A photograph of a person sitting on a large, fallen log in a dense forest. The person is wearing a yellow jacket, dark pants, and a red cap, and has a blue backpack. The forest is filled with tall, slender trees and lush green foliage. The scene is captured from a low angle, looking up at the trees.

Ecosystem Services and British Columbia's Inland Temperate Rainforest

A RESEARCH BRIEF

B.C.'s inland temperate rainforest is a conservation priority not only for wildlife and their habitat, but as a nationally important hotspot for the benefits that people get from nature, due to its high capacity to store aboveground carbon, tremendous provision of freshwater, and significance for recreation.

We have a prime opportunity for win-win actions that protect rare ecosystems and at-risk species, and safeguard vital benefits that people get from nature.

Photo Credit: iStock Photo

Yellowstone to Yukon Conservation Initiative

B.C.'S BIOGEOCLIMATIC ZONES

There are 16 zones in B.C.'s Biogeoclimatic Ecosystem Classification (BEC) system. These zones are large geographic areas that share a similar topography, climate, vegetation and soils. BEC is widely used in B.C. as a framework for scientific research and resource management.

The Interior Cedar-Hemlock (ICH) zone includes an extensive section located in the southeast portion of B.C. and a northern section in the Hazelton and Skeena mountains. This analysis focussed on the southern ICH zone. In this research brief we use inland temperate rainforest and southern ICH zone interchangeably.

B.C.'s Inland Temperate Rainforest Stands Out

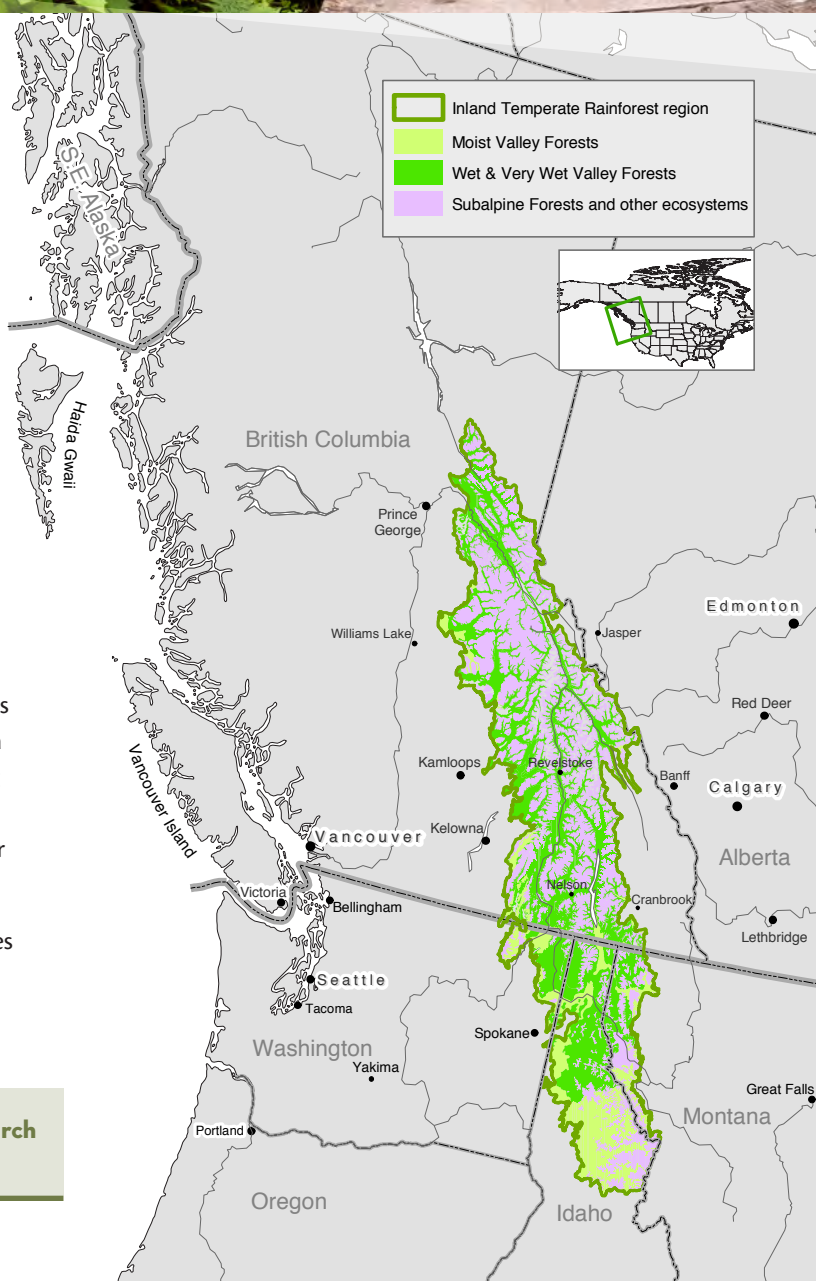
Found nowhere else on the planet, the inland temperate rainforest of southeastern British Columbia is home to old-growth forest and at-risk species like wolverines, grizzly bears, and mountain caribou.

