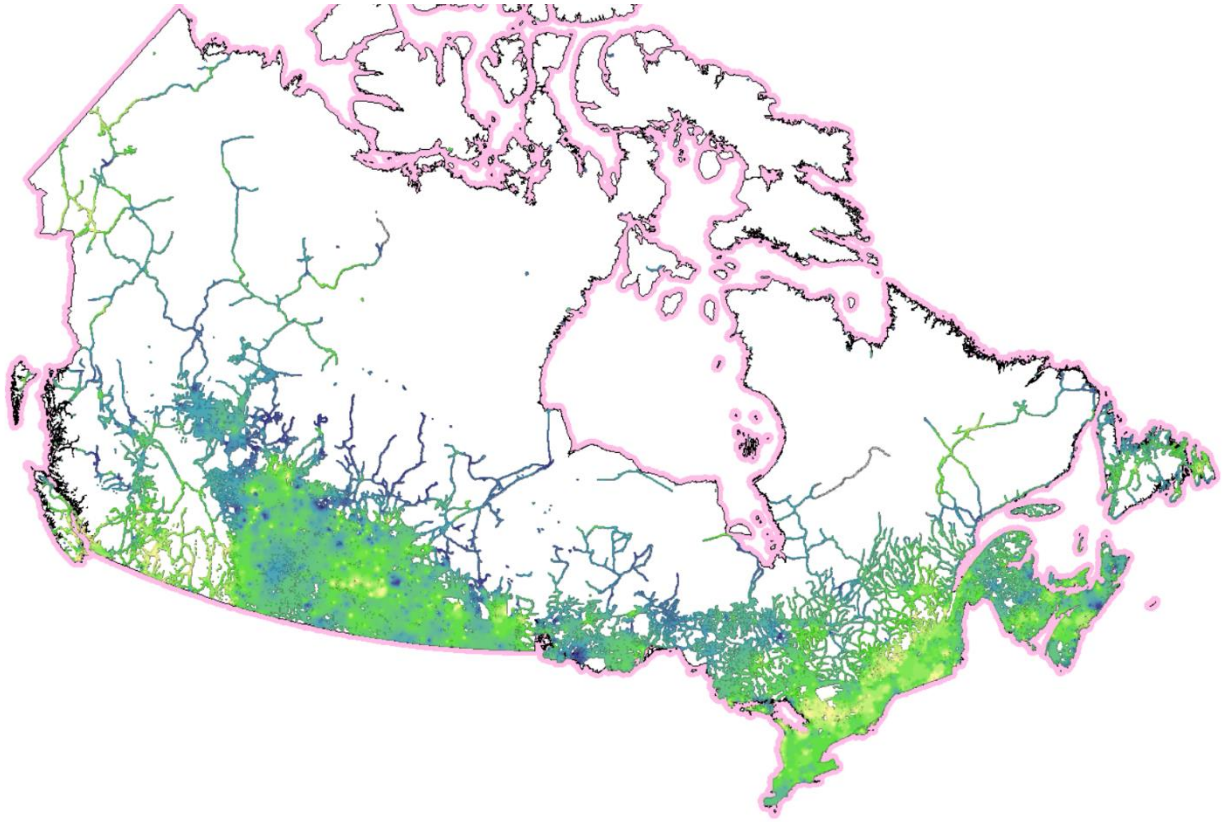
CanEcumene 3.0 GDB

Regional and Community Vitality Index Mapping



Technical Reference 1.0

December 2023

Introduction

This document provides technical reference information for the Regional and Community Vitality Index (RVI/CVI) database published in the GeoDiscovery platform of the Government of Canada.

The purpose of the RVI/CVI database is twofold:

1. To provide georeferenced socio-economic conditions of communities and regions for use in natural resource and environmental management applications, particularly for Cumulative Effects Assessment (CEA) and Climate Change Adaptation (CCA)

2. To analyze socio-economic conditions in according to their spatial and temporal variability on a local, regional, or national basis, and in relation to their natural environmental or ecological settings.

