The Economic, Environmental and Public Health Benefits of the Trans Canada Trail

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ECONSULT SOLUTIONS INC.

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About Econsult Solutions, Inc.

This report was produced by Econsult Solutions, Inc. ("ESI"). ESI is a Philadelphia-based economic consulting firm that provides businesses and public policy makers with economic consulting services in urban economics, real estate economics, transportation, public infrastructure, development, public policy and finance, community and neighbourhood development, and planning, as well as expert witness services for litigation support. Its principals are nationally recognized experts in urban development, real estate, government and public policy, planning, transportation, non-profit management, and business strategy and administration, as well as litigation and commercial damages. Staff members have outstanding professional and academic credentials, including active positions at the university level, wide experience at the highest levels of the public policy process, and extensive consulting experience.

1. Introduction

Trail networks provide valuable economic, environmental and public health benefits to the communities they serve. However, these impacts are often understated or overlooked when considering investment in trail systems within communities. The purpose of this report is to highlight the Trans Canada Trail's economic and social benefits to help stakeholders understand the estimated value of the network, including opportunities arising for the communities, workers and local businesses throughout the nation. As this report demonstrates, the Trans Canada Trail network provides environmental service benefits in the form of flood mitigation, carbon sequestration and other avoided costs due to the presence of the Trail. The usage of the Trail sections by residents and visitors also provides invaluable public health and economic benefits to local communities across Canada, making these places more attractive for residents and businesses to locate, and bolsters tourism.

1.1. About the Trans Canada Trail

The Trans Canada Trail is a network of recreational trails and greenways that spans over 28,000 kilometres across Canada, making it the longest recreational trail in the world.[1] The Trail connects all ten provinces and three territories of Canada, connecting the Atlantic to the Pacific and Arctic oceans. The Trail consists of a variety of trail types, including urban greenways, rural trails and backcountry routes, and can be used for activities such as hiking, cycling, cross-country skiing and snowmobiling. The Trans Canada Trail began as an idea in 1992, coinciding with Canada's 125th anniversary. It was developed by a partnership of national, provincial and territorial organizations, as well as volunteers and local communities.

Figure 1.1: Length of the Trans Canada Trail by Province and Territory (KM)

Province/Territory	Total Trail Length
Alberta	3,250
British Columbia	3,600
Manitoba	1,800
New Brunswick	950
Newfoundland and Labrador	1,300
Northwest Territories	3,400
Nova Scotia	2,000
Nunavut	200
Ontario	6,000
Prince Edward Island	500
Quebec	2,000
Saskatchewan	1,800
Yukon	1,600
Total	**28,400**

Source: Trans Canada Trail (2022)

[1] Trans Canada Trail. (n.d.). About. Retrieved March 3, 2023, from https://tctrail.ca/about/

This report covers the benefits of over 19,000 kilometres of the Trans Canada Trail network. The waterway sections are excluded from this analysis. Also, the sections of the Trans Canada Trail within Nunavut did not have calculable economic or public health benefits because of unavailable data on trail usage and users.

1.2. Benefits of the Trail Network

Research and practice show that active transportation networks are essential infrastructure that improve the economic vitality of communities. Trails create safe and easy access to a community's natural assets and connect destinations throughout a region. When developed as a network, they support healthy living, provide active transportation routes and improve the quality of life for residents. In addition to providing benefits to residents, investments in trails increase the attractiveness of a community for businesses and out-of-town visitors. In addition to their clear environmental, recreational and health value, trails also deliver multiple economic benefits:

- As part of a region's green infrastructure, trail building – if completed in ways that support existing natural resources – can include the creation of a green buffer that contributes to sustainable and resilient ecosystems.
- As a mode of active recreation for residents and out-of-town visitors, trails also often serve to encourage excursions as well as attract visitors to spend more time in the region, which in turn leads to increased spending at nearby businesses.
- Finally, as a critical social infrastructure, trails support mental and physical health.

This report estimates the benefits of the Trans Canada Trail, first by analyzing the Trail as a whole and then by conducting ten case studies to better understand the different types of benefits at a more localized level. Specifically, the report demonstrates the economic, health and social benefits of the Trail in ten different communities, highlighting the unique contributions that the Trail can make to each community and the potential for local stakeholders to leverage these benefits for further economic and social development.

1.3. Trail Typologies

The Trans Canada Trail offers a wide range of activities and experiences, with different sections of the Trail featuring unique attractions and amenities. For example, the Niagara River Recreation Trail is a 55-kilometre section of the Trail that runs along the Niagara River in Ontario, offering visitors the chance to stop at local wineries and vineyards, and to access popular tourist attractions like Niagara Falls. On the other hand, the North Whiteshell Trail is a 105-kilometre section that runs through boreal forest in Manitoba. This trail is open to camping, hiking, cross-country skiing and snowmobiling, providing visitors with the opportunity to enjoy the wilderness of Canada. Given that different sections of the Trans Canada Trail offer users distinct experiences, this analysis categorizes each section of the Trail into one of seven typologies based on its characteristics. These typologies consider factors such as trail type, location and amenities, impacting the types of benefits that are relevant to measure.

Figure 1.2: Trans Canada Trail Typologies

#	Typology	Environment	Trail Length	Trail Subtype
1	Large Cities Dedicated Trail/Low-Stress Bikeway	Large Cities	Long and Short Distance	Protected
2	Large Cities On-Road Route	Large Cities	Long and Short Distance	Unprotected
3	Small to Medium Cities Dedicated Trail	Small/Medium Cities	Long and Short Distance	Protected
4	Small to Medium Cities On-Road Route	Small/Medium Cities	Long and Short Distance	Unprotected
5	Wilderness/Rural Long-Distance Dedicated Trail	Rural/Limited Development	Long Distance	Protected
6	Wilderness/Rural Long-Distance On-Road Route	Rural/Limited Development	Long Distance	Unprotected
7	Wilderness/Rural Self-Sustained Long-Distance Route[2]	Rural/Limited Development	Long Distance	Unprotected

Source: NV5 (2023)

1. Trails categorized as **Large Cities Dedicated Trail** are short distance trail systems, local trails, protected or low-stress sections of long-distance trails, and on-road protected bicycle accommodations within urban population centres. They allow for greater all-ages and -abilities use and are expected to have the highest volume. This type of trail is used by residents, commuters and visitors.
2. Trails categorized as **Large Cities On-Road Route** are typically short distance sections of road routes that are part of larger trail systems, and sections of road without bicycle infrastructure within urban population centres, including unprotected bike accommodations. They are expected to have moderate to high volume use by residents, commuters and visitors.
3. Trails categorized as **Small to Medium Cities Dedicated Trail** may be part of a long-distance excursion trail within a town, or a shorter local trail. They accommodate bicycles and pedestrians with multi-use paths, greenways or trails, and protected bicycle lanes, allowing for more all-ages and -abilities use. These trails are expected to have moderate volume use by residents.
4. Trails categorized as **Small to Medium Cities On-Road Route** may be part of a long-distance excursion route within a town. These trails have very limited accommodations for bicycles except for roadway shoulders. They are expected to have lower volume use by residents.
5. Trails categorized as **Wilderness/Rural Long-Distance Dedicated Trail** are long-distance trail routes that are protected/separated from vehicular traffic. They are located outside of urban, medium or small population centres, and in limited development or agricultural areas. These trails accommodate bicycles and pedestrians with multi-use paths, greenways or trails, and

[2] A specified distance from population centres; trail subtype includes some protected rougher trails.

protected bicycle lanes. They are expected to have moderate volume use by long-distance riders as well as residents.