Fed by plenty of rain and heavy winter snows, the productivity and diversity of this region allows wildlife to thrive. The ecosystem also provides many benefits to people and communities – fresh air, drinking water, timber, and a host of ways to support human physical, mental, and spiritual well-being.

New analysis by researchers from the University of British Columbia shows that across B.C.'s biogeoclimatic zones, the inland temperate rainforest is significant for many reasons. Provincially, this is one of the wettest zones with the highest diversity of tree species. This region stores high amounts of aboveground carbon in its forests. It is also exceptionally important for freshwater provision. This southern Interior Cedar-Hemlock zone has the highest density of overlapping carbon storage and freshwater provision hotspots in the province. In addition, Canada-wide research shows this region as a hotspot for nature-based outdoor recreation.

This brief provides a summary of new research on ecosystem services in B.C.'s inland temperate rainforest, as well as highlights from the Upper Columbia basin and southern mountain caribou habitat.

For the full report, maps, and links to related national research visit y2y.net/BCecosystems-services.



What benefits were measured?

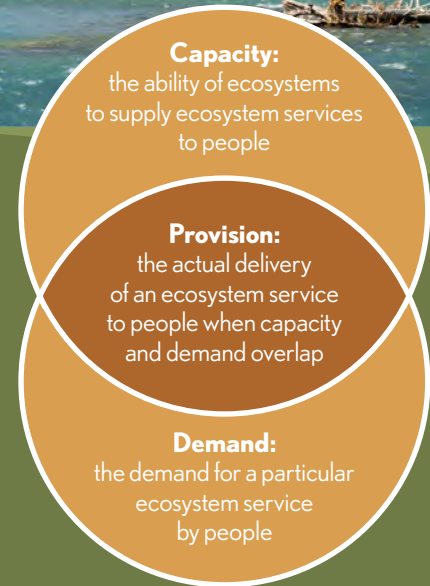
In 2020, Y2Y commissioned researchers Dr. Matthew Mitchell and Cameron Bullen from the University of British Columbia to analyze ecosystem services in B.C. with a focus on the inland temperate rainforest, the Upper Columbia River basin, and southern mountain caribou habitat. This analysis built on national research that explored Canada's most important spots where people get key benefits from nature. The B.C. regional analysis included the ecosystem services of climate regulation / carbon storage and freshwater (e.g., for drinking, irrigation, hydroelectricity). The national research also included nature-based outdoor recreation, but due to data limitations was not included in the regional analysis. The national level mapping however, shows that southeastern B.C. is a recreation hotspot.

Researchers quantified the capacity of areas across B.C. to provide climate regulation by calculating the total amount of carbon stored above- and belowground. *Carbon storage* (MgC / hectare) was calculated using data from the Canadian National Forest Inventory and the SoilGrids system.

Freshwater *provision* was calculated using freshwater *capacity* (runoff data from the global HydroSHEDS database) and an estimation of demand by people downstream. *Demand* includes: municipal consumption (household and institutional), agriculture, hydropower generation, and industrial activities (factories and thermal power stations). Proxies for freshwater demand across Canada and hydrologically connected areas of the U.S.A. included the number of people living in downstream settlements larger than 100 people, agricultural surface area, and the number of dams, industrial facilities, and thermal power stations present in Canada. It is important to note that this analysis does not include freshwater demand downstream in the USA by industry or dams due to lack of data, therefore results presented can be considered to be the minimum estimate of transboundary freshwater provision importance.