Description

The RVI/CVI database is derived from the CanEcumene 3.0 GDB (Eddy, et. al. 2023) using a selection of socio-economic variables identified in Eddy and Dort (2011) that aim to capture the overall state of socio-economic conditions of communities as 'human habitats'.

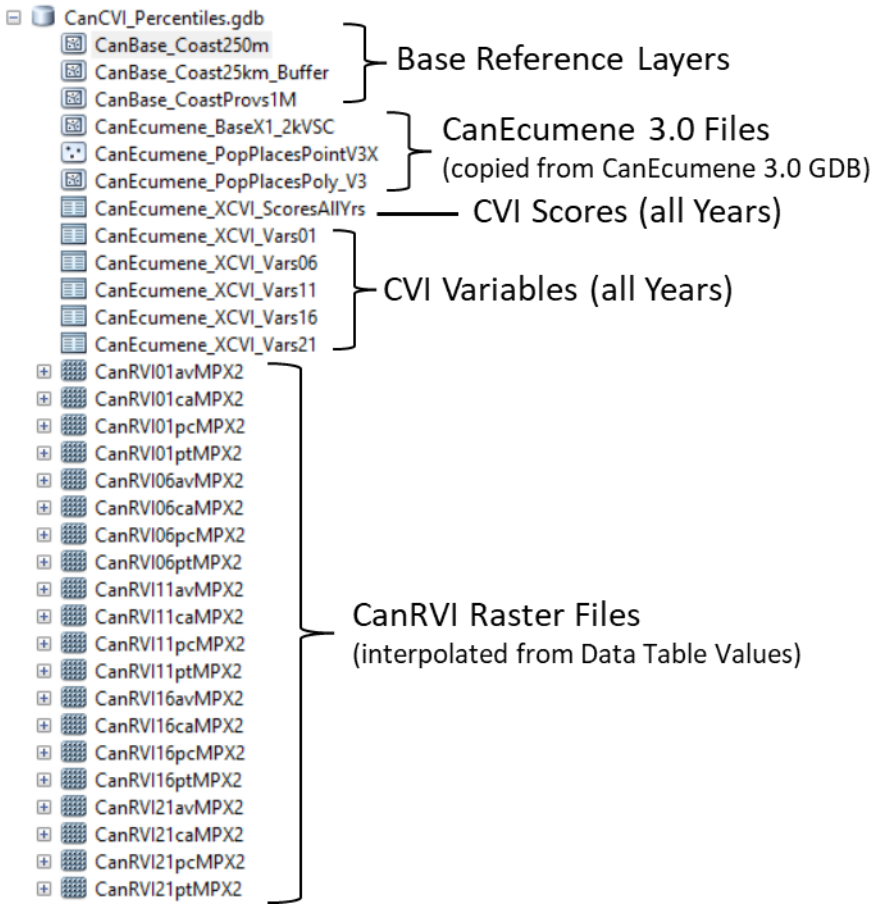
The RVI/CVI is comprised of five sub-indicators: 1) population change, 2) age structure, 3) education levels, 4) employment levels, and 5) real estate values. Index values are based on percentile ranks of each sub-indicator, and averaged for each community, and for three ranked groups: 1) all of Canada, 2) by province, and 3) by population size. The data covers the Census periods of 2001, 2006, 2011 (NHS), 2016, and 2021 (StatsCan, 2023).

The index is mapped in two ways: 1) as 'points' for individual communities (CVI), and 2) as 'rasters' for spatial interpolation of point data (RVI). These formats provide an alternative spatial framework to conventional StatsCan CSD framework. (For more information on this approach see Eddy, et. al. 2020).

This document provides technical reference information to assist users.

Data Contents

The contents of the CanCVI_Percentiles.gdb are as follows:



The main data table for the CVI data is the XCVI_ScoresAllYrs table. The data used to calculate the scores are stored in the XCVI_Vars{YR} tables. The Base Reference and CanEcumene 3.0 layers are provided for convenience.

CVI data can be mapped as for individual communities by joining the XCV_ScoresIAllYrs table to the PopPlacesPointV3X or PopPlacesPoly_V3 layers using the ECUID as the common link field. The Raster layers are individual spatial interpolations of each CVI field in the XCVI_ScoresAllYrs table.

