Durham Region Natural System Climate Change Vulnerability Assessment

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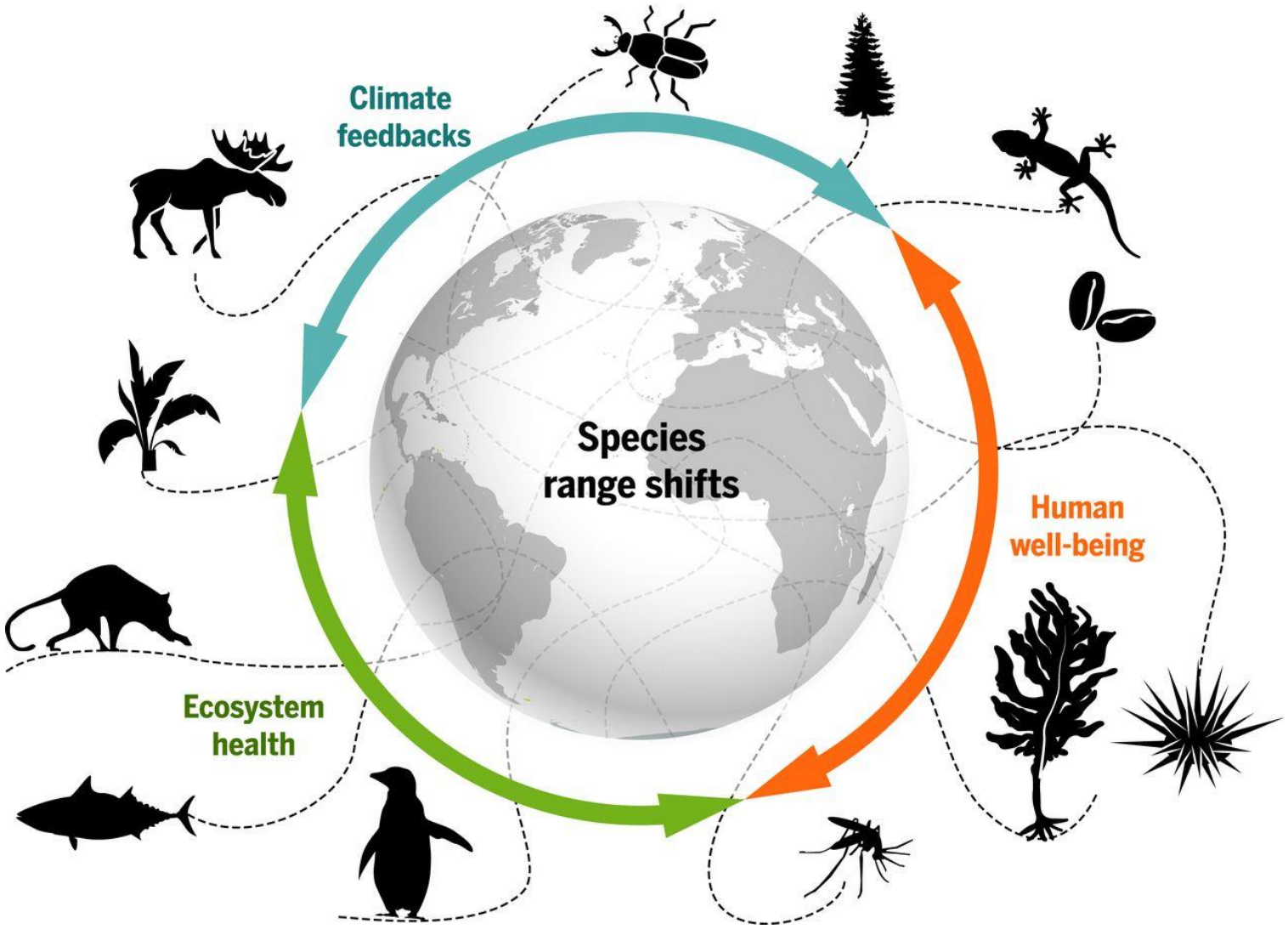
Jun 17, 2022

Toronto and Region Conservation Authority

Agenda

- Background/Objectives
- Rapid Climate Comparison
- Durham NSCCVA Indicators & Results
- Implementation with NHS and EO areas
- Conclusions

