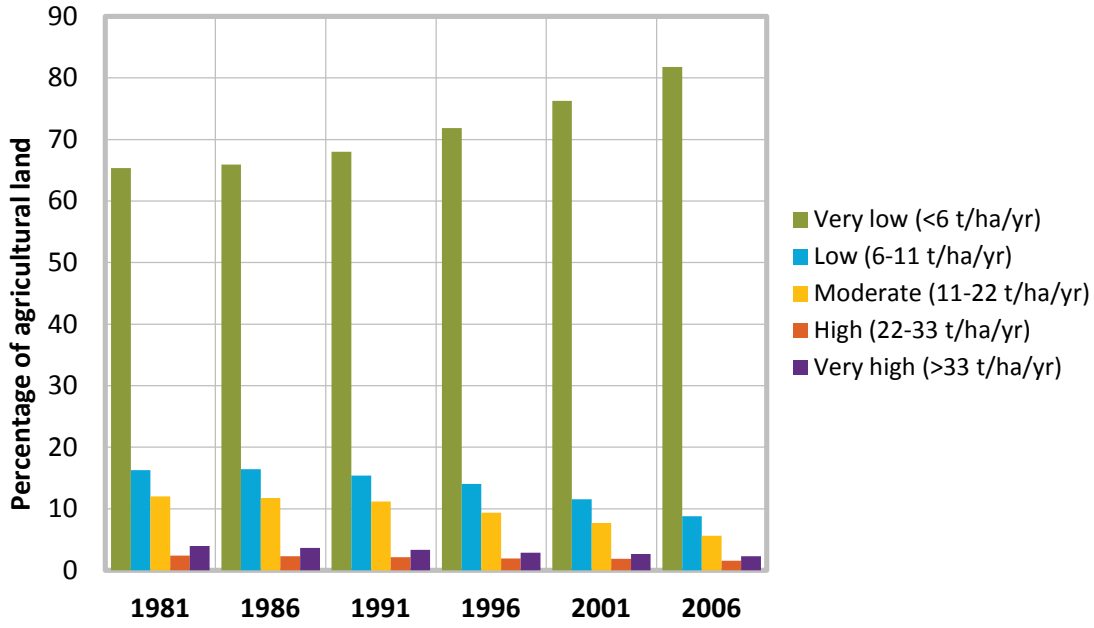

Figure 2. Soil erosion risk for Cropland in Canada, 1981-2006.
Source: data from the National Soil Database and the Census of Agriculture

Ecozones+

Atlantic Maritime Ecozone+

Although Cropland[8] only occupies 4% of the Atlantic Maritime Ecozone+ (Figure 3), it is a locally important land use in many areas such as Prince Edward Island, St. John River Valley, and Annapolis Valley. The Atlantic Maritime Ecozone+ has some of the highest erosion rates in Canada. Tillage is generally intensive and the climate creates a constant threat of water erosion on unprotected soils. Even with conservation practices, potato production on erodible landscapes has high rates of tillage and water erosion. Potato is an important crop in several areas and is often grown on highly erodible landscapes. Fully 36% of the Cropland has unsustainable erosion risk. This is down from 41% in 1981 (Figure 4). In 2006, 18% of the land had moderate to very high erosion risk compared to 20% in 1981.

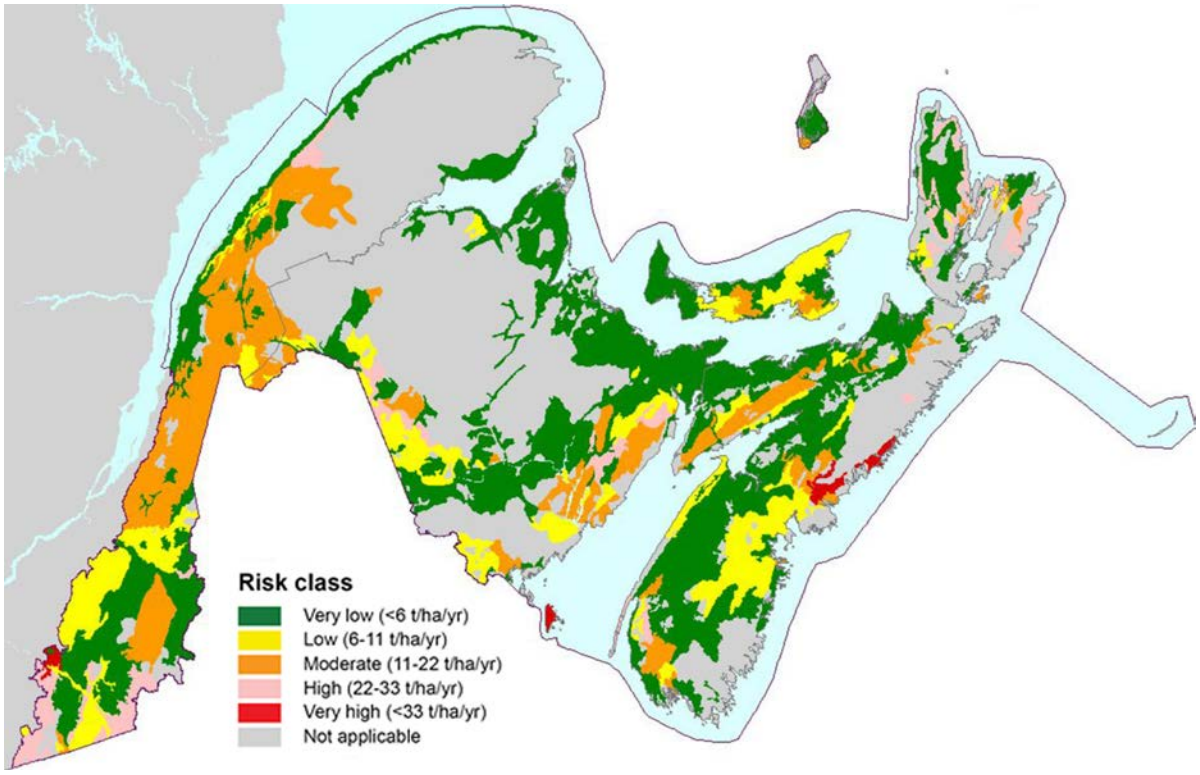

Figure 3. Cropland in the Atlantic Maritime Ecozone+ by soil erosion risk class, 2006.
All SLC polygons containing >5% Cropland were included in the analysis and are shown here.

[8] Cropland, as discussed throughout this report, also includes areas defined as Improved Pasture and Summerfallow in the Census of Agriculture, and thus the statistics reported here may differ from other thematic reports. See the Agri-environmental indicators section on page 1 for more information.