6. Trails categorized as **Wilderness/Rural Long-Distance On-Road Route** are long-distance, on-road routes located outside of urban, medium or small population centres, and in limited development or agricultural areas. These trails have very limited to no specific accommodations for bicycles, except perhaps roadway shoulders. They are expected to have medium to low volume use, mostly by long-distance riders, and even more limited use by residents.
7. Trails categorized as **Wilderness/Rural Self-Sustained Long-Distance Route** are long-distance trails that are a mix of on-road and protected trails. They are far outside of any population centres in wilderness areas and typically lack specific accommodations for bicycles, except rougher trails and perhaps roadway shoulders. These trails are expected to have very low volume use, mostly by long distance self-sustained riders, and they offer a greater variety of topographic change.

Roughly 80 percent of the 19,000 kilometres of the Trans Canada Trail included in this study are in rural or wilderness areas, while 14 percent run through small or medium-sized cities. The remaining 6 percent are situated in urban locations.

Figure 1.3: Trans Canada Trail Typology by Province and Territory in Kilometres

	Large Cities		Small/Medium Cities		Rural/Wilderness			
	1	2	3	4	5	6	7	Total
Alberta	122	15	182	65	443	629	822	2,278
British Columbia	116	47	182	121	1,113	562	900	3,041
Manitoba	58	26	170	94	777	590		1,715
New Brunswick	24	-	111	64	277	255		731
Newfoundland and Labrador	29	-	52	23	756	23		883
Northwest Territories	-	-	24	1	45	27	688	785
Nova Scotia	17	9	182	50	868	224	50	1,400
Nunavut†	-	-	-	-	-	-	-	-
Ontario	259	112	428	313	1,077	1,120		3,309
Prince Edward Island	-	-	24	2	436			462
Quebec	224	27	279	88	531	127	136	1,412
Saskatchewan	43	0	96	45	207	638	492	1,521
Yukon	-	-	16	-	128	48	1,272	1,464
Total	**893**	**236**	**1,745**	**867**	**6658**	**4243**	**4,359**	**19,001**
Percent	**5%**	**1%**	**9%**	**5%**	**35%**	**22%**	**23%**	

Source: Trans Canada Trail (2023), NV5 (2023), Econsult Solutions, Inc (2023)
† The sections of the Trans Canada Trail within Nunavut did not match the typologies examined in this analysis and were therefore excluded.

Sections 2 through 4 of this methodology report provide a comprehensive benefits analysis of the Trans Canada Trail. Section 5 of the report examines case studies of the Trans Canada Trail using the trail typologies outlined above. Factors such as location and typology were considered in the selection process.

1.4. Organization of Report

This report analyzes the potential environmental, public health and economic impacts of the Trans Canada Trail, and is organized as follows:

- **Section 2: Environmental Benefits of the Trans Canada Trail:** quantifying the benefits associated with preserving the tree cover and green infrastructure along the network.
- **Section 3: Public Health Benefits of the Trans Canada Trail:** valuing the benefits associated with users increasing their physical activity, time outdoors and fitness due to the presence of the network.
- **Section 4: Economic Benefits of Spending by Trail Users:** calculating the potential spending generated due to trail users, particularly spending that supports local businesses.

2. Environmental Benefits of the Trans Canada Trail

Trail networks such as the Trans Canada Trail provide environmental benefits for the communities they serve, by bolstering natural resource management through active environmental conservation efforts. Trail networks help to preserve the surrounding natural environment, which otherwise may be at risk for development or further loss of natural lands. The natural lands adjacent to trail networks provide regulating environmental services such as air pollution removal, the provision of gas and climate regulation, water regulation and supply, soil formation and erosion control, and more.

These combined benefits create ecosystem functions that would require costly measures to replicate if lost. Trail networks bols benefits ter natural resource management by preserving open space and active environmental conservation efforts. If designed in ways that are mindful of existing ecosystems, the upkeep of the Trans Canada Trail will ensure that the value of the services from the ecosystems are retained. If these ecosystems were removed, local, provincial, territorial and national governing bodies would incur additional costs to recoup their value.

Based on our trail typologies reviewed above, only trails that were categorized as typology 1 through 4 were included in this analysis. Trails categorized as typology 5 through 7, located in rural and wilderness areas, were excluded from this analysis as the ecosystem surrounding the Trail is likely to be preserved in the absence of the Trail. By focusing solely on the environmental benefits of the ecosystem that are protected and exist because of the Trail network, we can better determine the overall impact of the Trail system.

2.1. Methodology

To quantify environmental services impacts, ESI calculated the total land cover variation for the network (including trails categorized as typologies 1 through 4) and applied the values associated with each of the ecosystem services available within proximity to the sections in the urbanized and suburban trail typologies. First, the hectarage of ecosystem types within a 15-metre buffer of the Trans Canada Trail network was determined using land cover imagery from the 2020 Canadian Land Cover file from the Canada Centre for Remote Sensing (CCRS).[3] Trail sections classified as Wilderness/Rural (typologies 5 through 7), were excluded from the analysis, as the Trail likely does not play a role in protecting the natural habitats in these environments. With these segments excluded, the per-hectare environmental benefits of each ecosystem were multiplied by the total hectarage of each ecosystem to calculate total environmental services benefits. Dollar values approximating the economic value of each of these services are based on the Costanza and Groot 2014 study,[4] detailing the changes in global value of ecosystem services. Ecosystem values from the 2014 study were adjusted for inflation and converted into Canadian dollars. This paper serves as an updated expansion of the authors' seminal 1997 analysis, *The Value of the World's Ecosystem Services and Natural Capital.*[5] These total value estimates represent

[3] Natural Resources Canada. Canada Centre for Remote Sensing. *2020 Land Cover of Canada* (2020).
[4] Robert Costanza, Rudolf de Groot, Paul Sutton, Sander van der Ploeg, Sharolyn J. Anderson, Ida Kubiszewski, Stephen Farber, R. Kerry Turner, *Changes in the global value of ecosystem services, Global Environmental Change*, Volume 26, 2014, Pages 152–158, ISSN 0959-3780
[5] Costanza, R., d'Arge, R., de Groot, R. *et al. The value of the world's ecosystem services and natural capital*. *Nature* 387, 253–260 (1997). https://doi.org/10.1038/387253a0

the costs avoided by not having to artificially replicate the ecosystem services currently provided by the Trans Canada Trail.

2.2. Analysis of Trans Canada Trail's Environmental Services Impact

The ecosystem services surrounding a trail include benefits such as gas and carbon sequestration, extreme weather protection, ground water supply, soil formation and erosion control, nutrient benefits, stormwater management, invasive species control and wildlife corridor services. It should be noted that some types of landscapes are more valuable than others for a particular type of benefit: air pollution removal and carbon sequestration are primarily a function of wetlands and tree cover, while wetlands are major drivers of water supply, water quality and flood mitigation benefits. Thus, the upkeep of the Trail network ensures the ecosystems are protected, providing significant benefits.

While many trails within the network are paved, the ecosystems surrounding the trail (within 15 metres) generate ecosystem services benefits, which will be protected by the existence and upkeep of the Trail network. In sum, the ecosystem services and environmental benefits within 15 metres of the Trail network are $82.2 million in annual benefits. The following subsections provide additional detail on the calculations of these ecosystem services and their total cost-savings impacts.[6]

Gas and Carbon Sequestration

Protected and preserved spaces mitigate the impacts of climate change by sequestering and storing atmospheric carbon from carbon dioxide, methane and other greenhouse gases. Vegetated areas and water sources work to regulate atmospheric chemical compositions such as ozone and sulphur oxides, that can be harmful to humans at above-normal levels. Carbon storage is an estimate of the total amount of carbon stored in the existing biomass of vegetation, both above and below ground, as well as fresh and saltwater sources. In other words, if the carbon currently stored in vegetation and water along protected trails were released into the air, it would cause damages that would require significant mitigation costs, such as damages to agricultural productivity, human health and property. Additionally, ecosystems within the Trans Canada Trail network are estimated to save $14.1 million in damages caused by climate change. In other words, if carbon currently stored within the trail network were released into the air, it would cause climate change damages that will cost approximately $14.1 million, or $3,773 per kilometre analyzed, to mitigate.[7]

[6] The potential environmental services and ecosystem service benefits quantifies and measures only a portion of the benefits ecosystems provide. There are many more functions that ecosystems provide that include but are not limited to water temperature regulation, climate change mitigation and more.
[7] 3,741 kilometres of trail were analyzed throughout this section.