This work revealed hotspots – areas within the top 20% of all values – across the province. The density of hotspots (km² of hotspots per 100 km² of surface area) was also calculated and shows the concentration of hotspots across different areas and the province.

For more information on the research methods and limitations view the full report.



What are ecosystem services?

People receive many benefits from nature. These benefits, also called 'ecosystem services', include food, drinking water, pollination, pest control, flood control, places to recreate, aesthetic beauty, culture and heritage, and more.

Increasingly, ecosystem services are included in conservation decisions – not as a replacement for traditional biodiversity values and measures, but as added motivation for protecting natural ecosystems. In particular, finding key locations where high biodiversity and high ecosystem service provision occur simultaneously is seen as an effective way of prioritizing ecosystem conservation for both people and nature, enabling win-win actions.

Ecosystem service provision depends on two distinct elements: the capacity of ecosystems to supply a service and demand for that service by people. When capacity and demand overlap, provision occurs. For example, many ecosystems have the capacity to deliver clean water, but freshwater provision only results when human demand for water is also present – when upstream capacity connects to downstream demand.



Research Highlights

LOTS OF WATER!

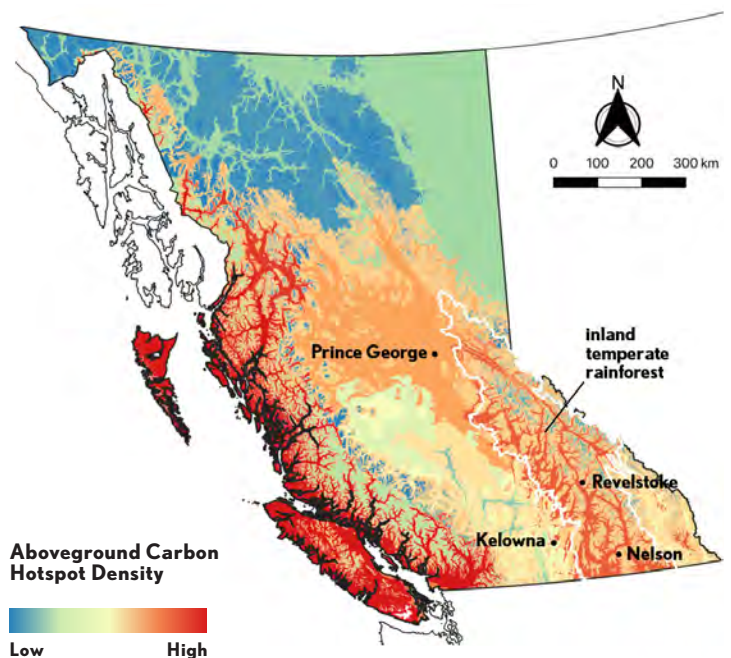
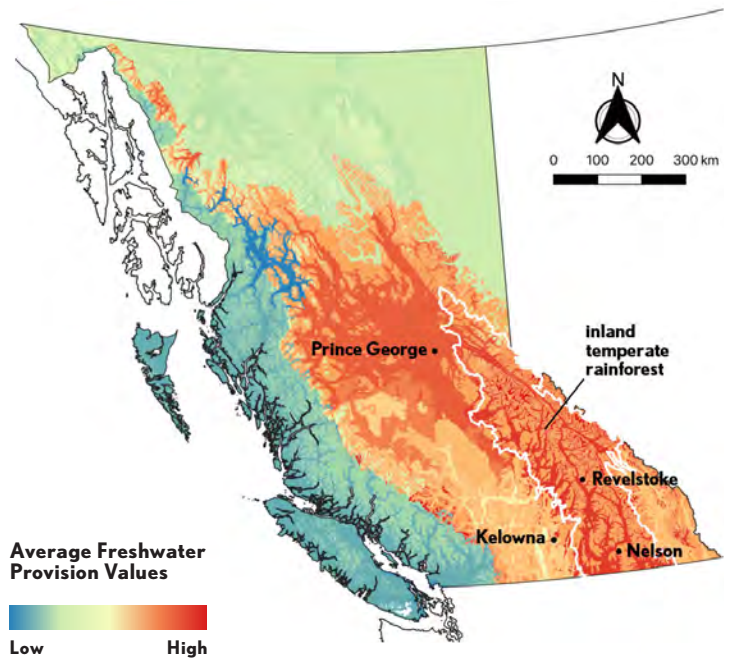
The inland temperate rainforest is...