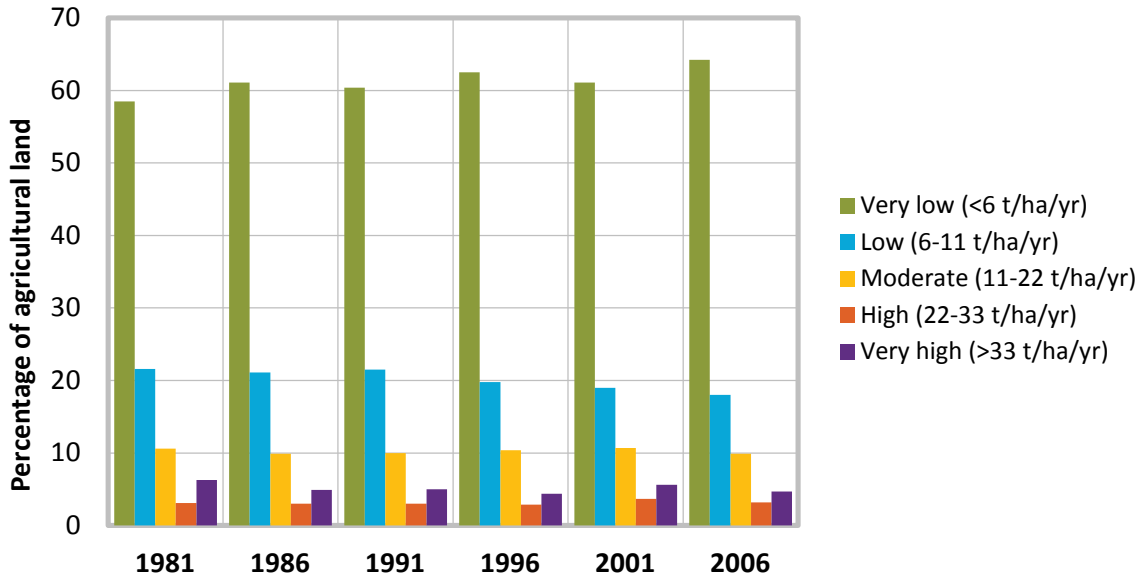

Figure 4. Soil erosion risk on Cropland in the Atlantic Maritime Ecozone+, 1981-2006.
Source: data from the National Soil Database and the Census of Agriculture

Boreal Plains Ecozone+

Much of the southern and western portions of the Boreal Plains have been developed for agriculture (Figure 5). Fully 11% of the ecozone+ is Cropland.[9] In the Boreal Plains, tillage erosion on Cropland located on hummocky landscapes represents the greatest erosion risk. On these same landscapes, both wind and water erosion also contribute to erosion risk. Water erosion on the longer slopes and wind erosion on the sandiest soils represent additional landscapes with important erosion risk. This ecozone+ has had important reduction in erosion risk due to reduction in tillage and summerfallow. The conversion from annual crops to perennial forages and tame pasture on some of the more erodible soil landscapes also helped reduce erosion risk. From 1981 to 2006, the area with very low erosion increased from 83 to 91% of Cropland (Figure 6). At the same time, the amount of land with moderate to very high erosion risk decreased from 7 to 3%.

[9] Cropland, as discussed throughout this report, also includes areas defined as Improved Pasture and Summerfallow in the Census of Agriculture, and thus the statistics reported here may differ from other thematic reports. See the Agri-environmental indicators section on page 1 for more information.

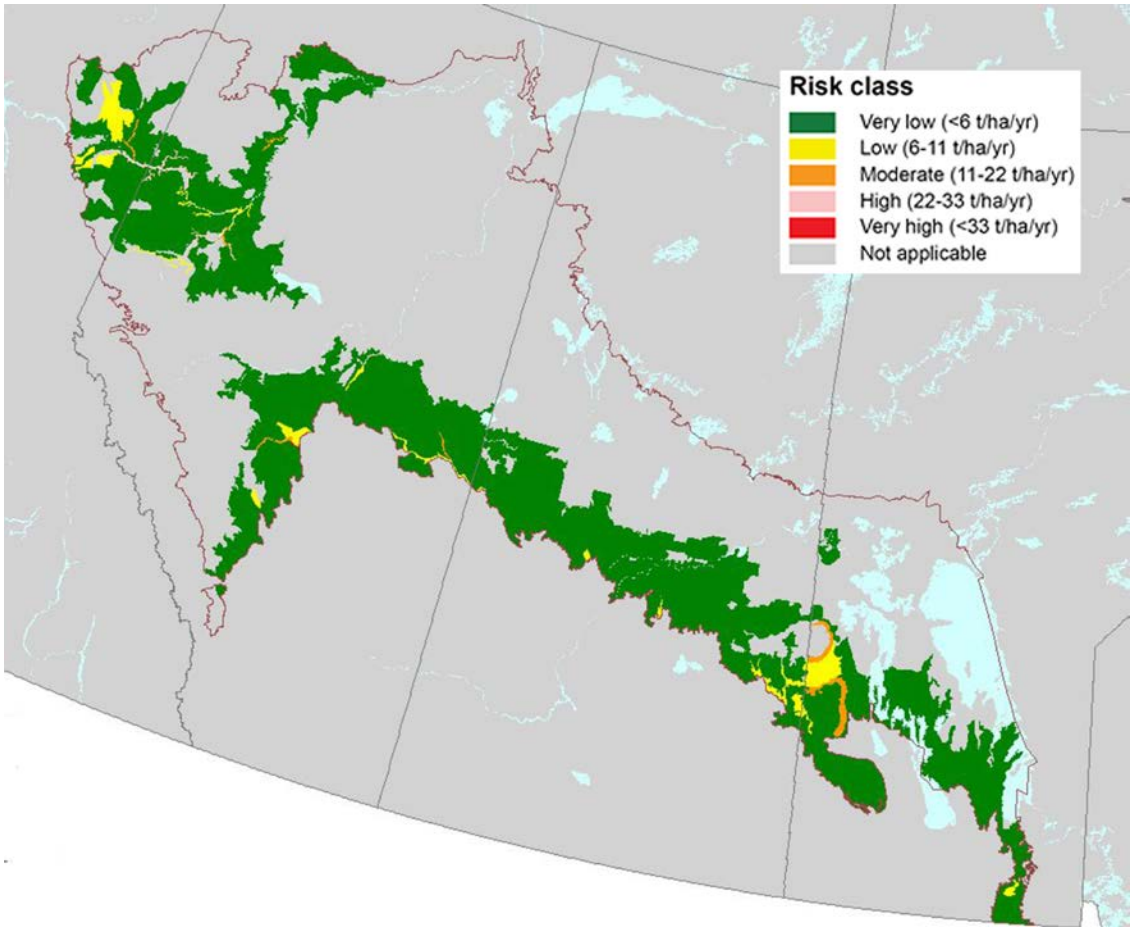

Figure 5. Cropland in the Boreal Plains Ecozone[+] by soil erosion risk class, 2006.
All SLC polygons containing >5% Cropland were included in the analysis and are shown here.

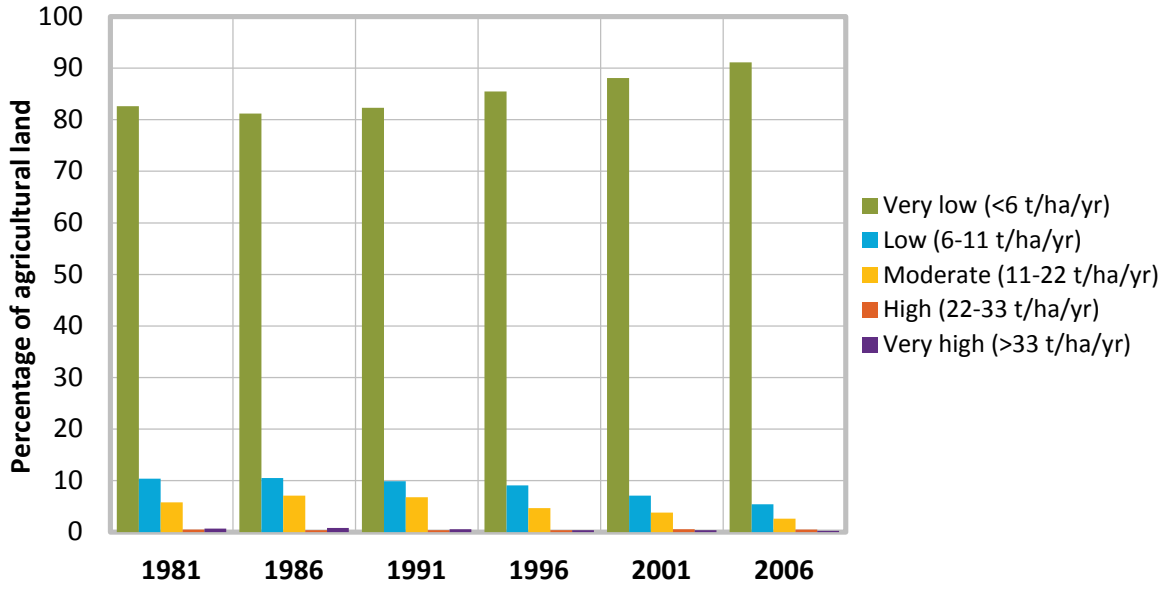

Figure 6. Soil erosion risk on Cropland in the Boreal Plains Ecozone[+], 1981-2006.
Source: data from the National Soil Database and the Census of Agriculture

Boreal Shield Ecozone+

Cropland[10] is a minor land use in the Boreal Shield Ecozone+ amounting to only 0.3% of the land area (Figure 7). The risk of erosion has not changed greatly with time. In 2006, 85% of the Cropland had very low erosion risk and 10% had moderate to very high erosion risk (Figure 8). Tillage erosion on hummocky landscapes represents the major contributor to risk.