Figure 2.1: Gas and Carbon Sequestration Benefits

Province/Territory	Benefit ($000s)
Alberta	$1,428
British Columbia	$1,762
Manitoba	$1,302
New Brunswick	$712
Newfoundland and Labrador	$360
Northwest Territories	$68
Nova Scotia	$756
Nunavut†	-
Ontario	$4,392
Prince Edward Island	$119
Quebec	$2,375
Saskatchewan	$798
Yukon	$45
Total	**$14,117**

Source: Costanza and Groot (2014), Natural Resources Canada (2020), Trans Canada Trail (2023), Econsult Solutions, Inc. (2023)
† The sections of the Trans Canada Trail within Nunavut did not match the typologies examined in this analysis and were therefore excluded.

Extreme Weather Protection

Ecosystems along the Trail network, especially wetlands, provide a protective barrier in the face of extreme weather events. These preserved areas provide storm protection, flood control, drought recovery and other mitigating responses to environmental fluctuations. Many natural landscapes serve as a buffer protecting people and properties from destructive natural events. The absorptive capacity of vegetated land helps to mitigate the risk of flood during storm events by trapping and containing stormwater. In the absence of this natural service and/or natural control measures for environmental disturbances, residents and governments would be forced to undertake costly measures to protect the built environment from further damage as a result of flooding, and significant investments would need to be made to mitigate the impacts of extreme weather events. Extreme weather protection services rendered by the Trans Canada Trail network provide approximately $1.7 million in benefits annually, or $447 per kilometre analyzed.

Figure 2.2: Extreme Weather Protection Benefits

Province/Territory	Benefit ($000s)
Alberta	$224
British Columbia	$9
Manitoba	$568
New Brunswick	$150
Newfoundland and Labrador	$210
Northwest Territories	$59
Nova Scotia	$20
Nunavut†	-
Ontario	$261
Prince Edward Island	$2
Quebec	$96
Saskatchewan	$74
Yukon	$0
Total	**$1,673**

Source: Costanza and Groot (2014), Natural Resources Canada (2020), Trans Canada Trail (2023), Econsult Solutions, Inc. (2023)
† The sections of the Trans Canada Trail within Nunavut did not match the typologies examined in this analysis and were therefore excluded.

Groundwater Supply

Various ecosystems, including forests, grasslands, wetlands, lakes and rivers, provide vital water regulation and supply services. The soil of undeveloped land stores water and replenishes streams, reservoirs and aquifers. This natural system provides the continuous recharge of groundwater and streams, while naturally filtering water supplies. Forests and wetlands are particularly productive land covers for water provision. These ecosystems work to provide residential, agricultural and industrial areas with adequate supplies of water. In sum, the buffer set around the Trans Canada Trail network will generate approximately $9.4 million, roughly $2,525 per kilometre analyzed, from groundwater supply services.

Figure 2.3: Groundwater Supply Benefits

Province/Territory	Benefit ($000s)
Alberta	$1,157
British Columbia	$1,419
Manitoba	$875
New Brunswick	$632
Newfoundland and Labrador	$312
Northwest Territories	$133
Nova Scotia	$468
Nunavut†	-
Ontario	$2,564
Prince Edward Island	$33
Quebec	$1,515
Saskatchewan	$280
Yukon	$60
Total	**$9,448**

Source: Costanza and Groot (2014), Natural Resources Canada (2020), Trans Canada Trail (2023), Econsult Solutions, Inc. (2023)
† The sections of the Trans Canada Trail within Nunavut did not match the typologies examined in this analysis and were therefore excluded.

Soil Formation and Erosion Control

Grasslands, wetlands and forests work to both form soil and prevent its runoff. Soil formation is a valuable process that creates more habitable and arable land, increasing its usage value. Simultaneously, these environments help prevent costly soil and particulate runoff. Loss of soil from wind, runoff or flooding creates significant cleanup costs and results in costly ecosystem disruption. In the absence of these natural soil formation and erosion control services, governments would be forced to pay for alternative soil control methods. In sum, the services provided by the Trans Canada Trail network generate approximately $2.6 million annually, roughly $690 per kilometre analyzed, in soil formation and erosion control.

Figure 2.4: Soil Formation and Erosion Control Benefits

Province/Territory	Benefit ($000s)
Alberta	$264
British Columbia	$169
Manitoba	$591
New Brunswick	$171
Newfoundland and Labrador	$165
Northwest Territories	$47
Nova Scotia	$132
Nunavut†	-
Ontario	$617
Prince Edward Island	$26
Quebec	$278
Saskatchewan	$121
Yukon	$2
Total	**$2,583**

Source: Costanza and Groot (2014), Natural Resources Canada (2020), Trans Canada Trail (2023), Econsult Solutions, Inc. (2023)
† The sections of the Trans Canada Trail within Nunavut did not match the typologies examined in this analysis and were therefore excluded.

Nutrient Cycling

Protected and preserved natural environments ensure the maintenance of healthy nutrient cycling. Nitrogen fixing and other nutrient cycles provide natural soil fertilization benefits that are essential to plant life cycles. Forests and wetlands help preserve that natural equilibrium of nutrient cycles. In sum, the services provided by the Trans Canada Trail network generate approximately $614,000 annually, roughly $164 per kilometre, in soil formation benefits.

Figure 2.5: Nutrient Cycling Benefits

Province/Territory	Benefit ($000s)
Alberta	$46
British Columbia	$31
Manitoba	$98
New Brunswick	$49
Newfoundland and Labrador	$43
Northwest Territories	$11
Nova Scotia	$66
Nunavut†	-
Ontario	$156
Prince Edward Island	$1
Quebec	$95
Saskatchewan	$14
Yukon	$4
Total	**$614**

Source: Costanza and Groot (2014), Natural Resources Canada (2020), Trans Canada Trail (2023), Econsult Solutions, Inc. (2023)
† The sections of the Trans Canada Trail within Nunavut did not match the typologies examined in this analysis and were therefore excluded.

Stormwater Management

Forests, rivers, lakes and wetlands provide a natural protective buffer between human activities and watersheds. This service is driven largely by the proportion of forests and wetland located along the Trail network. These ecosystems filter and stop several types of waste, including pathogens, excess nutrients, metals and sediments, from entering watersheds. In the absence of these natural filtration services, local governments would be forced to pay for alternative groundwater filtration or stormwater treatment methods. In sum, the services provided by the Trans Canada Trail network generate approximately $42 million annually, roughly $11,323 per kilometre, in stormwater management benefits.

Figure 2.6: Stormwater Management Benefits

Province/Territory	Benefit ($000s)
Alberta	$5,598
British Columbia	$477
Manitoba	$13,920
New Brunswick	$3,731
Newfoundland and Labrador	$5,105
Northwest Territories	$1,425
Nova Scotia	$645
Nunavut†	-
Ontario	$6,909
Prince Edward Island	$58
Quebec	$2,650
Saskatchewan	$1,844
Yukon	$10
Total	**$42,372**

Source: Costanza and Groot (2014), Natural Resources Canada (2020), Trans Canada Trail (2023), Econsult Solutions, Inc. (2023)
† The sections of the Trans Canada Trail within Nunavut did not match the typologies examined in this analysis and were therefore excluded.

Invasive Species Control

Invasive species control includes services rendered by wetlands, forests and, to a certain extent, cultivated areas. The natural dynamic regulation (in respect to the wetlands and forests) and the managed regulation (in respect to the cultivated areas) of species population, including invasive species, pests, predators and weeds helps to maintain a healthy ecosystem, in turn supporting the other ecosystem benefits outlined in this report. In total, invasive species control services are responsible for approximately $1.2 million in ecological benefits across the analyzed Trail network, equating to $330 per kilometre.