Climate, Ecosystem & Human well-being

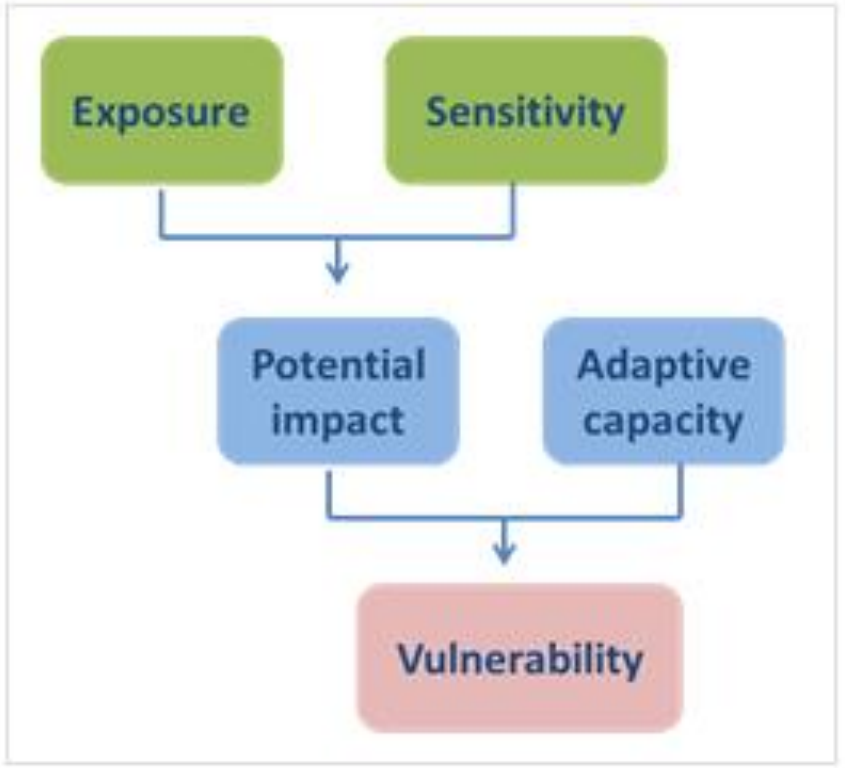


"The success of human societies depends intimately on the living components of natural and managed systems"

Pecl *et al.* 2021 *Science Advances*

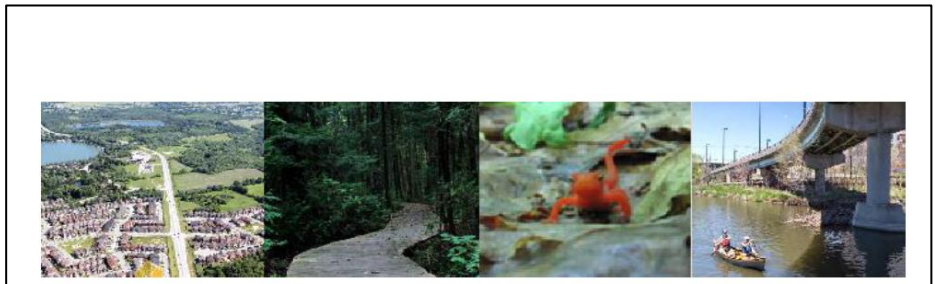
Climate Change Vulnerability Assessment (CCVA)

- Tool used as an initial step in the climate adaptation planning process
- Identify opportunities to protect, mitigate and enhance, natural systems
- Factors that contribute to vulnerability, include:
  - land use change;
  - habitat fragmentation;
  - pollution;
  - invasive species.