- No. 2 BEC zone in the province for freshwater provision hotspot density ($61.8 \text{ km}^2/100\text{km}^2$)
- No. 3 for freshwater demand hotspot density ($46.9 \text{ km}^2/100\text{km}^2$)
- One of the top densities of overlapping freshwater capacity and provision hotspots (higher than 12 of the other 16 BEC zones)
- Less than 5% of B.C.'s landmass, but has:
 - more than double that for freshwater demand hot spots (10.9%) and overlapping capacity and provision hotspots (11.6%)
 - almost three times that of freshwater provision hotspots (14.4%)

BIG TREES = BIG CARBON STORAGE

The inland temperate rainforest is...

- Storing high amounts of aboveground carbon, covering just under 5% of B.C.'s landmass, but containing more than 10% of hotspots
- No. 3 in B.C. for aboveground carbon hotspot density
- No. 5 for overlapping above- and belowground hotspots (and No. 2 for interior ecosystems)



Note: maps show single average value for each BEC zone

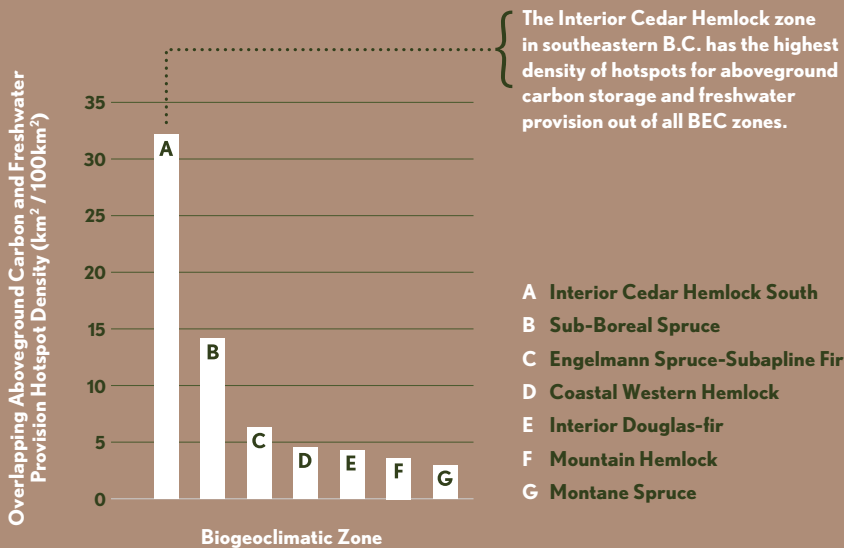
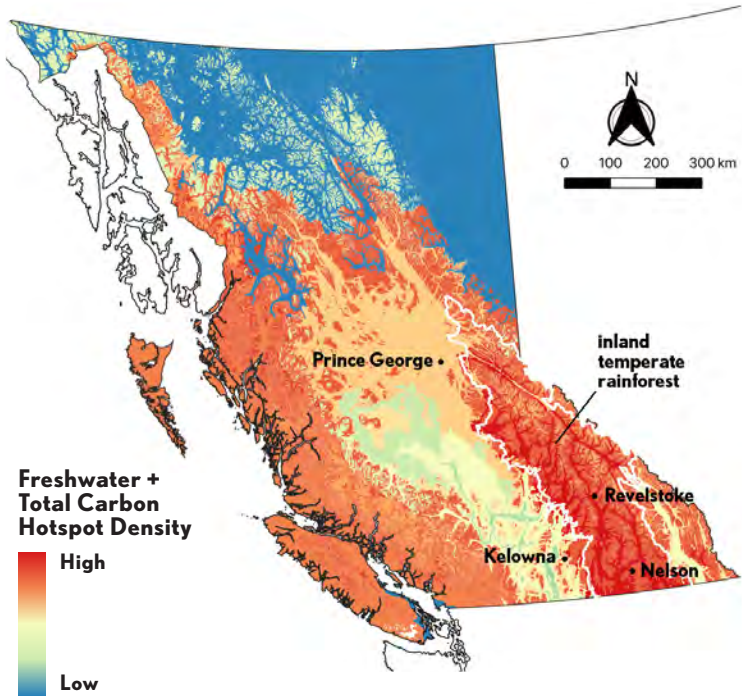
Forests absorb carbon by capturing carbon dioxide from the atmosphere and transforming it into biomass. Old natural forests are important because they store the most carbon. Leaving trees standing is a nature-based solution to fighting dangerous climate change.