Figure 2.7: Invasive Species Control Benefits

Province/Territory	Benefit ($000s)
Alberta	$75
British Columbia	$94
Manitoba	$118
New Brunswick	$89
Newfoundland and Labrador	$57
Northwest Territories	$14
Nova Scotia	$169
Nunavut†	-
Ontario	$356
Prince Edward Island	$4
Quebec	$227
Saskatchewan	$22
Yukon	$9
Total	**$1,234**

Source: Costanza and Groot (2014), Natural Resources Canada (2020), Trans Canada Trail (2023), Econsult Solutions, Inc. (2023)
† The sections of the Trans Canada Trail within Nunavut did not match the typologies examined in this analysis and were therefore excluded.

Wildlife Corridor

The Trail network serves as habitats for a diverse array of plants and animals. Forests, grasslands and wetlands harbour species that are valuable for both aesthetic and functional purposes. Wetlands provide vital habitats that help preserve the genetic diversity of an area. Genetic diversity is crucial in ensuring the stability and resiliency of plant and animal populations. In sum, the wildlife corridors located within the buffer zone of the Trans Canada Trail will have an estimated annual value of $10.1 million, or approximately $2,711 per kilometre analyzed.

Figure 2.8: Wildlife Corridor Benefits

Province/Territory	Benefit ($000s)
Alberta	$1,244
British Columbia	$756
Manitoba	$1,997
New Brunswick	$722
Newfoundland and Labrador	$781
Northwest Territories	$218
Nova Scotia	$709
Nunavut†	-
Ontario	$2,134
Prince Edward Island	$13
Quebec	$1,153
Saskatchewan	$377
Yukon	$40
Total	**$10,144**

Source: Costanza and Groot (2014), Natural Resources Canada (2020), Trans Canada Trail (2023), Econsult Solutions, Inc. (2023)
† The sections of the Trans Canada Trail within Nunavut did not match the typologies examined in this analysis and were therefore excluded.

Total Ecosystem Service Benefits

The combination of all the previously mentioned ecosystem services (gas and carbon sequestration, extreme weather protection, ground water supply, soil formation and erosion control, nutrient benefits, stormwater management, invasive species control and wildlife corridor services) have the cumulative impact of $82.2 million in cost avoidance. This translates to $21,963 per kilometre analyzed.

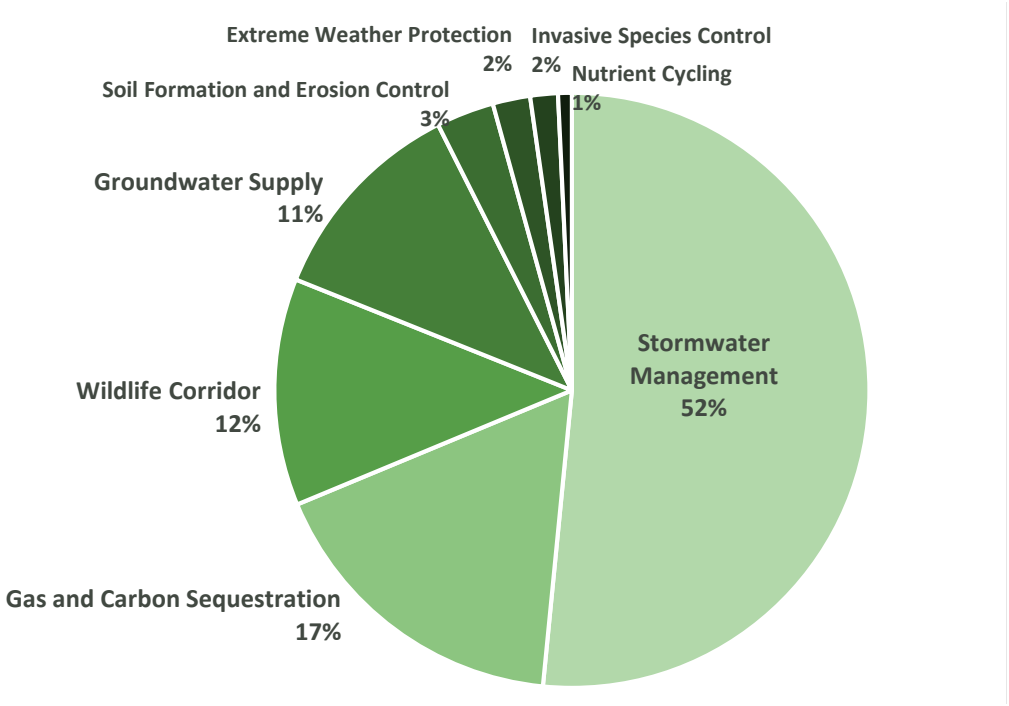
Figure 2.9: Total Ecosystem Services Benefit by Province

Province/Territory	Benefit ($000s)
Alberta	$10,036
British Columbia	$4,717
Manitoba	$19,469
New Brunswick	$6,256
Newfoundland and Labrador	$7,033
Northwest Territories	$1,975
Nova Scotia	$2,965
Nunavut†	-
Ontario	$17,389
Prince Edward Island	$256
Quebec	$8,389
Saskatchewan	$3,530
Yukon	$170
Total	**$82,185**

Source: Costanza and Groot (2014), Natural Resources Canada (2020), Trans Canada Trail (2023), Econsult Solutions, Inc. (2023)
† The sections of the Trans Canada Trail within Nunavut did not match the typologies examined in this analysis and were therefore excluded.

As a portion of the total ecosystem benefits of the Trans Canada Trail network, the greatest value of cost of services avoided is from the natural stormwater management services provided. This is largely due to the beneficial impact of the marsh and wetland ecosystems surrounding the Trail.

Figure 2.10: Total Ecosystem Services Benefit by Benefit Type



Source: Costanza and Groot (2014), Natural Resources Canada (2020), Trans Canada Trail (2023), Econsult Solutions, Inc. (2023)

3. Public Health Benefits of the Trans Canada Trail

The Trans Canada Trail supports healthy lifestyles for Canadians by providing an easily accessible and low-cost option for residents and visitors to engage in physical activity. Physically active people typically enjoy a variety of physical and mental health benefits, including lower incidence of cardiovascular diseases, type 2 diabetes, certain cancers, obesity, anxiety, stress, depression and mood disorders, compared to their sedentary counterparts. Additionally, physically active individuals tend to achieve higher rates of productivity at work. This section estimates health-related cost savings associated with the network's physically active users.

3.1. Estimated Active Users of the Trans Canada Trail

ESI used data from Stats Canada, the Trans Canada Trail-funded Léger survey and Esri Business Analyst to quantify the total active adult population that is active due to the use of the Trans Canada Trail network. In order to analyze the population of interest for the Trans Canada Trail, the population base was determined to include adults residing within a 100-kilometre buffer of the Trail. According to the *Canadian 24-Hour Movement Guidelines for Adults*, individuals who engage in at least 150 minutes of moderate to vigorous aerobic physical activity per week meet the minimum level of physical activity required for health benefits.[8]

Three Léger survey questions were used to assess the number of Canadians meeting the physically active definition through Trans Canada Trail usage:

- *Do you use trails for physical activity?*
- *How often do you use trails?*
- *How many hours do you spend on trails each time you use them?*

Respondents were included as "active" if they responded that they use trails for physical activity "more than once a week" for at least two hours or if they use trails "about once a week" for half a day or more. Additionally, half of the respondents that indicated they use trails "more than once a week" for "one hour or less" were considered active as well as half of the respondents that use trails "about once a week" for "two to three hours."[9] **Given these parameters, it is estimated that the Trans Canada Trail supports roughly 2.6 million active residents, or 8 percent of the adult population** (see Figure 3.1).