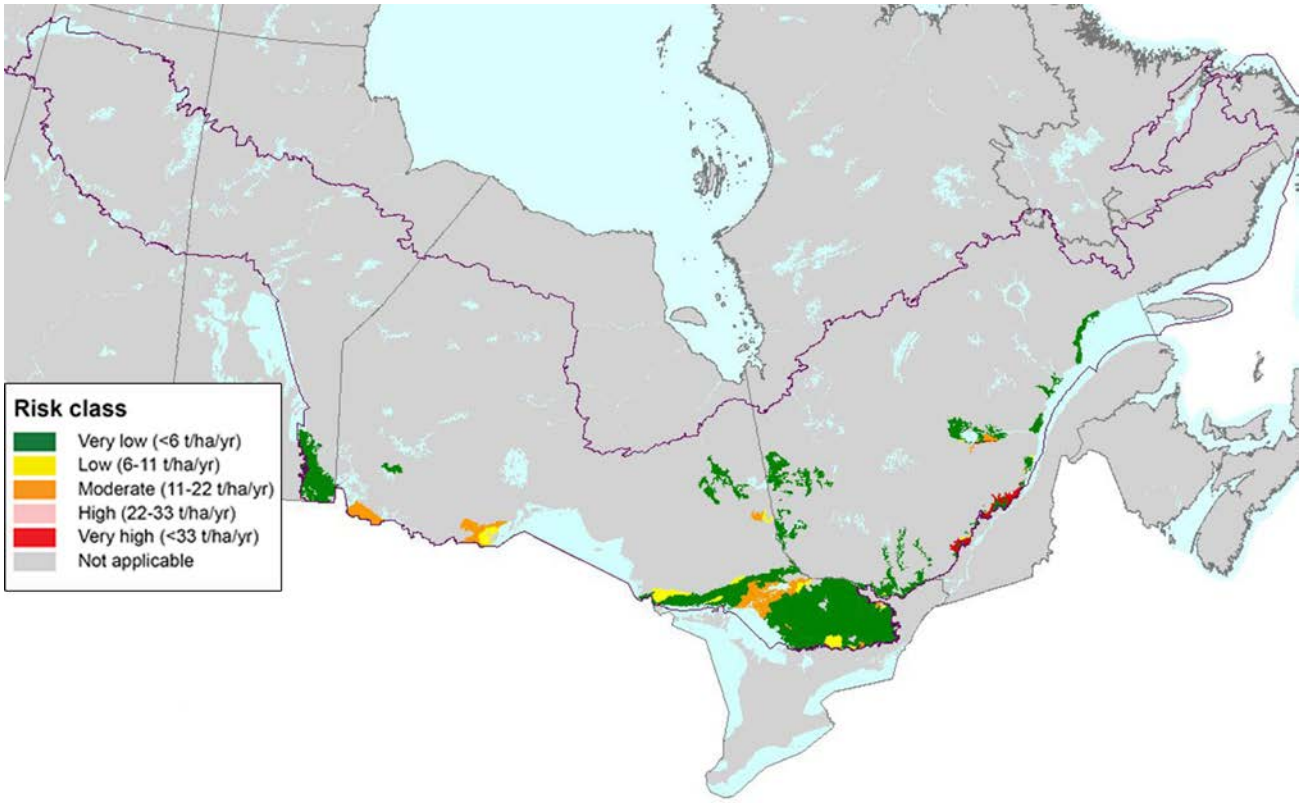

Figure 7. Cropland in the Boreal Shield Ecozone+ by soil erosion risk class, 2006.
All SLC polygons containing >5% Cropland were included in the analysis and are shown here.

[10] Cropland, as discussed throughout this report, also includes areas defined as Improved Pasture and Summerfallow in the Census of Agriculture, and thus the statistics reported here may differ from other thematic reports. See the Agri-environmental indicators section on page 1 for more information.

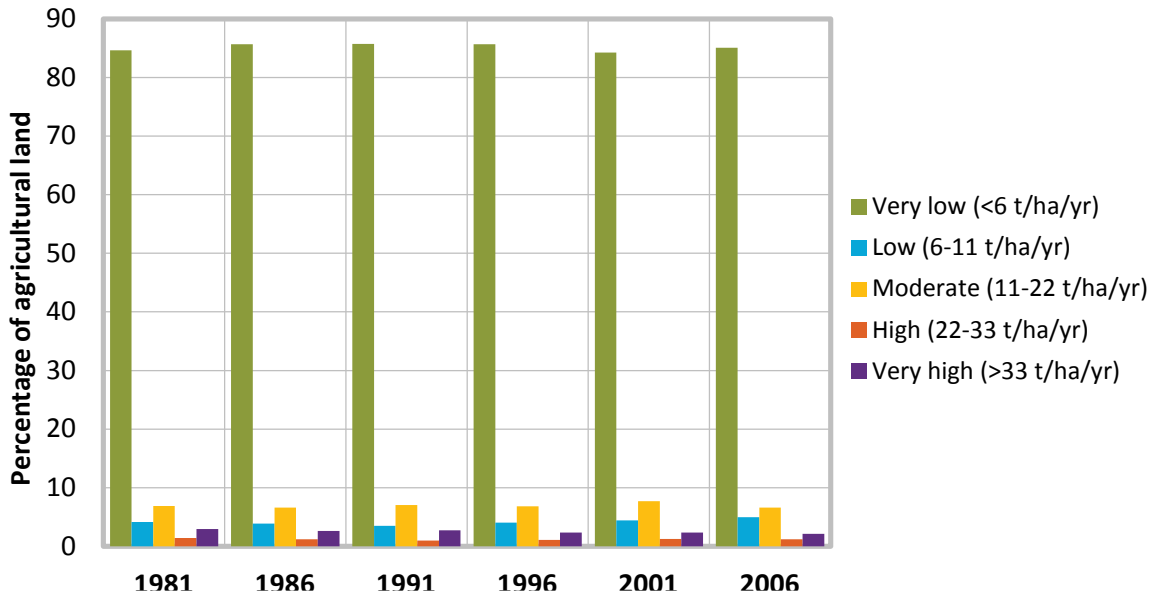

Figure 8. Soil erosion risk on Cropland in the Boreal Shield Ecozone+, 1981-2006. Source: data from the National Soil Database and the Census of Agriculture

Mixedwood Plains Ecozone+

Cropland[11] is a major land use in the Mixedwood Plains accounting for 40% of land area. The 2006 distribution of soil erosion risk classes is shown on Figure 9. Overall this region has the greatest erosion risk in Canada (see Figure 1). Large intense rainstorms occur every year so water erosion is always a concern. Tillage is generally intense. Within the Mixedwood Plains, the St. Lawrence Valley and adjacent lowlands have relatively shallow slopes so that part of the ecozone+ has relatively low erosion risk. However, the western part of the ecozone+ has large areas of Cropland on hummocky landforms with maximum slopes of 10% or more. On these landforms, the risk of both tillage and water erosion is great. Row crops of corn and soybean produced with intensive tillage have relatively high erosion risk and the proportion of these crops has been increasing. Nevertheless, the adoption of reduced tillage practices for conservation purposes has provided significant reductions in erosion risk. The proportion of land in very low risk class increased from 42 to 53% from 1981 to 2006 (Figure 10). That with moderate to very high erosion risk decreased from 44 to 34%.