Table Structures

The structure of the CVI Scores (XCVI_ScoresAllYrs) table is as follows:

	ECUID	Ecumene Unique ID
	ECUName	Ecumene Name
	ProvTerr	Province/Territory
Individual Group CVI Values	CVI01ca	*These fields are the individual CVI 'score' values calculated in three (3) categories: ca = Canada pt = Province/Territory pc = Population Class (These scores are calculated relative' to each of these groups) (Note: Population Class categories are provided in the CanEcumeneMaster table)*
	CVI01pt	
	CVI01pc	
	CVI06ca	
	CVI06pt	
	CVI06pc	
	CVI11ca	
	CVI11pt	
	CVI11pc	
	CVI16ca	
	CVI16pt	
	CVI16pc	
	CVI21ca	
	CVI21pt	
	CVI21pc	
Average CVI Score Values	CVI01avg	*These CVI fields are values calculated for each year as an 'average' of the three groups listed above.*
	CVI06avg	
	CVI11avg	
	CVI16avg	
	CVI21avg	

The initial calculations were done for all communities in Canada as a total set. This means that scores for all community types and locations were compared with all others in Canada ('ca' fields). However, since it may be deemed unfair to compare small, rural, remote communities, and larger cities in the same group, calculations were repeated for two other groupings: to compare all communities with those of their own province or territory ('pt' fields), and comparisons of communities only with those of their respective population classes ('pc fields). The final CVI scores are calculated as an average of the three groups.

The table structure for the CVI Variables (XCVI_Vars{yr}) table is as follows:

	ECUID	Ecumene ID
	ECUName	Ecumene Place Name
	ProvTerr	Province/Territory
	Latitude	Latitude
	Longitude	Longitude
	TotPop{yr}	Total Population
	PopCh{yr}	Population Change (5 yr)
[1]	Age{yr}	Age Structure (ratio of Youth/Seniors)
[2]	Edu{yr}	Education (% with post-secondary education)
[3]	Emp{yr}	Employment (% of Workforce Employed)
[4]	Econ{yr}	Economy (Total Residential Real Estate Value per Capita)

Notes: [1] Youth=1-15 yrs, Seniors=> 65 yrs
[2] Includes all trades, college and university levels
[3] This is the inverse of the Unemployment Rate
[4] The sum of all Dwelling values / Population

These tables contain the CVI variables from which the CVI Percent Rank scores were calculated. The variables were derived from Census data for the years indicated.

Percent Rank scores were calculated for each variable and averaged as a final CVI score for each community. This process was repeated for each year, and each grouping category: ca, pt, pc as described above. (Note: these calculations were completed in other tables not provided as part of this database, but may be obtained by request to the author).

Interpretation and Use

The primary spatial unit of analysis with this data is the individual community as represented by point and polygon features stored in the CanEcumene 3.0 GDB. CVI Scores can be mapped using either points or polygons on their own, such as in the national scale map in Fig.1.