[8] https://csepguidelines.ca/guidelines/adults-18-64/
[9] The 50% calculation was used to accommodate for the survey design and estimate the number of people reaching the minimum threshold of 150 minutes of activity.

Figure 3.1: Estimated Number of Users Meeting Physical Activity Requirement Due to the Trans Canada Trail

Province	Adults 18+	Number of People Using the Trail for Exercise	Percent of Adult Population Regularly Exercising on Trail
Alberta	3,553,200	324,400	9%
British Columbia	4,430,900	335,100	8%
Manitoba	1,097,100	48,400	4%
New Brunswick	673,300	32,600	5%
Newfoundland and Labrador	441,500	22,700	5%
Nova Scotia	851,100	49,800	6%
Ontario	12,334,100	1,045,400	8%
Prince Edward Island	140,100	8,200	6%
Quebec	7,078,700	669,300	9%
Saskatchewan	919,600	38,800	4%
Total	**31,519,600**	**2,574,700**	**8%**

Source: Stats Canada (2023), Econsult Solutions, Inc. (2023), Léger (2023)

3.2. How Trail Networks Lead to Positive Public Health Outcomes

To quantify the health benefits for users, this section measures the impacts of frequent network users who are considered active due to their trail usage. ESI used data from Trans Canada Trail's annual survey of users as well as research from Stats Canada to estimate the number of users meeting the physical activity requirement due to the Trans Canada Trail (see Figure 3.1 above). Measures from the study Janssen, "Health Care Costs of Physical Inactivity in Canadian Adults," from the *Journal of Applied Physiology, Nutrition, and Metabolism*, were used to quantify the estimated value of an active lifestyle.[10] These measures were used as the basis for estimating the potential savings in the form of healthcare costs that are avoided as a result of physical activity on the Trail network.

Furthermore, the health benefits achieved by physically active individuals are associated with benefits in terms of workplace productivity. Physically active workers tend to have lower rates of absenteeism (employees missing work) compared to their physically inactive counterparts.[11] Lost productive work hours due to absenteeism represent direct costs associated with physical inactivity. Using the approach established in Chenoweth and Bortz, *Physical Inactivity Cost Calculator*, the productivity cost savings realized by estimated number of workers who meet the recommended levels of physical activity by using the Trans Canada Trail are quantified.[12]

Finally, time spent outdoors and in nature has been shown to have a variety of health benefits, including mental health benefits such as stress and anxiety reduction. ESI used data from Trans Canada Trail's annual survey to estimate the number of users that are using the Trail frequently for mental health

[10] Health care costs of physical inactivity in Canadian adults (cdnsciencepub.com)
[11] Chenoweth and Leutzinger (2006), *The Economic Cost of Physical Inactivity and Excess Weight in American Adults*. https://www.huffinesinstitute.org/Portals/0/Chenoweth_JPAH_3_06.pdf and Chenoweth and Bortz (2005), *Physical Inactivity Cost Calculator: How the Physical Inactivity Cost Calculator Was Developed*.
[12] Chenoweth and Bortz (2005), *Physical Inactivity Cost Calculator: How the Physical Inactivity Cost Calculator Was Developed*.

purposes. Measures from the study *Spending at Least 120 Minutes a Week in Nature is Associated with Good Health and Wellbeing* were then employed to quantify the percent improvement in overall well-being from time spent on the Trail.[13] These improvements in overall well-being are then monetized using average healthcare costs for anxiety and mood disorders from the study *The Life and Economic Impact of Major Mental Illnesses in Canada*.[14]

Physical Health Benefits Achieved by Active Users of the Trans Canada Trail

Trail users who achieve physically active lifestyles due to the Trans Canada Trail yield a range of personal health benefits as well as broader public health benefits for Canada. Physically active lifestyles are linked to positive health outcomes including reduced risk of chronic diseases, improved mental health and reduced prevalence of rheumatic conditions and injury.[15] These positive individual outcomes yield public health value by reducing strain on the health system and lowering overall healthcare costs.

The economic value of these health benefits can be quantified in terms of the healthcare costs avoided by physically active users. ESI developed estimates of the potential healthcare cost reductions achieved by active users of the network. These estimates were developed by applying potential healthcare expenditure savings per active individual ($651 per user annually) from the Janssen study. It is estimated that physically active users of the existing network could achieve annual healthcare cost savings of approximately $1.7 billion per year.

Figure 3.2: Estimated Value of Healthcare Savings from Active Users in the Study Area

Province	Adults 18+	Number of People Using the Trail for Exercise	Percent of Adult Population Regularly Exercising on the Trail	Estimated Health Care Savings of Physical Active Adults ($M)	Benefit per Kilometre
Alberta	3,553,230	324,400	9.1%	$211.3	$93,000
British Columbia	4,430,870	335,100	7.6%	$218.3	$72,000
Manitoba	1,097,090	48,400	4.4%	$31.5	$18,000
New Brunswick	673,260	32,600	4.8%	$21.2	$29,000
Newfoundland and Labrador	441,540	22,700	5.1%	$14.8	$17,000
Nova Scotia	851,060	49,800	5.9%	$32.4	$23,000
Ontario	12,334,050	1,045,400	8.5%	$680.9	$206,000
Prince Edward Island	140,080	8,200	5.9%	$5.3	$12,000
Quebec	7,078,730	669,300	9.5%	$436.0	$309,000
Saskatchewan	919,610	38,800	4.2%	$25.3	$17,000
Total	**31,519,520**	**2,574,700**	**8.1%**	**$1,677.0**	**$88,000**

[13] Spending at Least 120 Minutes a Week in Nature is Associated with Good Health and Wellbeing | Scientific Reports
[14] Mental Health Commission of Canada. (2012). Changing directions, changing lives: The mental health strategy for Canada - A base for action. https://www.mentalhealthcommission.ca/wp-content/uploads/drupal/MHCC_Report_Base_Case_FINAL_ENG_0_0.pdf.
[15] Saunders, T. J., Gray, C. E., Poitras, V. J., Chaput, J.-P., Janssen, I., Katzmarzyk, P. T., Olds, T., & Tremblay, M. S. (2017). Combinations of physical activity, sedentary behaviour and sleep: Relationships with health indicators in school-aged children and youth. Applied Physiology, Nutrition, and Metabolism, 42(10), S283-S293. https://doi.org/10.1139/apnm-2017-0346

Source: Stats Canada (2023), Econsult Solutions, Inc. (2023), Léger (2023), Janssen (2012)

Productivity Benefits Achieved by Active Users of the Trans Canada Trail

To quantify productivity in the workplace, a series of steps are taken to estimate the number of physically active workers supported by the network. The approach to this estimation is consistent with the methodology used in Section 3.2; however, data from Stats Canada tracking the number of *workers* within each province is used.[16] As outlined in Figure 3.3 below, it is estimated that the Trans Canada Trail supports 1.56 million physically active workers.

Figure 3.3: Estimated Number of Workers Meeting Physical Activity Requirement Due to the Trans Canada Trail

Province	Working Adults 18+	Number of Workers Using the Trail for Exercise
Alberta	2,388,600	208,600
British Columbia	2,765,000	201,900
Manitoba	676,300	28,500
New Brunswick	372,500	17,400
Newfoundland and Labrador	235,800	11,700
Nova Scotia	483,200	27,300
Ontario	7,743,700	631,400
Prince Edward Island	85,100	4,800
Quebec	4,439,000	404,800
Saskatchewan	581,000	23,400
Total	**19,770,200**	**1,559,800**

Source: Stats Canada (2023), Econsult Solutions, Inc. (2023), Léger (2023)

The approach established in Chenoweth and Bortz, *Physical Inactivity Cost Calculator*, presents productivity cost calculations in terms of the annual average costs per worker associated with physical inactivity. The benefits calculated in this section should, therefore, be thought of as the costs that are avoided by workers using the network in the region to meet recommended levels of physical activity and the associated health and productivity benefits. Average number of hours lost from absenteeism due to physical inactivity are drawn from the Chenoweth and Bortz study.[17] These inputs are used to estimate the corresponding share of a typical employee's annual workload lost due to absenteeism associated with physical inactivity (see Figure 3.4).[18] It is estimated that, in aggregate, workers who maintain recommended levels of physical activity using the Trans Canada Trail could achieve roughly $619 million in annual productivity cost savings, due to reduced levels of absenteeism.