[11] Cropland, as discussed throughout this report, also includes areas defined as Improved Pasture and Summerfallow in the Census of Agriculture, and thus the statistics reported here may differ from other thematic reports. See the Agri-environmental indicators section on page 1 for more information.

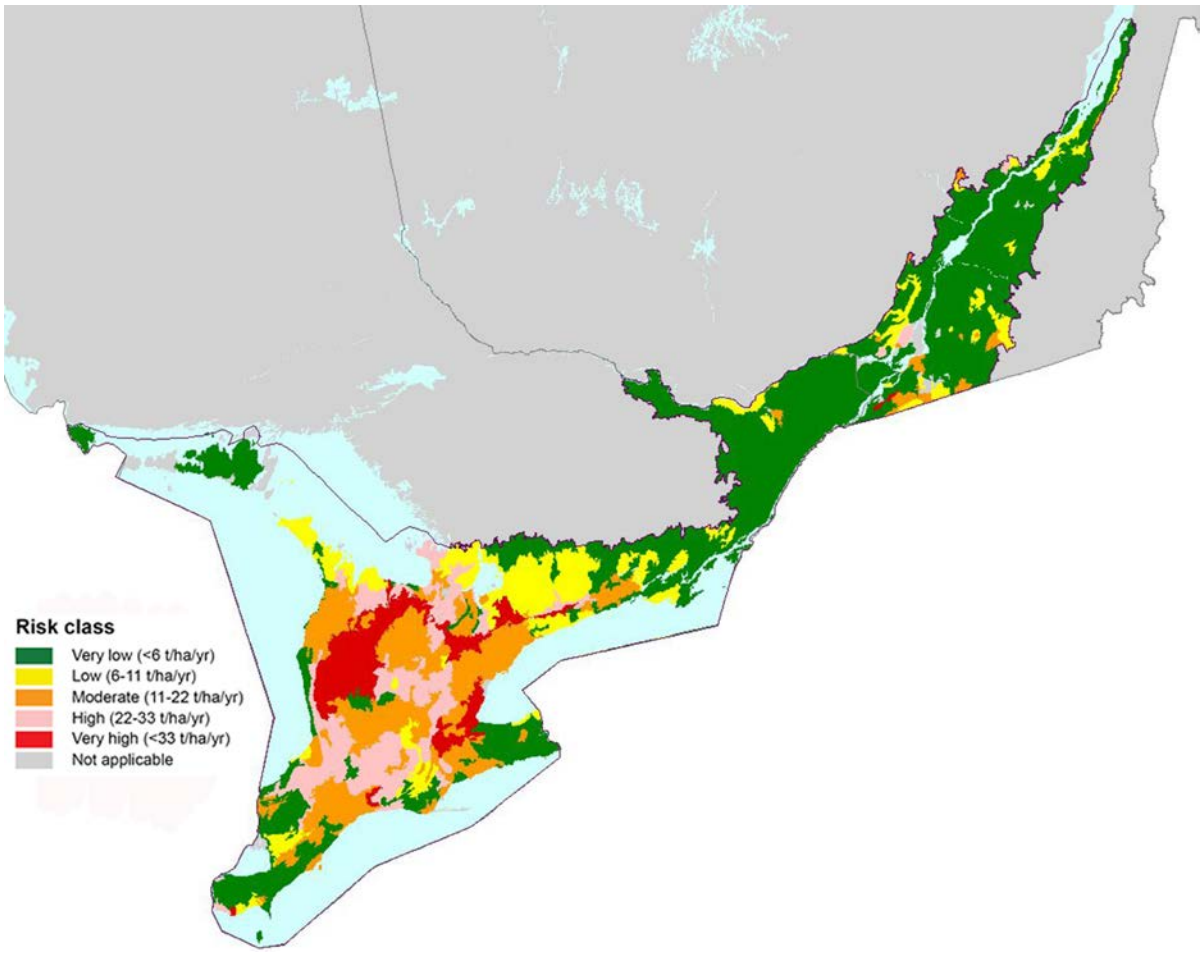

Figure 9. Cropland in the MIxedwood Plains Ecozone[+] by soil erosion risk class, 2006.
All SLC polygons containing >5% Cropland were included in the analysis and are shown here.

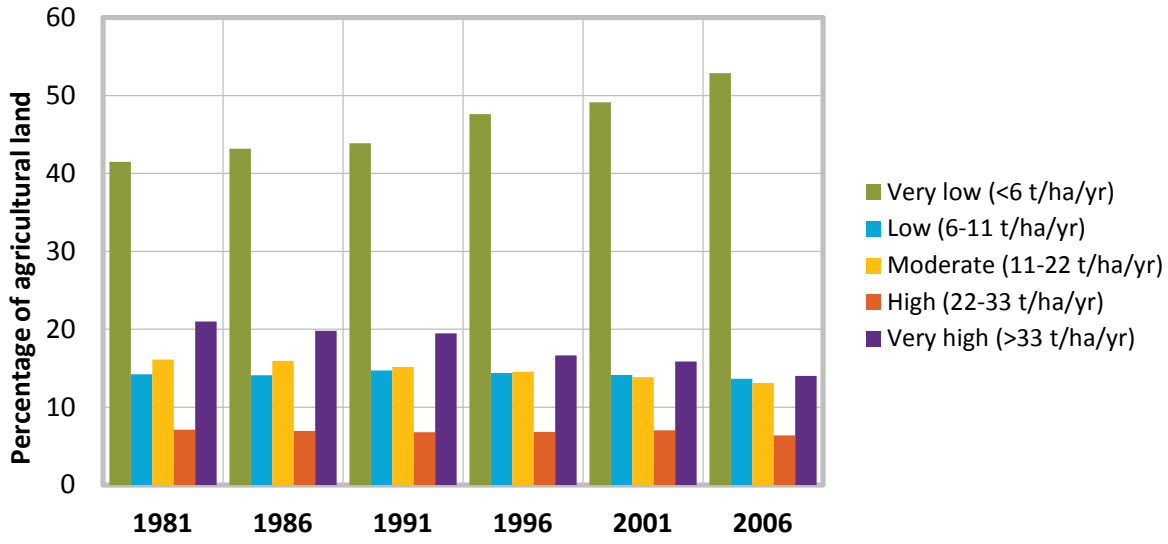

Figure 10. Soil erosion risk on Cropland in the Mixedwood Plains Ecozone[+], 1981-2006.
Source: data from the National Soil Database and the Census of Agriculture

Montane Cordillera Ecozone+

Cropland[12] is a minor land use (0.4% of total land area) and located in lower elevation intermountain areas in the Montane Cordillera Ecozone+ (Figure 11). From 1981 to 2006, the amount of Cropland with very low erosion risk increased from 85 to 93%, while that with moderate to high erosion risk decreased from 7 to 3% (Figure 12). The greatest erosion risks are on that portion of Cropland on the most steeply sloping landscapes. Tillage is quite intensive so tillage erosion dominates. These erosion reductions reflect a shift from annual crops to perennial crops. Perennial crops generally require less tillage and provide better protection of landscape from water erosion.