SOURCE: climateactiontool.org/

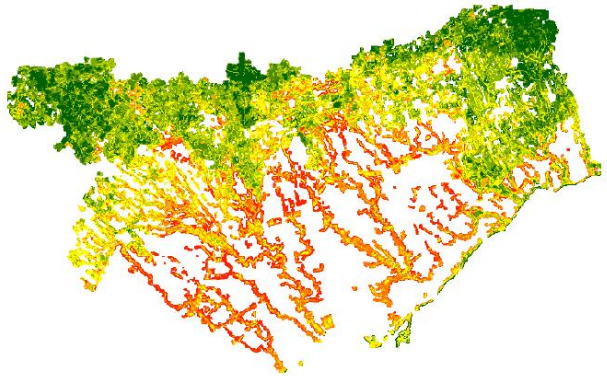
GTA Precedents

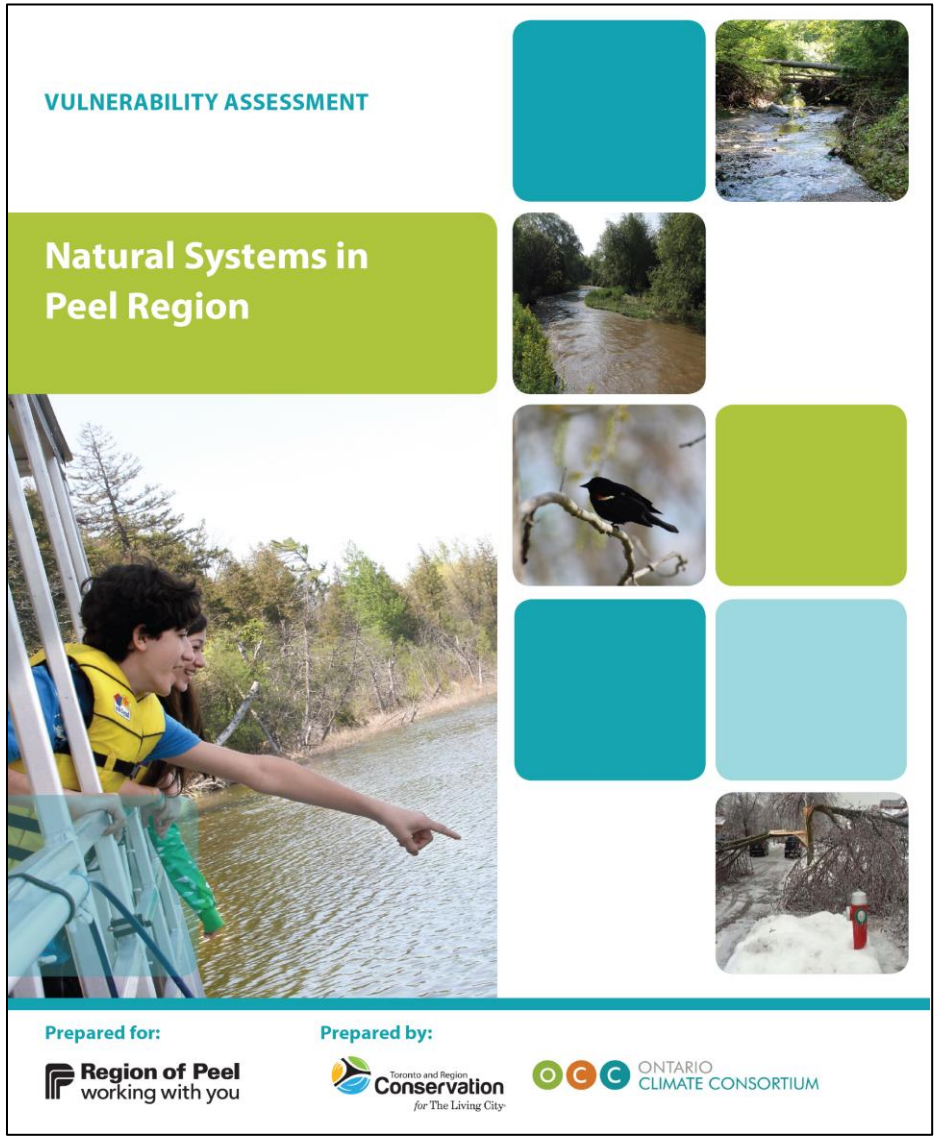


TRCA Terrestrial Ecosystem Climate Change Vulnerability Assessment

Part of the TRCA Terrestrial Natural Heritage System Strategy Update