[16] Active workers (rather than working-age residents) are considered in this portion of the analysis because the productivity savings calculated are achieved by employed residents only.
[17] Chenoweth and Bortz (2005), *Physical Inactivity Cost Calculator: How the Physical Inactivity Cost Calculator Was Developed*.
[18] A typical employee's scheduled annual workload is assumed to be 2,000 hours.

Figure 3.4: Workplace Productivity Cost Savings from Absenteeism Achieved by Active Users (in $M)

Province	Employed Adults 18+	Number of Workers Using the Trail for Exercise	Est. Savings from Physically Active Workers	Benefit per Kilometre
Alberta	2,388,600	208,600	$89.2	$39,000
British Columbia	2,765,000	201,900	$79.8	$26,000
Manitoba	676,300	28,500	$10.9	$6,000
New Brunswick	372,500	17,400	$6.4	$9,000
Newfoundland and Labrador	235,800	11,700	$4.2	$5,000
Nova Scotia	483,200	27,300	$10.0	$7,000
Ontario	7,743,700	631,400	$249.4	$75,000
Prince Edward Island	85,100	4,800	$1.8	$4,000
Quebec	4,439,000	404,800	$158.4	$112,000
Saskatchewan	581,000	23,400	$9.5	$6,000
Total	**19,770,200**	**1,559,800**	**$619.6**	**$33,000**

Source: Stats Canada (2023), Econsult Solutions, Inc. (2023), Léger (2023), Chenoweth and Bortz (2005)

Mental Health Benefits Achieved by Active Users of the Trans Canada Trail

According to *The Life and Economic Impact of Major Mental Illnesses in Canada,* it is estimated approximately 11.6 percent of the Canadian population is impacted by anxiety and mood disorders. However, the study *Spending at Least 120 Minutes a Week in Nature is Associated with Good Health and Wellbeing* found that spending time outdoors and in nature has a statistically significant impact on individuals' overall sense of well-being. The first step in assessing how the Trans Canada Trail can lead to mental health benefits and cost savings is to estimate the number of users that are using the Trail frequently for mental health purposes.

For each province, 11.6 percent of the adult population was used as the starting population ("Adults facing Anxiety and Mood Disorders").

From here, four survey questions were used to estimate the number of Canadians meeting the 120-minute threshold per week for mental health through Trans Canada Trail usage.

- *Do you use trails?*
- *Do you use trails for mental health purposes?*
- *How often do you use trails?*
- *How many hours do you spend on trails each time you use them?*

Respondents were included as "facing anxiety and mood disorders and frequently using trails for mental health purposes" if they responded that they use trails for mental health reasons "more than once a week" for at least two hours or if they use trails "about once a week" for half a day or more. Additionally, half of the respondents that indicated they use trails "more than once a week" for "one hour or less" were considered physically active as well as half of the respondents that use trails "about

once a week" for "two to three hours."[19] Given these parameters, it is estimated that the Trans Canada Trail supports roughly 351,400 adults using the Trail frequently for mental health purposes, or roughly 1 percent of the adult population (see Figure 3.5).

Figure 3.5: Estimated Number of Users with Anxiety or Mood Disorders Who Are Using the Trans Canada Trail for Mental Health Benefits

Province	Adults Facing Anxiety & Mood Disorders	Percent Using the Trail for Mental Health	Population Using the Trail for Mental Health	Percent Using the Trail Frequently for Mental Health	Population Frequently Using the Trail for Mental Health
Alberta	372,100	35.5%	132,100	25.3%	33,400
British Columbia	455,500	40.2%	183,100	25.3%	46,400
Manitoba	119,300	35.5%	42,400	25.3%	10,700
New Brunswick	64,700	39.5%	25,600	25.3%	6,500
Newfoundland and Labrador	45,100	39.5%	17,800	25.3%	4,500
Nova Scotia	98,700	39.5%	39,000	25.3%	9,900
Ontario	1,396,000	41.7%	581,800	25.3%	147,300
Prince Edward Island	16,200	39.5%	6,400	25.3%	1,600
Quebec	762,700	43.5%	332,000	25.3%	84,000
Saskatchewan	95,700	29.2%	28,000	25.3%	7,100
Total	**3,426,000**		**1,388,200**		**351,400**

Source: Stats Canada (2023), Econsult Solutions, Inc. (2023), Léger (2022)
Columns may not sum due to rounding.

The study *Spending at Least 120 Minutes a Week in Nature is Associated with Good Health and Wellbeing* found that spending roughly 120–179 minutes in nature was associated with 23 percent greater odds (1.23 odds ratio) of having a "high" level of well-being compared to Canadians who spent no time in nature. This odds ratio, while statistically significant, had a relatively large confidence interval [1.08, 1.40].[20] To ensure a conservative estimate, ESI used the lower confidence interval of 1.08 (or 8 percent greater odds of having a "high" level of well-being, all else equal) when estimating the mental health benefits of frequent trail usage.

Given this odds ratio, ESI estimates the number of users that have increased odds of "high" well-being due to their frequent usage of the Trail. In total, it is estimated that roughly 28,000 Canadians per year have "high" well-being due to their frequent usage of the trail. To quantify these impacts, the total estimated annual direct costs of mood and anxiety disorders from *The Life and Economic Impact of Major Mental Illnesses in Canada* study were used. Annual physician visits ($344), psychiatrist/psychologist visits ($1,400) and prescription drug costs ($482) per capita were included in the total cost of anxiety and mood disorders ($2,226 annually). **Together, it is estimated that the Trans Canada Trail affords Canadians $62.6 million in mental healthcare savings annually.**

[19] The 50 percent calculation was used to accommodate for the survey design and estimate the number of people reaching the minimum threshold of 150 minutes of activity.
[20] Zhang, Y., Pan, X.-F., Chen, J., Xia, L., Cao, A., Wang, J., Wu, Y., & Tang, J.-L. (2019). Combined lifestyle factors and risk of incident cardiovascular disease and diabetes in Chinese adults: A population-based cohort study. *Heart*, 105(9), 686–692. https://doi.org/10.1136/heartjnl-2018-314253

Figure 3.6: Estimated Value of Mental Healthcare Savings from Trans Canada Trail Users

Province	Adults Facing Anxiety and Mood Disorders and Frequently Using the Trail for Mental Health	Increased Odds of "High" Well-Being with Sufficient Time in Nature	Potential Number of People with Decreased Self-Reported Mood and Anxiety Issues	Costs per Case	Costs Savings ($M)	Benefit per km
Alberta	33,400	8.0%	2,700	$2,226	$6.0	$3,000
British Columbia	46,400	8.0%	3,700	$2,226	$8.3	$3,000
Manitoba	10,700	8.0%	900	$2,226	$1.9	$1,000
New Brunswick	6,500	8.0%	500	$2,226	$1.2	$2,000
Newfoundland and Labrador	4,500	8.0%	400	$2,226	$0.8	$1,000
Nova Scotia	9,900	8.0%	800	$2,226	$1.8	$1,000
Ontario	147,300	8.0%	11,800	$2,226	$26.2	$8,000
Prince Edward Island	1,600	8.0%	100	$2,226	$0.3	$1,000
Quebec	84,000	8.0%	6,700	$2,226	$15.0	$11,000
Saskatchewan	7,100	8.0%	600	$2,226	$1.3	$1,000
Total	**351,400**		**28,100**		**$62.6**	**$3,000**

Source: Stats Canada (2023), Econsult Solutions, Inc. (2023), Léger (2022)
Columns may not sum due to rounding.