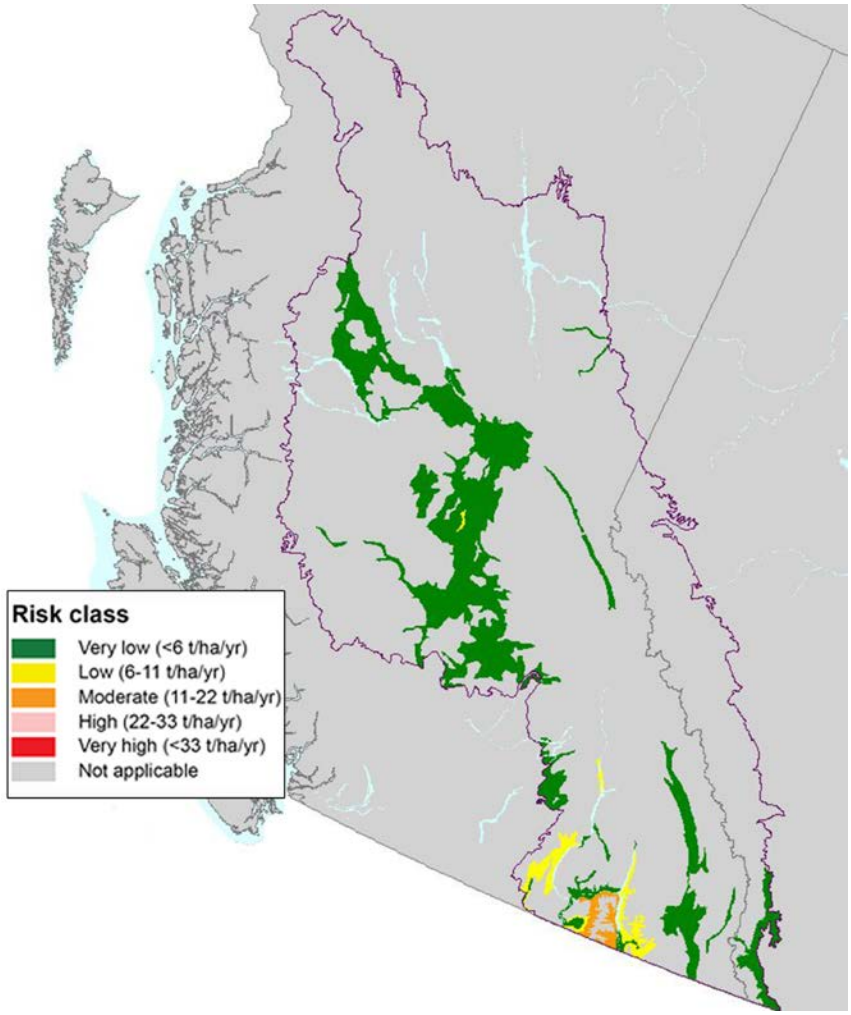

Figure 11. Cropland in the Montane Cordillera Ecozone+ by soil erosion risk class, 2006. All SLC polygons containing >5% Cropland were included in the analysis and are shown here.

[12] Cropland, as discussed throughout this report, also includes areas defined as Improved Pasture and Summerfallow in the Census of Agriculture, and thus the statistics reported here may differ from other thematic reports. See the Agri-environmental indicators section on page 1 for more information.

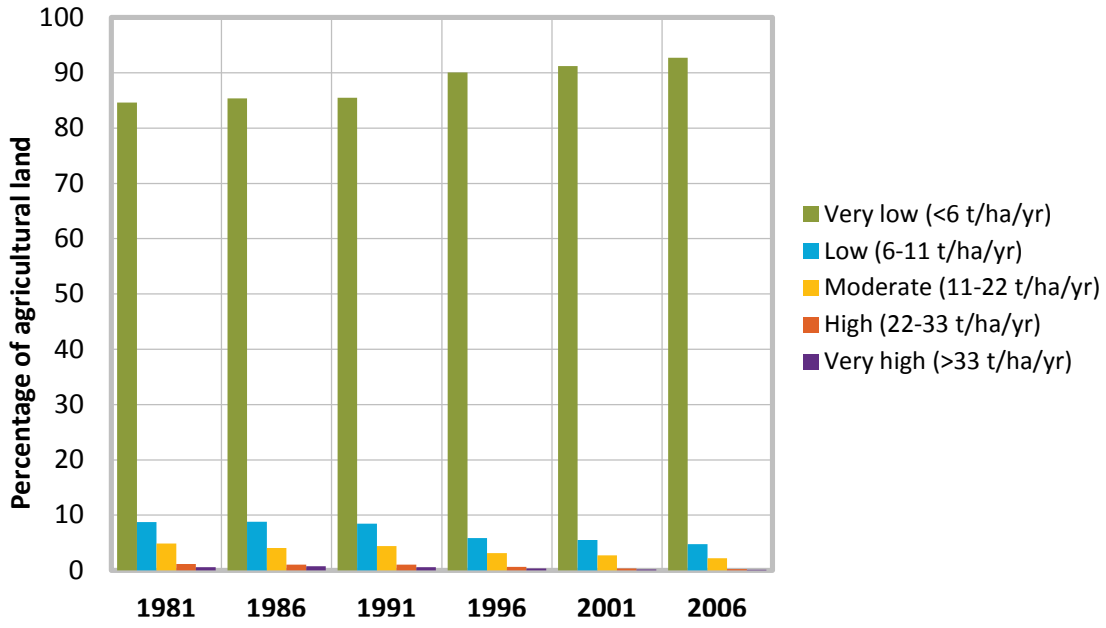

Figure 12. Soil erosion risk on Cropland in the Montane Cordillera Ecozone+, 1981-2006.
Source: data from the National Soil Database and the Census of Agriculture

Newfoundland Boreal Ecozone+

There are just over 7,000 ha of Cropland[13] Newfoundland Boreal Ecozone+, representing less than 0.1% of the ecozone+. In 2006, erosion risk varied across the landscape (Figure 13). The erosion risk on Cropland has not changed much over time (Figure 14). Most (79%) of land had very low erosion risk while 12% had moderate to very high erosion risk. Tillage intensity has also not changed greatly explaining why erosion risk is almost unchanged.

[13] Cropland, as discussed throughout this report, also includes areas defined as Improved Pasture and Summerfallow in the Census of Agriculture, and thus the statistics reported here may differ from other thematic reports. See the Agri-environmental indicators section on page 1 for more information.