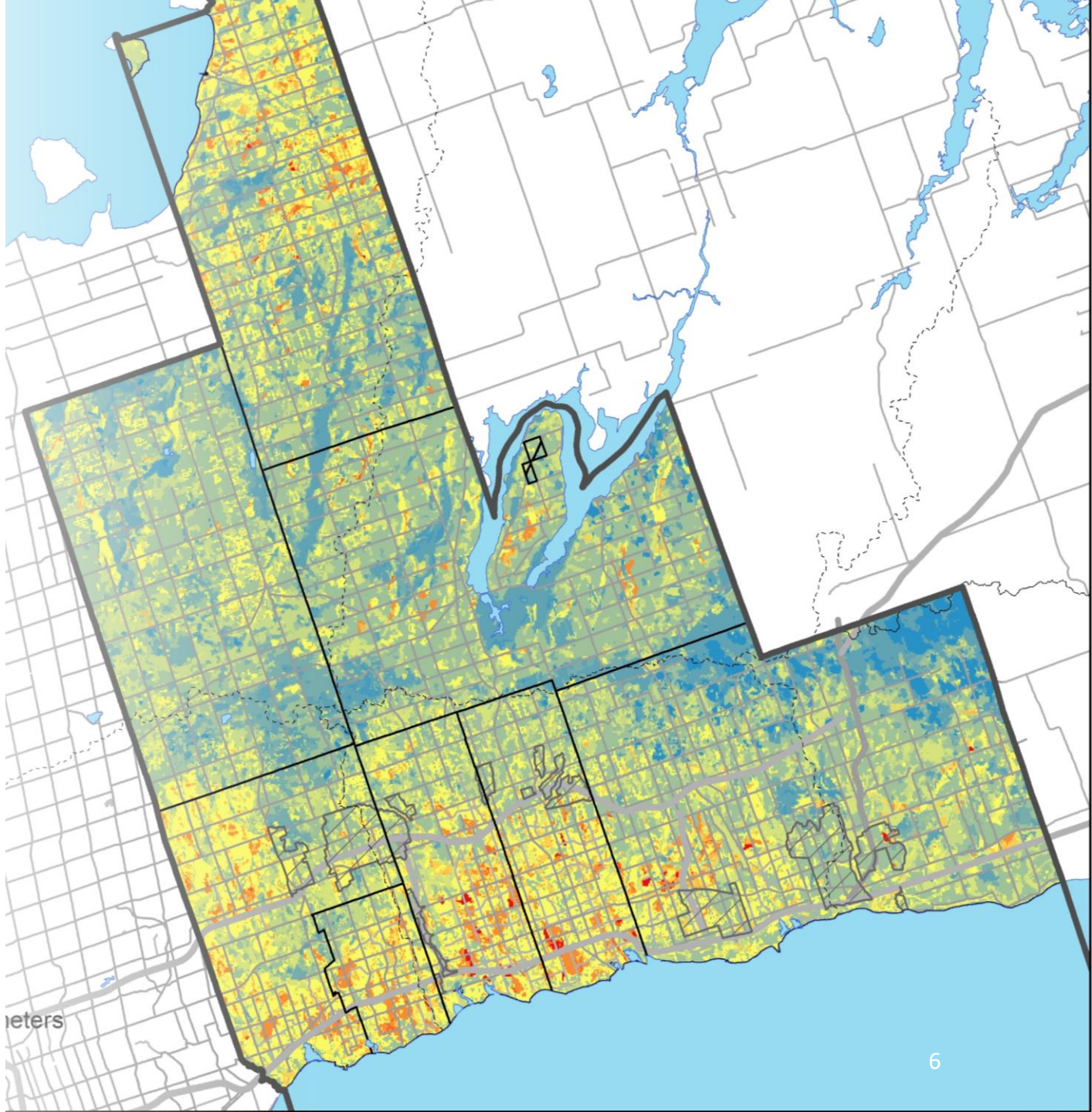
April 2020





Key Objectives

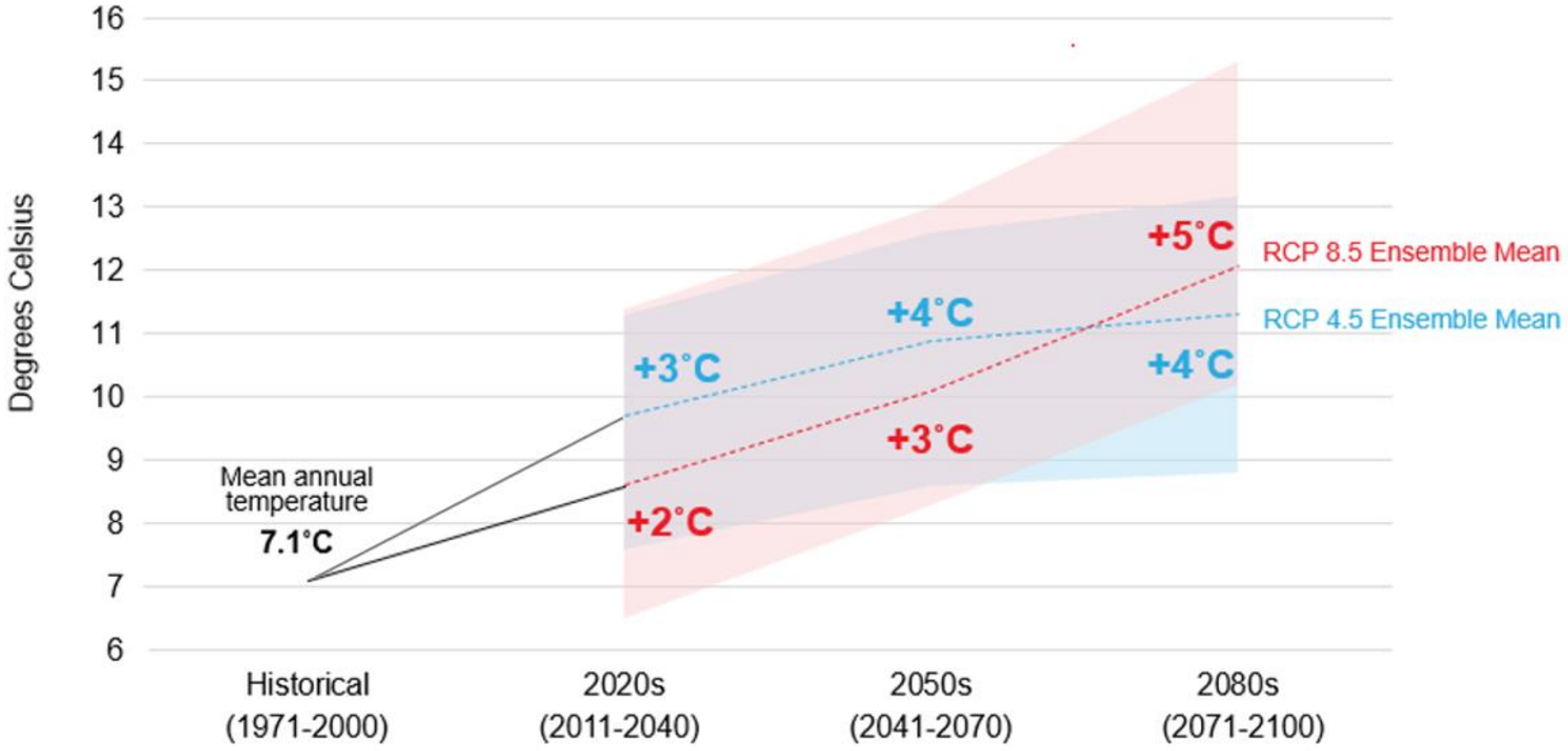
1. Rapid assessment to compare climate futures between Peel and Durham;
2. Complete NS-CCVA for the Durham Region using available data;
3. Assess alignment of NS-CCVA with Durham's proposed Official Plan Natural Heritage System (NHS) and Enhancement Opportunity (EO) areas as well as the known future development areas.