4. Economic Benefits of Spending by Trail Users

Above and beyond the environmental and public health benefits produced by the Trans Canada Trail, local spending by trail users also generates additional economic benefits for businesses located near the Trans Canada Trail. Residents and visitors who access the Trail often spend money on both goods and services related to active recreational activity during their trips, which generates additional economic activity in the regions surrounding the Trail and supports local jobs and businesses.

4.1. Methodology

The estimated economic outputs, jobs and employee compensation calculated in this study used inputs provided by Trans Canada Trail's Léger survey regarding local spending. Inputs were further reviewed by ESI for validation that they were reasonable expenditures. To quantify the local spending from trail users, ESI developed trail user profiles based on Canadians living within use-distance of a Trans Canada Trail section. A per-usage spending profile was created based on survey data from the Léger survey, which collected national data on general spending patterns of trail users for trails across Canada (including but not limited to the Trans Canada Trail). Survey respondents were asked several questions about their frequency of usage as well as their spending behaviour. Based on these responses, a spending profile was created for regular ("more than once a week"), frequent ("about once a week"), routine ("multiple times a month"), occasional ("about once a month"), and intermittent ("less than once a month") users of the Trail.[21]

Figure 4.1: Trail User Frequency by Province[22]

	Regular	Frequent	Routine	Occasional	Intermittent	Total Trail Users	Adult Population by Province	Percent Trail Users
Alberta	430,800	461,900	502,100	451,700	610,100	2,456,600	3,553,200	69.1%
British Columbia	508,200	433,400	443,100	764,700	722,000	2,871,400	4,430,900	64.8%
Manitoba	27,700	104,700	149,000	95,400	250,700	627,600	1,097,100	57.2%
New Brunswick	37,500	53,500	73,800	45,000	153,500	363,300	673,300	54.0%
Newfoundland and Labrador	26,100	37,300	51,500	31,400	107,000	253,300	441,500	57.4%
Nova Scotia	57,100	81,600	112,600	68,600	234,200	554,100	851,100	65.1%
Ontario	1,208,000	1,284,700	1,963,200	1,358,200	2,595,500	8,409,500	12,334,000	68.2%
Prince Edward Island	9,400	13,400	18,500	11,300	38,500	91,200	140,100	65.1%
Quebec	774,200	671,200	967,300	787,100	1,798,700	4,998,400	7,078,700	70.6%
Saskatchewan	22,200	84,000	119,600	76,500	201,200	503,500	919,600	54.8%
Total	**3,101,200**	**3,225,700**	**4,400,700**	**3,689,900**	**6,711,400**	**21,128,800**	**31,519,500**	**67.0%**

Source: Stats Canada (2023), Econsult Solutions, Inc. (2023)
Columns may not sum due to rounding.

[22] Yukon, Northwest Territories, and Nunavut excluded due to insufficient data and negligible estimated trail user population.

In addition to their trail usage frequency, survey respondents were asked if they spent money when on a trail outing, and if so, on what and how much. Figure 4.2 below shows the per trip spending profile for each type of user.

Figure 4.2: Trail Spending per Trip by User Frequency

	Regular	Frequent	Routine	Occasional	Intermittent
Accommodations	$19.21	$16.87	$19.61	$31.04	$16.23
Food	$16.67	$13.98	$18.04	$22.78	$7.41
Attractions	$7.13	$9.58	$6.46	$5.47	$2.45
Stores	$4.98	$5.96	$3.30	$6.36	$2.39
Other	$4.66	$0.66	$1.02	$2.01	$2.09
Total	**$52.64**	**$47.05**	**$48.43**	**$67.65**	**$30.57**

Source: Stats Canada (2023), Econsult Solutions, Inc. (2023),

ESI estimated the number of annual trail visits based on user frequency:

- Regular users are estimated to have an average of 50 spending trips per year,
- Frequent users are estimated to have an average of 35 spending trips per year,
- Routine users are estimated to have 20 spending trips per year,
- Occasional users are estimated to have 6 spending trips per year, and
- Intermittent users are estimated to have 1 spending trip per year.

Since many of the "regular" and "frequent" users are local, the number of trips with "Accommodations" spending was estimated as 6 for Regular users, 4 for Frequent users, 2 for Routine users and 1 for Occasional and Intermittent users. Together, the spending profile per trip by type of user, multiplied by the number of annual trips, generates the total trail spending by province for the Trans Canada Trail network. Figure 4.3 below breaks down spending by type and province. Based on these calculations, total spending is estimated to be $13 billion.

Figure 4.3: Trail Spending by Province ($M)

	Accommodations	Food	Attractions	Stores	Other	Total	Spending per km
Alberta	$124	$832	$390	$255	$128	$1,730	$0.76
British Columbia	$141	$905	$411	$277	$148	$1,882	$0.62
Manitoba	$23	$143	$68	$43	$14	$291	$0.17
New Brunswick	$15	$91	$43	$27	$12	$188	$0.26
Newfoundland and Labrador	$10	$64	$30	$19	$9	$131	$0.15
Nova Scotia	$22	$139	$65	$42	$19	$287	$0.21
Ontario	$387	$2,549	$1,166	$756	$373	$5,231	$1.58
Prince Edward Island	$4	$23	$11	$7	$3	$47	$0.10
Quebec	$226	$1,444	$656	$431	$229	$2,985	$2.11
Saskatchewan	$19	$115	$55	$34	$11	$233	$0.15
Total	**$971**	**$6,305**	**$2,894**	**$1,891**	**$945**	**$13,006**	**$0.68**

Source: Econsult Solutions, Inc (2023)

These direct expenditures by trail users support local businesses and generate spillover effects in the local and regional economy. In the next section, industry standard input-output modelling is used to model the economic impacts of this direct trail user spending.

4.2. Potential Annual Economic Impact from Trail User Spending

Input-output modelling was used to estimate the potential economic impacts by province and within Canada associated with this local spending by trail users. The modelled local direct expenditures associated with trail user spending on the Trail network generates approximately $23 billion in economic impact nationwide, supporting roughly 221,500 jobs and approximately $7 billion in wages annually.

Figure 4.4: Annual Economic Impact from Local Spending by Trail Users

	Output ($M)			Wages ($M)			Jobs		
	Direct	Indirect & Induced	Total	Direct	Indirect & Induced	Total	Direct	Indirect & Induced	Total
Alberta	$1,730	$1,200	$2,930	$630	$270	$900	21,100	5,300	26,500
British Columbia	$1,880	$1,360	$3,240	$640	$320	$960	23,000	7,700	30,700
Manitoba	$290	$160	$450	$100	$40	$130	3,900	900	4,800
New Brunswick	$190	$110	$290	$70	$20	$90	2,800	600	3,400
Newfoundland & Labrador	$130	$70	$200	$40	$20	$60	1,600	400	2,000
Nova Scotia	$290	$170	$460	$100	$40	$140	4,100	1,000	5,100
Ontario	$5,230	$4,610	$9,840	$1,850	$1,110	$2,960	66,800	23,300	90,100
Prince Edward Island	$50	$20	$70	$10	$0	$10	600	100	800
Quebec	$2,990	$2,280	$5,270	$1,060	$530	$1,590	41,300	12,800	54,200
Saskatchewan	$230	$130	$360	$80	$30	$110	3,300	700	4,000
Total	**$13,010**	**$10,100**	**$23,100**	**$4,580**	**$2,370**	**$6,950**	**168,600**	**52,900**	**221,500**

Source: Trans Canada Trail User Survey (2023), Econsult Solutions, Inc (2023), Stats Canada (2023)
Columns may not sum due to rounding.