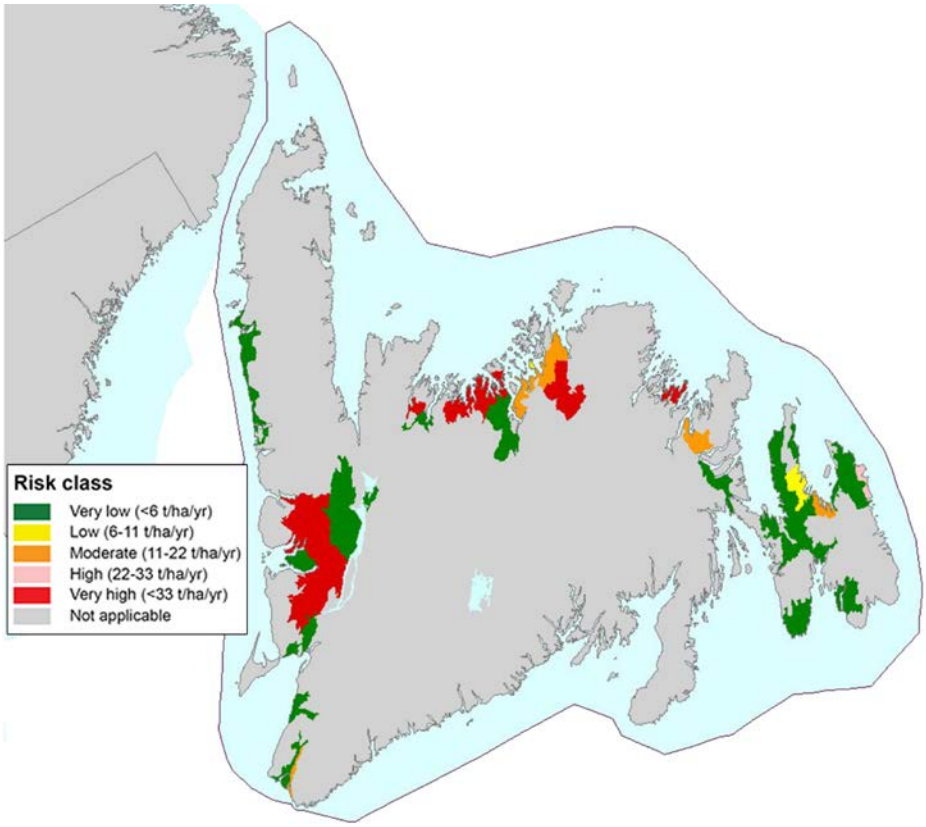

Figure 13. Cropland in the Newfoundland Boreal Ecozone[+] by soil erosion risk class, 2006. All SLC polygons containing >5% Cropland were included in the analysis and are shown here.

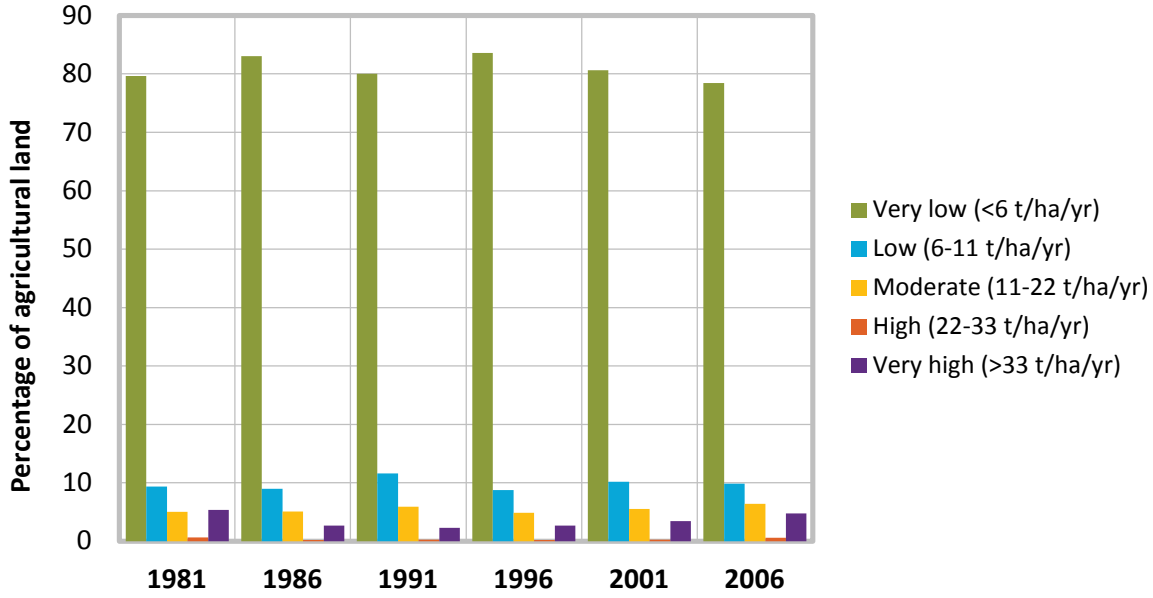

Figure 14. Soil erosion risk on Cropland in the Newfoundland Boreal Ecozone[+], 1981-2006. Source: data from the National Soil Database and the Census of Agriculture

Pacific Maritime Ecozone⁺

Only 0.3% of the Pacific Maritime Ecozone⁺ is Cropland.[14] The largest area of Cropland is the lower Fraser Valley with the remainder in small pockets in the coastal lowlands of the southern mainland, southern Vancouver Island, and on the Gulf Islands (Figure 15). Although only covering a small proportion of the ecozone⁺, the Cropland is adjacent to and within the largest metropolitan areas so its relative impact on the human environment is much greater than its relative area. Although much precipitation can occur during precipitation events, it falls at low intensity so the risk of water erosion is low. Tillage is quite intensive so tillage erosion dominates. The greatest erosion risks are on that portion of Cropland on the most steeply sloping landscapes. From 1981 to 2006, the amount of Cropland with very low erosion risk increased from 87 to 89%, while that with moderate to high erosion risk decreased from 9 to 7% (Figure 16).

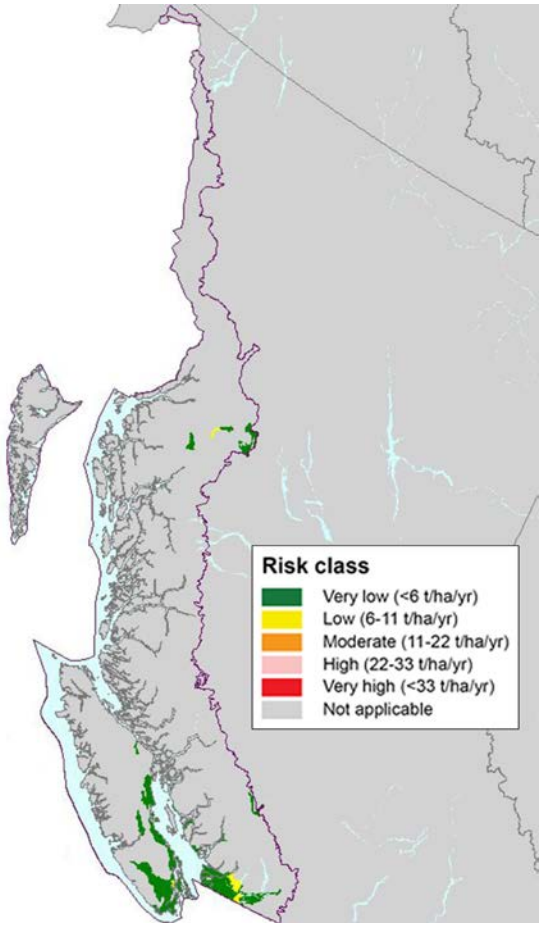

Figure 15. Cropland in the Pacific Maritime Ecozone⁺ by soil erosion risk class, 2006.
All SLC polygons containing >5% Cropland were included in the analysis and are shown here.

[14] Cropland, as discussed throughout this report, also includes areas defined as Improved Pasture and Summerfallow in the Census of Agriculture, and thus the statistics reported here may differ from other thematic reports. See the Agri-environmental indicators section on page 1 for more information.