Peel-Durham Climate Comparison

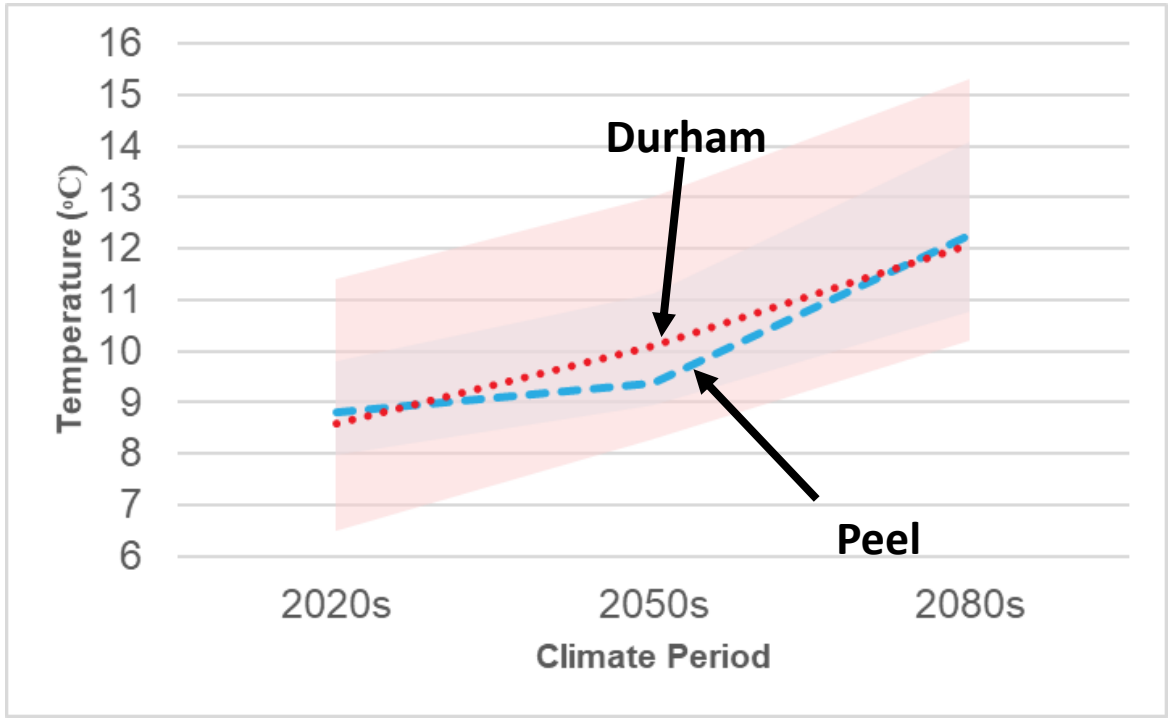
- A rapid analysis to compare the climate projections developed for the Region of Peel in 2016 and those recently developed for the Region of Durham in 2020 by TRCA and partners
- Reviewed RCP 4.5 (moderate emissions) and 8.5 (high emissions)
- This comparison focused on a subset of climate variables most relevant to the NSCCVA under the RCP 8.5 (high emissions) scenario

Climate projections under high and moderate emission scenarios for Mean Annual Temperature