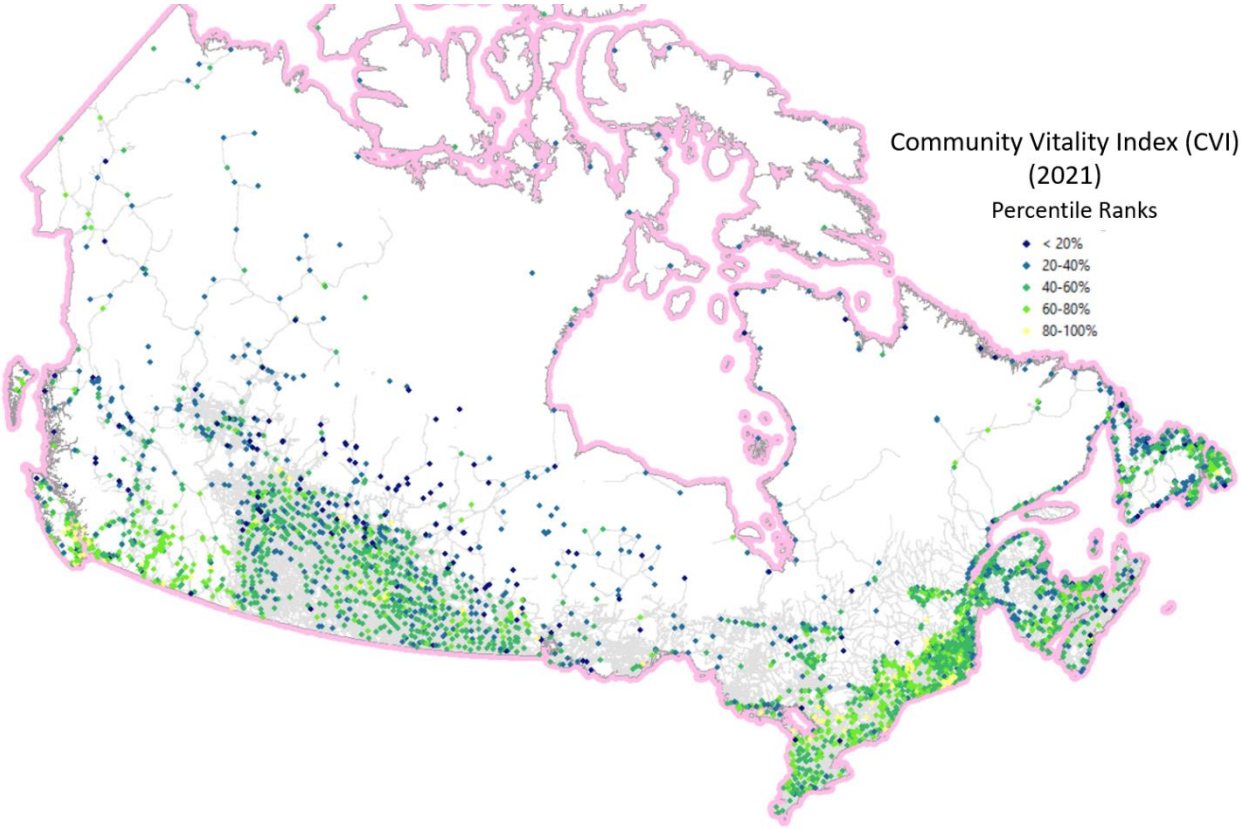


Figure 1. Mapping CVI point data at a national scale.

It is possible to visualize CVI patterns using point data at a national scale. Some patterns that are discernable at this scale include the medium to high values in the Quebec-Windsor economic core region and in southern BC, the mixed CVI values throughout the Prairie and Atlantic provinces, and the generally lower CVI values in the remote and northern communities. However, due to the large number of communities and limits with symbolization, this is not the most optimal form of visualizing patterns at a regional or national scale.

An alternative is to use the raster data that show regional values (RVI's) as a continuous interpolated surface, such as in Fig. 2.