Photo Credit: Shutterstock

MAJOR HOTSPOT IN B.C.

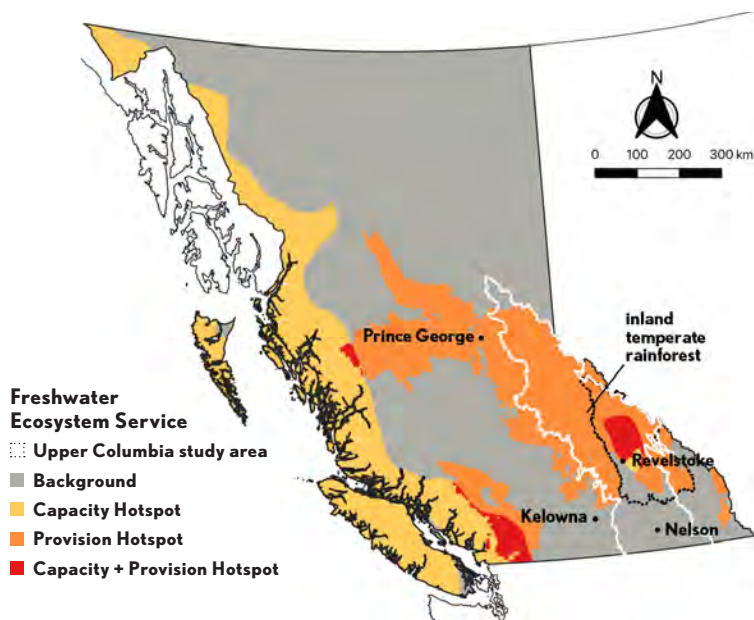
The southern portion of the inland temperate rainforest has the highest density of overlapping carbon and freshwater provision hotspots in the province compared to all other biogeoclimatic zones. Despite being just under 5% of the province by area, this region has about 30% of the overlapping aboveground carbon-freshwater provision hotspots and about 20% of the overlapping total carbon-freshwater provision hotspots in B.C. This makes the region a high priority not only to protect this globally rare ecosystem, but to secure fundamental needs for people.





IN THE SPOTLIGHT: THE UPPER COLUMBIA

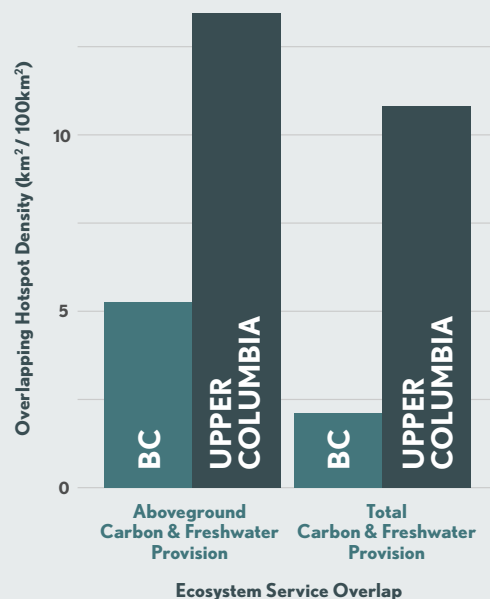
The Upper Columbia region covers only 4% of the province but contains more than 40% of overlapping freshwater capacity and provision hotspots – and this is an underestimation because underlying data do not include the significant freshwater demand downstream in the USA. The freshwater provision hotspot density is nearly four times the provincial density, while the overlap of capacity and provision hotspots is more than 10 times the provincial density. The Upper Columbia is one of the top three areas in B.C. where freshwater capacity and provision hotspots overlap.



The Upper Columbia has two to five times the density of overlapping carbon and freshwater provision hotspots as B.C. overall. It is a region where win-win conservation actions could be targeted to protect both carbon storage and freshwater provision ecosystem services, as well as essential ecological functions.

The Upper Columbia has a higher density of aboveground carbon hotspots compared to B.C. as a whole. Aboveground carbon densities and overlapping above- and belowground carbon hotspots are concentrated at lower elevations along river valleys, especially near Golden and Nakusp.