Figure 4.5: Annual Economic Impact from Local Spending per Kilometre

	Output ($M)			Wages ($M)			Jobs		
	Direct	Indirect & Induced	Total	Direct	Indirect & Induced	Total	Direct	Indirect & Induced	Total
Alberta	$0.8	$0.5	$1.3	$0.3	$0.1	$0.4	9	2	12
British Columbia	$0.6	$0.4	$1.1	$0.2	$0.1	$0.3	8	3	10
Manitoba	$0.2	$0.1	$0.3	$0.1	$0.0	$0.1	2	1	3
New Brunswick	$0.3	$0.2	$0.4	$0.1	$0.0	$0.1	4	1	5
Newfoundland and Labrador	$0.1	$0.1	$0.2	$0.0	$0.0	$0.1	2	0	2
Nova Scotia	$0.2	$0.1	$0.3	$0.1	$0.0	$0.1	3	1	4
Ontario	$1.6	$1.4	$3.0	$0.6	$0.3	$0.9	20	7	27
Prince Edward Island	$0.1	$0.0	$0.2	$0.0	$0.0	$0.0	1	0	2
Quebec	$2.1	$1.6	$3.7	$0.8	$0.4	$1.1	29	9	38
Saskatchewan	$0.2	$0.1	$0.2	$0.1	$0.0	$0.1	2	0	3
Total	**$0.7**	**$0.5**	**$1.2**	**$0.2**	**$0.1**	**$0.4**	**9**	**3**	**12**

Source: Econsult Solutions, Inc (2023), Stats Canada (2023)

5. Appendix

5.1. Case Study Methodology

Overview

Due to the difference in availability of data and different geographic scope, different methodologies were developed to conduct the Health Benefits and Local Spending Analysis. For the Environmental Benefits analysis, the same methodology was used in both the case study and the national analysis.

Environmental Benefits

The geographic area of the case studies was determined through discussion between NV5 and Trans Canada Trail. In order to align the analysis with NV5's trail typologies, we used the same case study shapefiles in the Environmental Benefits section.

Using the case study shapefiles provided by NV5, environmental impacts were derived using the same method as the national environmental benefits analysis outlined in Section 2.1. The land cover variation for each case study (excluding trail sections categorized as typologies 5 through 7) was calculated using the land cover imagery from the 2020 Canadian Land Cover file from the Canada Centre for Remote Sensing (CCRS). The total estimated benefits for each case study were derived by multiplying the hectarage of each ecosystem and their respective ecosystem benefits values. Dollar values ($ CAD) approximating the economic value of each of these services are based on the Costanza and Groot 2014 study, detailing the changes in global value of ecosystem services. This paper serves as an updated expansion of the authors' seminal 1997 analysis, *The Value of the World's Ecosystem Services and Natural Capital.* These total value estimates represent the costs avoided by not having to artificially replicate the ecosystem services currently provided by the Trans Canada Trail.

Health Benefits

To calculate the health benefits for each case study, a mix of Propulso, Léger and Stats Canada data was used to determine (1) the number of regular adult trail users, (2) the number of employed regular adult trail users and (3) regular trail users gaining mental health benefits from the Trail. Cell phone data analyzed by Propulso, a Canadian data analytics company, was used to estimate the number of unique users, total visits and regular visitors within the case study trails.

In order to estimate the number of unique trail users reaching Canadian Health Guidelines recommendation for moderate to vigorous exercise, a combination of Propulso and Léger survey data was used. The number of unique visitors visiting more than ten times a year (Propulso) was multiplied by the national percent of "more than once a month" users using trails enough to meet physical fitness standards (Léger).

Once the number of users meeting recommended activity levels was determined, this number was multiplied by the derived cost per inactive Canadian adult. The cost of inactive Canadian adults was derived from the 2009 study, *Health Care Costs of Physical Inactivity in Canadian Adults*, from Ian Janssen and inflated to 2023 dollars.[23]

To calculate the benefits that workers would derive from decreased absenteeism, the province and territory level ratio of working age adults to all adults was applied to the 10+ visits user category from Propulso. Similar to the provincial calculations, the percentage of trail users who derive exercise benefits was applied to the estimated number of workers regularly using the Trail. Using the mean work hours lost to physical inactivity, as derived in the *How the Physical Inactivity Cost Calculator Was Developed* Study, and the median earning by province, we calculated the absenteeism productivity costs.

Similar to the province analysis, the number of users gaining mental health benefits was derived by applying the percentage of people using trails for mental health purposes (as self-reported in the survey), and for at least 120 minutes at one time to the number of regular users (Propulso). After determining the number of regular users using the Trail for mental health purposes, we estimated the number of people who had anxiety or mood disorders by applying the national percentage of people self-reporting these disorders. This number was calculated in *The Life and Economic Impact of Major Mental Illnesses in Canada,* a document prepared for the Mental Health Commission of Canada. We then estimated the number of avoided mental health cases by applying the percentage of people with decreased self-reported mood and anxiety issues due to sufficient outdoor activity. Finally, we multiplied the avoided mental health cases by the cost per case, which was pulled from *The Life and Economic Impact of Major Mental Illnesses in Canada.*

Local Spending Benefits

To estimate the total local spending benefits per case study, two main spending profiles were created: (1) residents and (2) tourists. The spending profile of each of these categories was created using the Léger data. Survey respondents were split into two groups, those who travelled greater than 40

[23] https://cdnsciencepub.com/doi/10.1139/h2012-061

kilometres to get to the trails (tourists) and those who travelled less than 40 kilometres to get to the trails (residents). The spending profile for each of these groups was then calculated by averaging the per visit spend for each survey spending category.

To estimate the number of users, we first reduced the total visits numbers for each trail to a "total intentional visits" number, which included all who spend more than 15 minutes on the trail. Those spending less than 15 minutes were considered passers-by who may have been included in the Propulso data but were not necessarily in the area for the purpose of using the trail. Then we used the percentage of visits occurring at least 40 kilometres or more from place of residence to categorize the users as either a tourist or a resident.

To account for the different locations and retail potential of the case studies, different spending profiles were further developed based on the typology types and Trans Canada Trail website descriptions. Based on this information, assumptions on magnitude of average potential spend were created. It was also assumed that residents would spend 0% of the total potential spending profile on accommodations. The resulting case study spending profiles were then multiplied by the number of resident and tourist users to derive the total spending inputs by Léger survey spending categories. These were then split up into further categories to match the Canadian input-output modelling categories. As with the provincial analysis, these inputs were then modelled through Stats Canada input-output multipliers to arrive at the total output, wages and jobs associated with each case study.

5.2. Ecosystem Hectare by Province/Territory

Figure 5.1: Ecosystem Hectare by Province/Territory

	Temperate/ Boreal Forest	Grass/ Rangelands	Wetlands	Lakes/Rivers	Ice/Rock	Cropland	Urban
Alberta	90	190	20	50	-	60	720
British Columbia	150	190	-	60	-	110	870
Manitoba	140	90	60	20	-	110	610
New Brunswick	160	20	20	20	-	40	340
Newfoundland and Labrador	90	30	20	10	-	-	170
Nova Scotia	330	30	-	10	-	80	310
Northwest Territories	20	10	10	-	-	-	30
Nunavut	-	-	-	-	-	-	-
Ontario	650	120	30	100	50	300	2,120
Prince Edward Island	-	-	-	-	-	20	60
Quebec	430	50	10	60	10	140	1,140
Saskatchewan	20	60	10	10	-	40	400
Yukon	20	-	-	-	-	-	20
Total	**2,100**	**790**	**180**	**340**	**60**	**900**	**6,790**

Source: Costanza and Groot (2014), Natural Resources Canada (2020), Trans Canada Trail (2023), Econsult Solutions, Inc. (2023)
† The sections of the Trans Canada Trail within Nunavut did not match the typologies examined in this analysis and were therefore excluded.