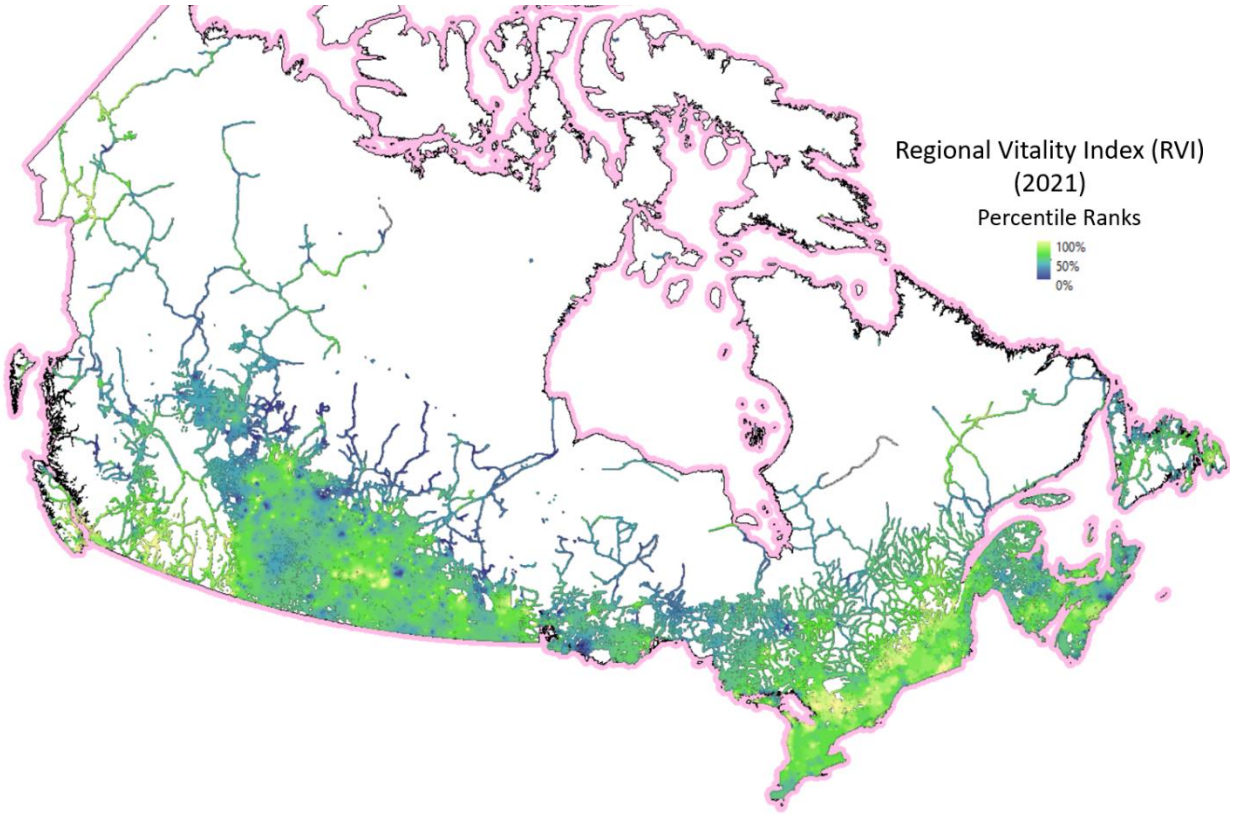


Figure 2. Mapping CVI as an interpolated surface (RVI).

By using the spatial extents of the settlement ecumene (See: Eddy, et. al. 2023a), individual CVI values are interpolated regionally and show more vividly the how vitality varies across regions. It may be particularly interesting to visualize changes over time by creating a time-series automation using the raster layers. This can aid in interpreting changes in regional vitality over time for specific locations.

It is also possible to use both point (CVI) and raster (RVI) representations in the same display. This may be more useful for regional or local scale analysis, such as the maps shown in Figure 3.0 comparing two time intervals for the island of Newfoundland.

