Some of the largest increases in population densities are in the Prairies and southern Ontario—population density increased in the Upper North Saskatchewan-05D (27%), Bow-05B (28%), Red Deer-05C (19%), Central North Saskatchewan-05E (19%) and Lake Ontario and Niagara Peninsula-02H (16%). These five indicators—landscape type, natural land parcel size, distance to natural land parcel, barrier density and population density—can be related and when viewed together they can help create a useful representation of the overall quality of an ecosystem.

### 3.3 Ecosystem services potential: Boreal forest case study

Ecosystem service potential is the capacity of landscapes to deliver goods and services without affecting ecosystem integrity. This capacity is controlled by the ecosystem's biophysical structures and processes such as climate, soils, land cover and productivity, which interact to generate ecosystem functions. While ecosystem services require a human beneficiary to be considered as such, the potential to provide that service exists independently of use.

A framework for quantifying the potential of landscapes to provide EGS was developed in the context of the MEGS project. The boreal forest case study was used to test and demonstrate the value of this approach (Appendix D). Ecosystem services that were addressed in the case study were habitat provision, carbon sequestration, resilience to epidemic insect outbreaks, opportunities for solitary wilderness experiences, prey for hunting, timber supply, scenic beauty, habitat for charismatic or iconic species, air filtration, soil fertility, and water purification.

The case study also applied an aggregate measure for assessing the total ecosystem potential—the overall relative ecosystem capability to deliver a number of different ecosystem services—while also representing the individual contribution of each EGS.

Information on a single regulating service—water purification—is presented here for illustrative purposes.

#### 3.3.1 A regulating service: Water purification

Forest ecosystems can affect water quality in many ways. *Riparian* forests provide shade, which moderates water temperatures, and provide a source of organic debris and nutrients, which are used by aquatic organisms. Natural processes in forested areas, such as landslides, channel erosion, blowdown, and wildfire, can affect water quality by increasing sediment and nutrient concentrations and stream temperatures. Forests also modify the chemistry of incoming precipitation as a result of vegetation and soil interactions. Natural disturbances and management activities may change dissolved and chemical particulate concentrations in water bodies.

Water purification is defined as the filtration and decomposition of wastes and pollutants in water, as well as the assimilation and detoxification of compounds through soil and subsoil processes. Preliminary results of the study showed that the potential of boreal watersheds to purify water is largely intact, with 71% of the watersheds assessed experiencing no negative change in their water purification potential from 2000 to 2010 (Maps 3.4, 3.5 and 3.6).

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22. The boreal zone is a major biogeoclimatic zone of the high northern latitudes, covering much of North America, mainly with forests, woodlands, wetlands and lakes (see Maps 3.4, 3.5 and 3.6).
23. Statistics Canada – Catalogue no. 16-201-X
Map 3.4
Water purification potential index by watershed, 2000

**Water purification potential index, 2000**
- Very high
- High
- Moderate
- Low
- Very low

**Note(s):** Results from the boreal forest case study are preliminary. The variability observed in the index values was not assessed against independent datasets on water quality. The selected predictor variables, data sources and scoring scheme are found in Tables 1 and 2 (Appendix D).

**Source(s):** Environment Canada and Natural Resources Canada, 2013, special tabulation.
Map 3.5
Water purification potential index by watershed, 2010

Note(s): Results from the boreal forest case study are preliminary. The variability observed in the index values was not assessed against independent datasets on water quality. The selected predictor variables, data sources and scoring scheme are found in Tables 1 and 2 (Appendix D).

Source(s): Environment Canada and Natural Resources Canada, 2013, special tabulation.
Map 3.6
Water purification potential index by watershed, 2000 to 2010 change

Note(s): Results from the boreal forest case study are preliminary. The variability observed in the index values was not assessed against independent datasets on water quality. The selected predictor variables, data sources and scoring scheme are found in Tables 1 and 2 (Appendix D).

Source(s): Environment Canada and Natural Resources Canada, 2013, special tabulation.
While still relatively high, the water purification potential index of watersheds declined from 2000 to 2010 in some regions of the boreal forest, including in the south-west and eastern parts. Underlying causes of these changes varied and included, in no particular order, an increase in the area affected by forest fires, a decrease in forest cover and riparian forest buffer, and an increase in the area affected by settlements and other human landscape features (e.g., roads, powerlines).

3.4 Ecosystem productivity measure: National biomass extraction

Ecosystems have the capacity to provide or contribute to the production of many goods that people use including organic materials such as agricultural products, fish, and timber, which can collectively be referred to as ‘biomass.’ The extraction of these goods can place pressure on ecosystems, potentially reducing their ability to produce EGS in the future. For example, overfishing can deplete fish populations upon which people rely as a stock of natural resources; farming and forestry practices can result in soil erosion; and livestock production can degrade the productivity of pasture land and rangeland through overgrazing. Measuring the extraction of biomass is a step towards the development of indicators that help explain whether human use of ecosystem goods is sustainable.25,26 For more information see Appendix E.

Table 3.5 shows the extraction of biomass for human use for the following categories: agricultural crops, livestock and poultry, milk, maple products and honey, forestry, and fisheries. An estimated 285.8 million tonnes of biomass were extracted for human use from Canada’s terrestrial and aquatic ecosystems in 2010. Biomass extraction related to crops was highest in Alberta, Saskatchewan, and Ontario. The top three provinces producing livestock and poultry were Quebec, Alberta, and Ontario. Quebec and Ontario account for the largest proportion of biomass extraction in the form of milk, maple products, and honey.

25. For example, tracking net carbon balance (NCB) provides an assessment of the goods and services that are provided by the earth’s ecosystems. NCB is considered an indicator of the sustainability of carbon or biomass use. The MEGS project focused on measuring biomass extraction as it is a component of carbon accounting.

26. Biomass extraction data are provided for various sources (e.g., agricultural crops, livestock and poultry, milk, honey, and maple products, forestry, fisheries) but are not a complete representation of all biomass extraction in Canada.