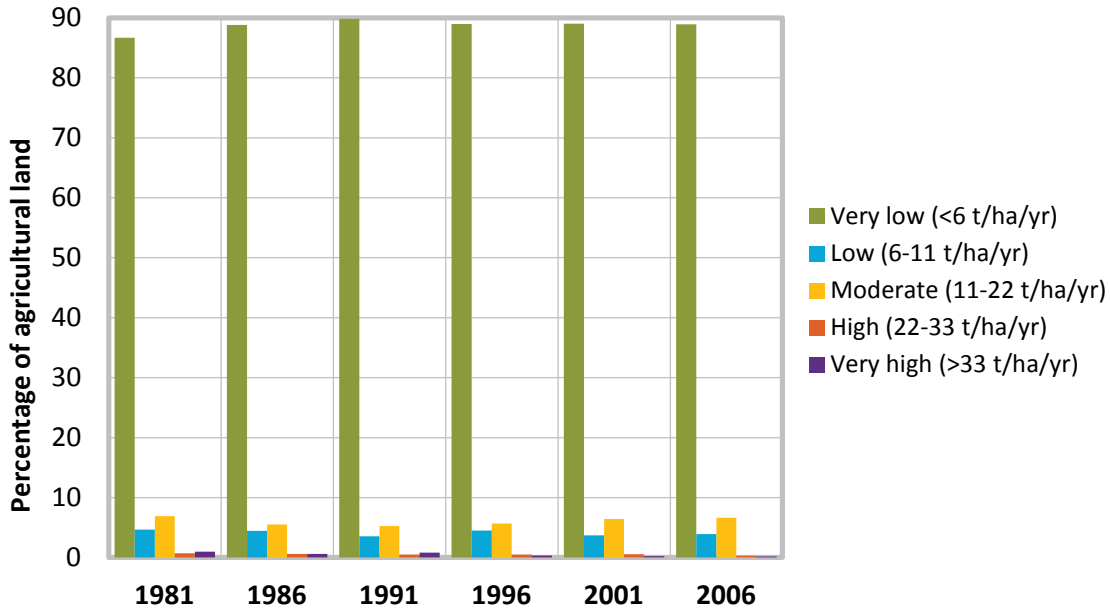

Figure 16. Soil erosion risk on Cropland in the Pacific Maritime Ecozone+, 1981-2006.
Source: data from the National Soil Database and the Census of Agriculture

Prairies Ecozone+

Cropland[15] is the dominant land use in the Prairies Ecozone+ (54% of area) and it accounts for two-thirds (67%) of all Cropland in Canada (see Figure 1). The 2006 distribution of soil erosion risk classes is shown in Figure 17. Because of the dry climate and large fields exposed to wind, wind erosion is a continual concern in the Prairies Ecozone+ if conservation measures such as maintaining windbreaks and/or adequate soil cover with plants or crop residue are not used. Sandier soils are most prone to wind erosion but erosion will occur on all soils without conservation measures. Excessive tillage can pulverize soils and leave any soil vulnerable to severe wind erosion. Tillage erosion is the largest source of erosion on hummocky landscapes. Due to climate, the risk of water erosion is relatively low except on the landscapes with long steep slopes such as cropped soil along the Manitoba Escarpment. Water erosion in the form of gully erosion is not considered in this analysis but can also be important in this ecozone+ on sloping landforms without use of conservation practices such as grassed waterways.

[15] Cropland, as discussed throughout this report, also includes areas defined as Improved Pasture and Summerfallow in the Census of Agriculture, and thus the statistics reported here may differ from other thematic reports. See the Agri-environmental indicators section on page 1 for more information.

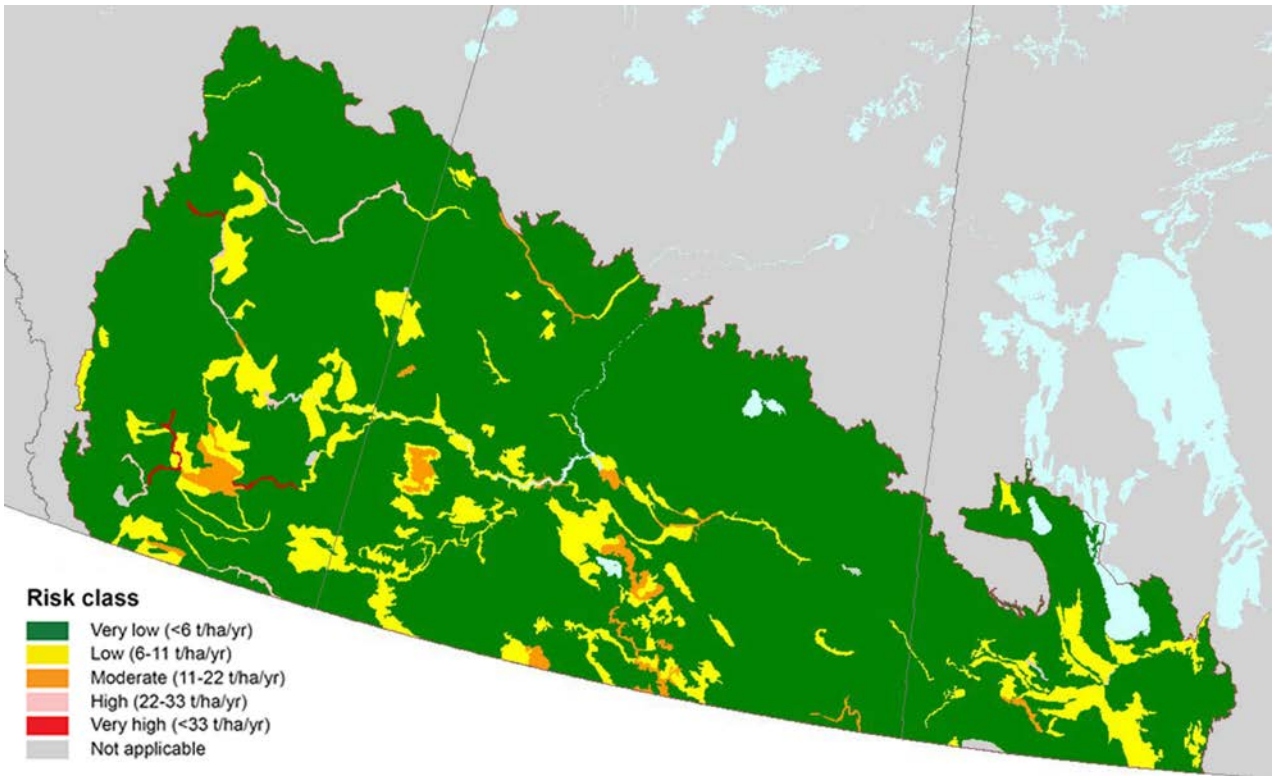

Figure 17. Cropland in the Prairies Ecozone⁺ by soil erosion risk class, 2006.
All SLC polygons containing >5% Cropland were included in the analysis and are shown here.

The Prairies Ecozone⁺ accounts for the greatest reductions in erosion risk in Canada. The proportion of Cropland with very low risk increased from 64% in 1981 to 84% in 2006 (Figure 18). During the same time period, the amount of land with moderate to very high erosion risk decreased from 18 to 7%. The reasons for these reductions in erosion risk have been the combination of widespread adoption of conservation tillage, especially no-till, and the marked reduction in summerfallow. Further, some of the more erodible land has been converted from annual crops to perennial forages and tame pasture with associated dramatic reductions.