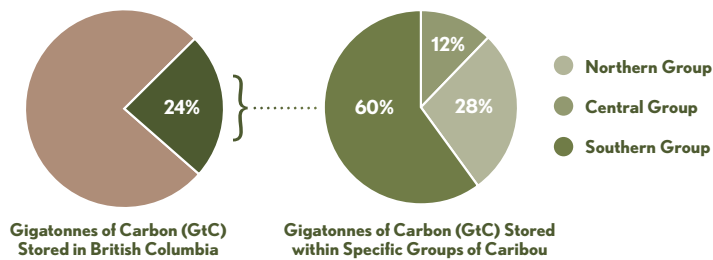
These lower and more gently sloping areas have greater vegetation and tree growth, deeper soils, and store significantly more carbon than the steeper mountain slopes around them.



MOUNTAIN CARIBOU HIGHLIGHTS

Southern mountain caribou habitat in B.C. covers a significant amount of the overlapping carbon storage and freshwater provision hotspots in the province.

The Local Population Units (LPUs) of southern mountain caribou were analyzed and results show that these areas store 7.3 gigatonnes of carbon (GtC), which is about 24% of the total carbon stored in the province. About 60% of that is stored within the Southern Group, 28% in the Northern Group, and 12% in the Central Group.

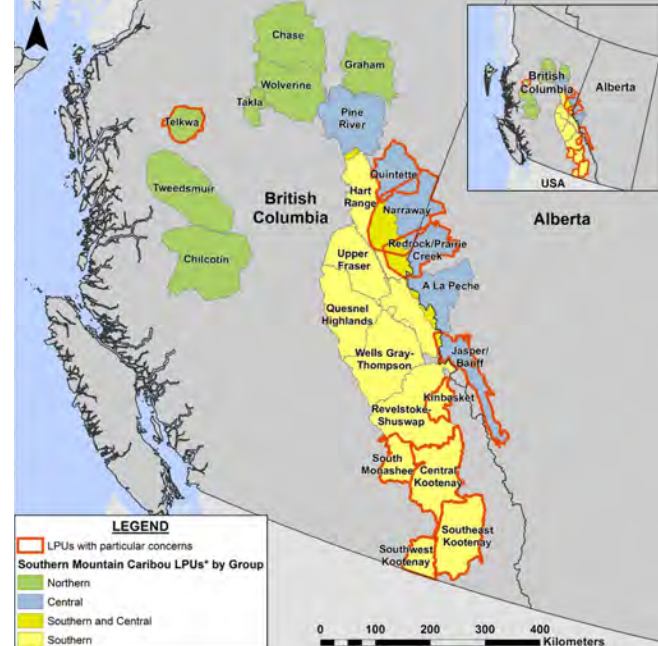


Found within the highly productive inland rainforest ecosystem, the habitat of the Southern Group is a hotspot for aboveground carbon storage with densities much higher than the B.C. average. Within the Southern Group habitat area, the Revelstoke-Shuswap LPU has the highest density of aboveground carbon hotspots in the mountain caribou analysis.

The habitat of the Southern Group also encompasses more than 40% of freshwater demand hotspots and more than 50% of freshwater provision hotspots in B.C. Revelstoke-Shuswap has an extremely high density of freshwater provision hotspots (95.7 km² hotspots per 100 km² area) – covering just 2% of the province but almost 10% of B.C.'s freshwater hotspots. The Hart Ranges LPU, which covers the headwaters of the Fraser River, also stands out, covering 1.6% of the province but more than 5% of provincial demand and provision hotspots.

The Southern Group, and in particular the Revelstoke-Shuswap LPU, represent an important priority for protecting both mountain caribou and carbon and freshwater benefits.

While only covering 15% of B.C. by landmass, the habitat for the Southern Group of mountain caribou has more than 55% of the overlapping aboveground carbon and freshwater provision hotspots.



A Conservation Priority

B.C.'s inland temperate rainforest is a conservation priority not only for its biodiversity, but because of its ability to provide critical ecosystem services for people. These globally unique forests have a high capacity to store carbon, provide essential freshwater for millions of people and industry, and are of significance for outdoor recreation as well as other important benefits. This region contains a high amount of overlapping carbon storage and freshwater hotspots in B.C. and is a prime opportunity to protect both globally rare ecosystems and secure fundamental needs for people.

For more information visit y2y.net/BCecosystems-services.