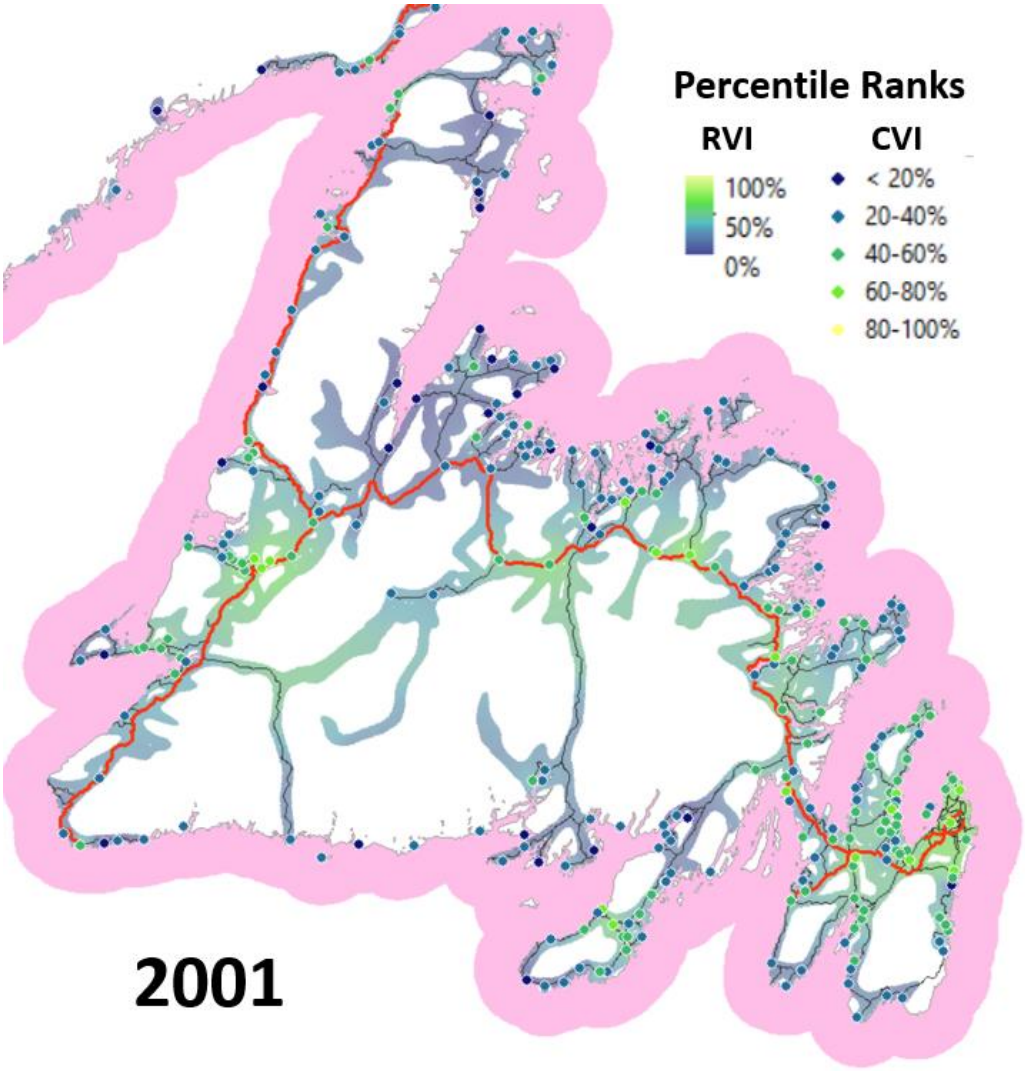


Figure 3a. Regional map of both CVI (point) and RVI (surface) data for the island of Newfoundland for 2001. (Compare with year 2021 in Figure 3b)

This map shows both RVI and CVI data simultaneously, along with major highways and roads. It shows below average values for most coastal communities with a few bright (hotspot) areas in larger towns and cities along the Trans-Canada highway. The RVI and CVI data for 2021 show a noticeable increase in many regions to average or above average values compared to 2001. As with the 2001 values, most regions and communities with higher values are within close proximity to major transportation routes. While the scores of some coastal communities have also improved by 2021, many remain at or below average values, which is similar to many other rural and remote areas of Canada.