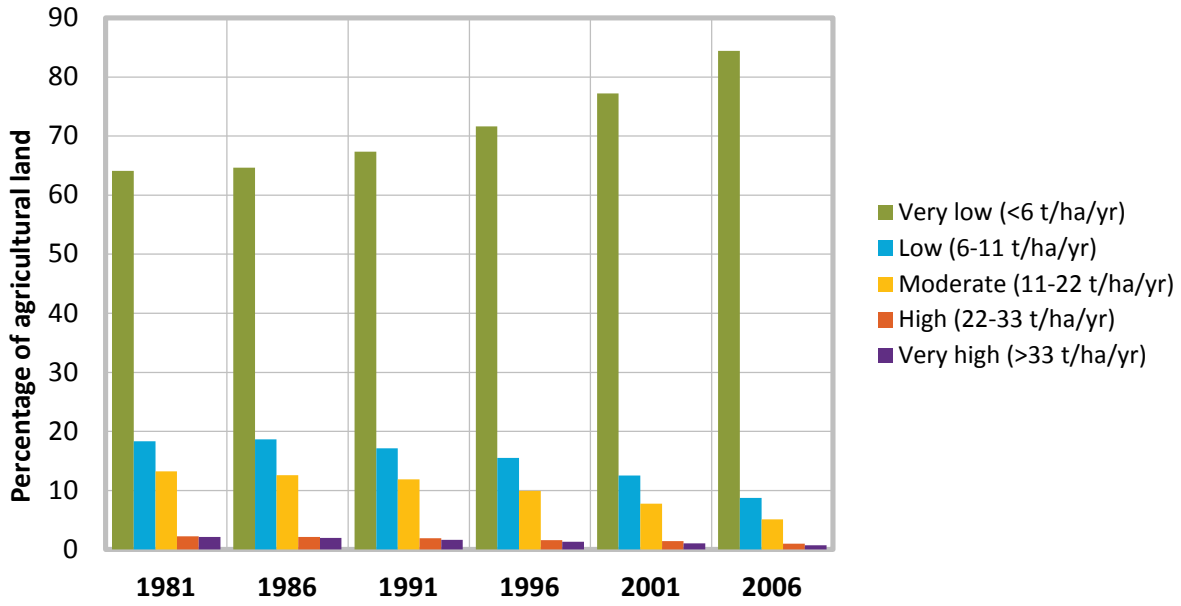

Figure 18. Soil erosion risk Cropland in the Prairies Ecozone[+], 1981-2006.
Source: data from the National Soil Database and the Census of Agriculture

Because of the risk of wind erosion, coarse-textured soils (sandy loams, loamy sands, and sands) generally have the greatest erosion risk in the Prairies Ecozone[+]. For these soils, complete no-till or conversion from annual crops to perennial cover is recommended. In addition to coarse-textured soils, the soils under irrigation in the extreme southwestern Prairies are especially prone to wind erosion, regardless of texture. Vulnerability to wind erosion in these areas results from climatic conditions which include high winds and often little snow cover due to Chinooks allowing erosion to occur throughout the winter. In addition, tillage is generally intensive on irrigated Cropland. The erosion risk on irrigated land is particularly severe after potato and sugar beet crops. After these crops, planting a cover crop of spring or winter cereals will help control wind erosion. Applying solid manure will also help control erosion.

Western Interior Basin Ecozone+

Cropland[16] is a minor land use in the Western Interior Basin Ecozone+ (1% of the land) and is located in valleys such as the Okanagan and Thompson River. The 2006 distribution of soil erosion risk classes in the Western Interior Basin Ecozone+ is shown in Figure 19. Like many other ecozones+, the Cropland is generally in close proximity to where the majority of people live so its potential impact on air and water quality around human settlements is greater than suggested by its low fraction of total zonal area. Due to dry climate in the valleys, the risk of water erosion is low. Generally, erosion risk is low except on tilled complex slopes where tillage erosion is important. From 1981 to 2006, the amount of Cropland with very low erosion risk increased from 91 to 95%, while that with moderate to high erosion risk decreased from 4 to 2% (Figure 20). Production of more perennial crops such as grapes largely explains the reduction in erosion risk.

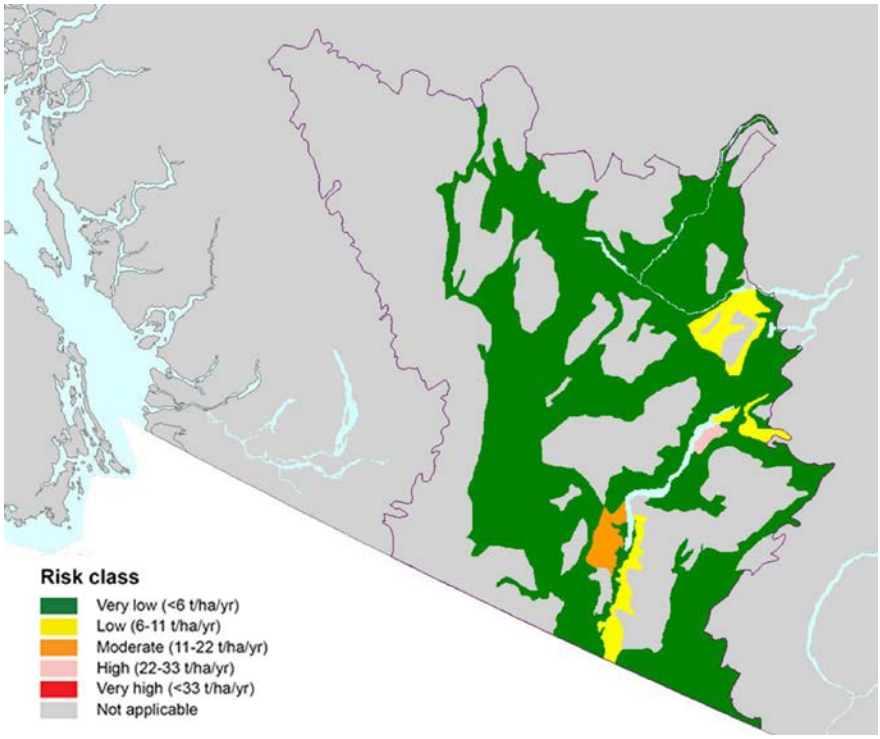

Figure 19. Cropland in the Western Interior Basin Ecozone+ by soil erosion risk class, 2006. All SLC polygons containing >5% Cropland were included in the analysis and are shown here.

[16] Cropland, as discussed throughout this report, also includes areas defined as Improved Pasture and Summerfallow in the Census of Agriculture, and thus the statistics reported here may differ from other thematic reports. See the Agri-environmental indicators section on page 1 for more information.

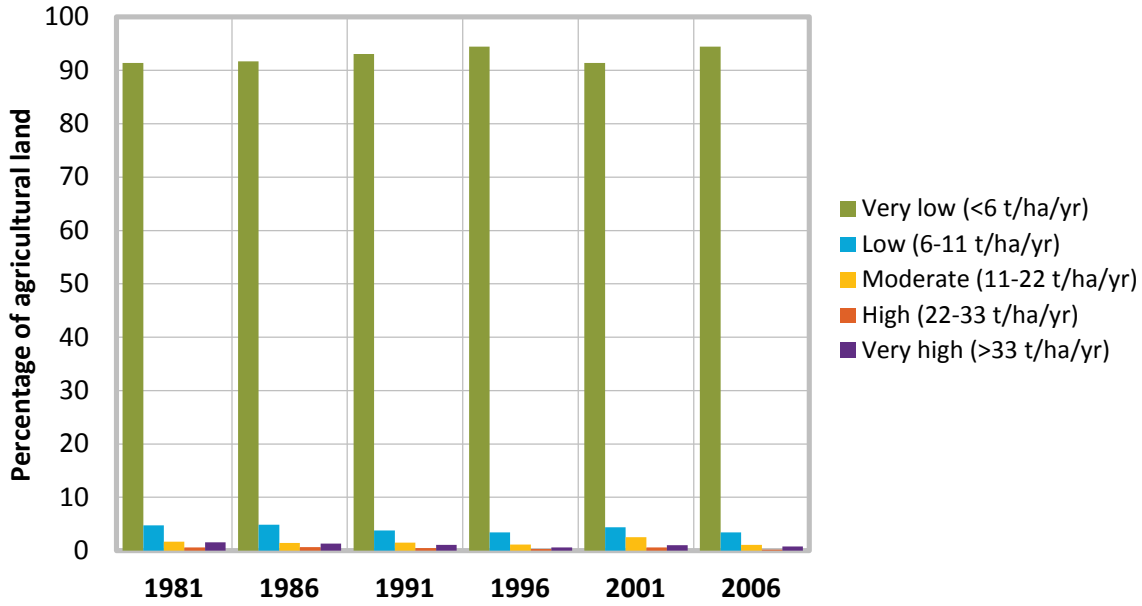

Figure 20. Soil erosion risk on Cropland in the Western Interior Basin Ecozone[+], 1981-2006. Source: data from the National Soil Database and the Census of Agriculture

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