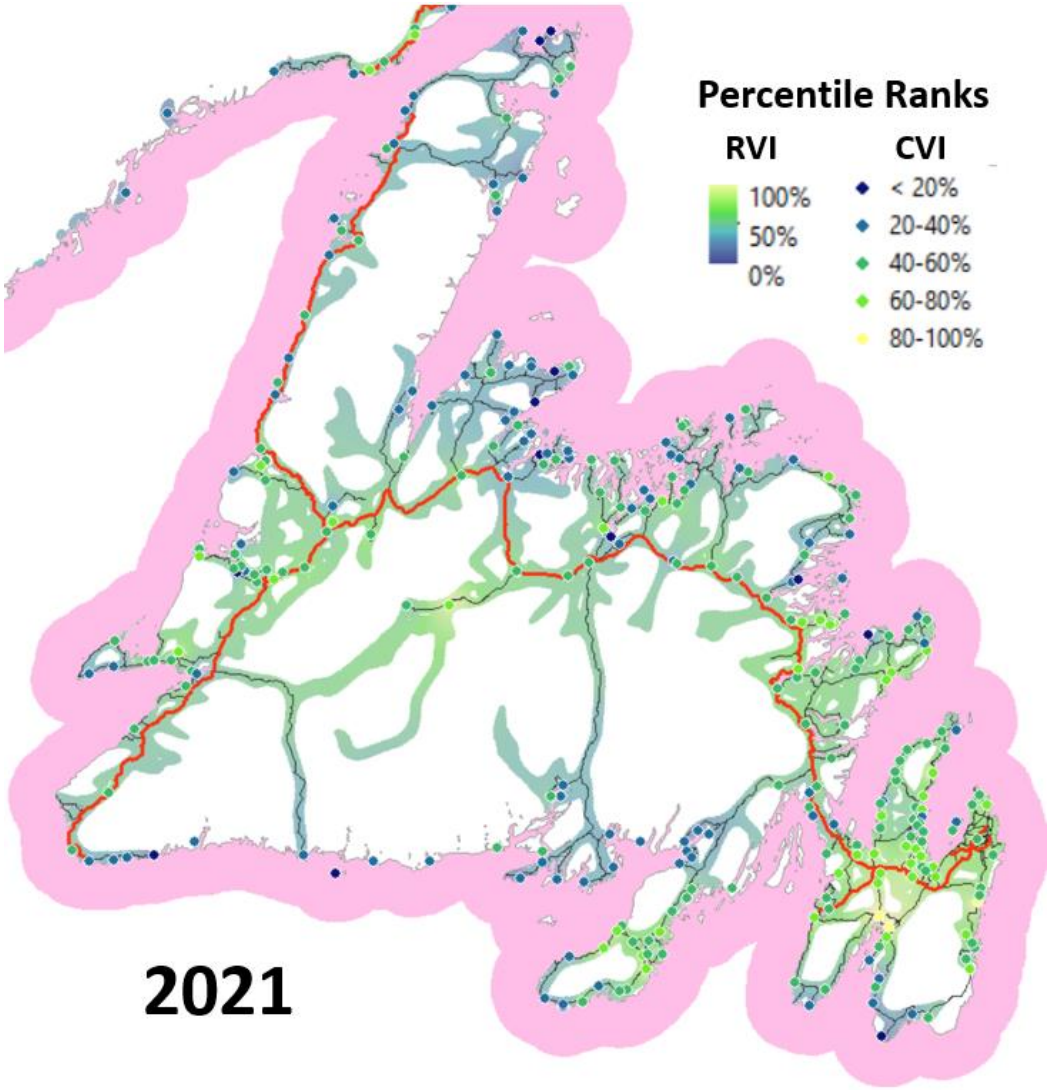


Figure 3b. Regional map of both CVI (point) and RVI (surface) data for the island of Newfoundland for and 2021. (Compare with year 2001 in Figure 3a).

This observation is just one of many possible factors that can be used to interpret reasons for differences in values. The CVI 'variables' tables provided in the database can also be used to examine breakdowns of factors that contribute to changes in CVI values over time and location. Factors that contribute to persistent lower CVI values can then be used to guide priorities for action.

For More Information

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Citations

Eddy, B.G.; Dort, A. 2011. Integrating Socio-Economic Data for Integrated Land Management (ILM): Examples from the Humber River Basin, western Newfoundland. *Geomatica*, Vol. 65, No. 3, p. 283-291. doi:10.5623/cig2011-044.

Eddy B, Muggridge M, LeBlanc R, Osmond J, Kean C, Boyd E (2020) An Ecological Approach for Mapping Socio-Economic Data in Support of Ecosystems Analysis: Examples in Mapping Canada's Forest Ecumene. *OneEcosystem* 5: e55881. https://doi.org/10.3897/oneeco.5.e55881

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StatCan, 2023. Canada Census Tables (2001, 2006, 2011, 2016, 2021). Statistics Canada. https://www.statcan.gc.ca/en/census?MM=1