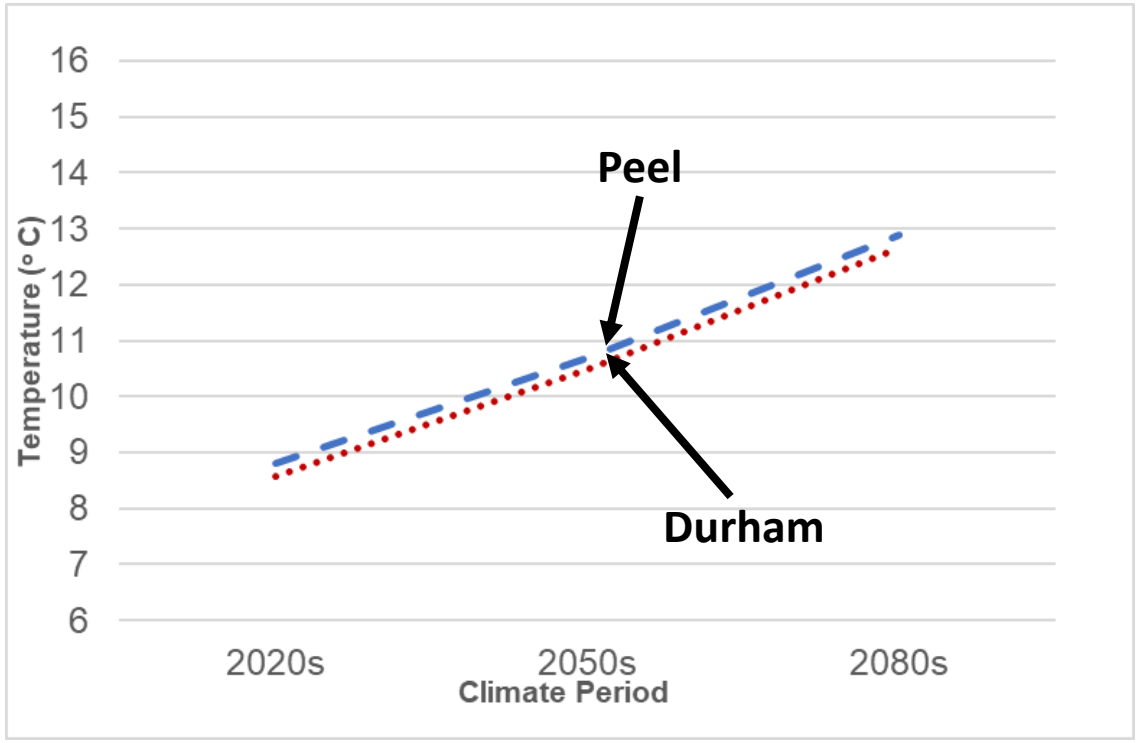


Projections for Durham by TRCA

Mean Annual Temperature under high emission scenario

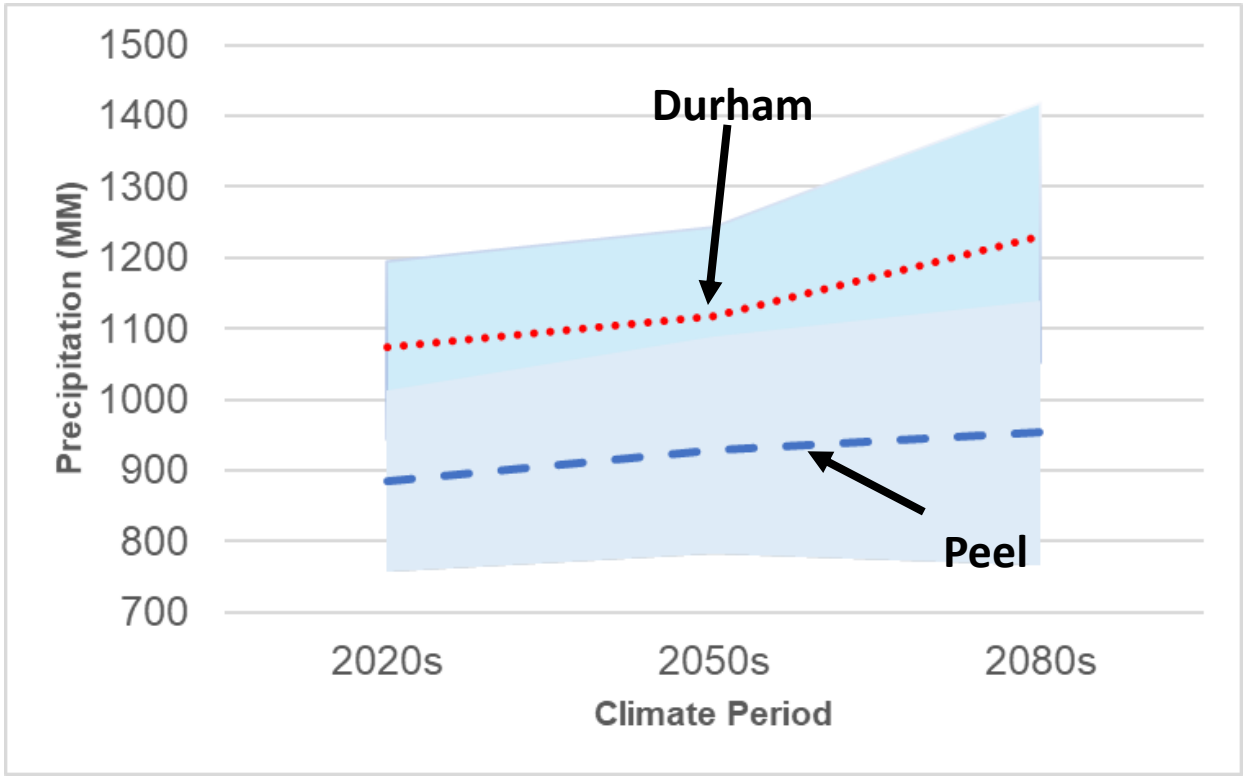


Climate Projections by TRCA and Partners



Climate Projections by Climatedata.ca

Annual Total Precipitation under high emission scenario



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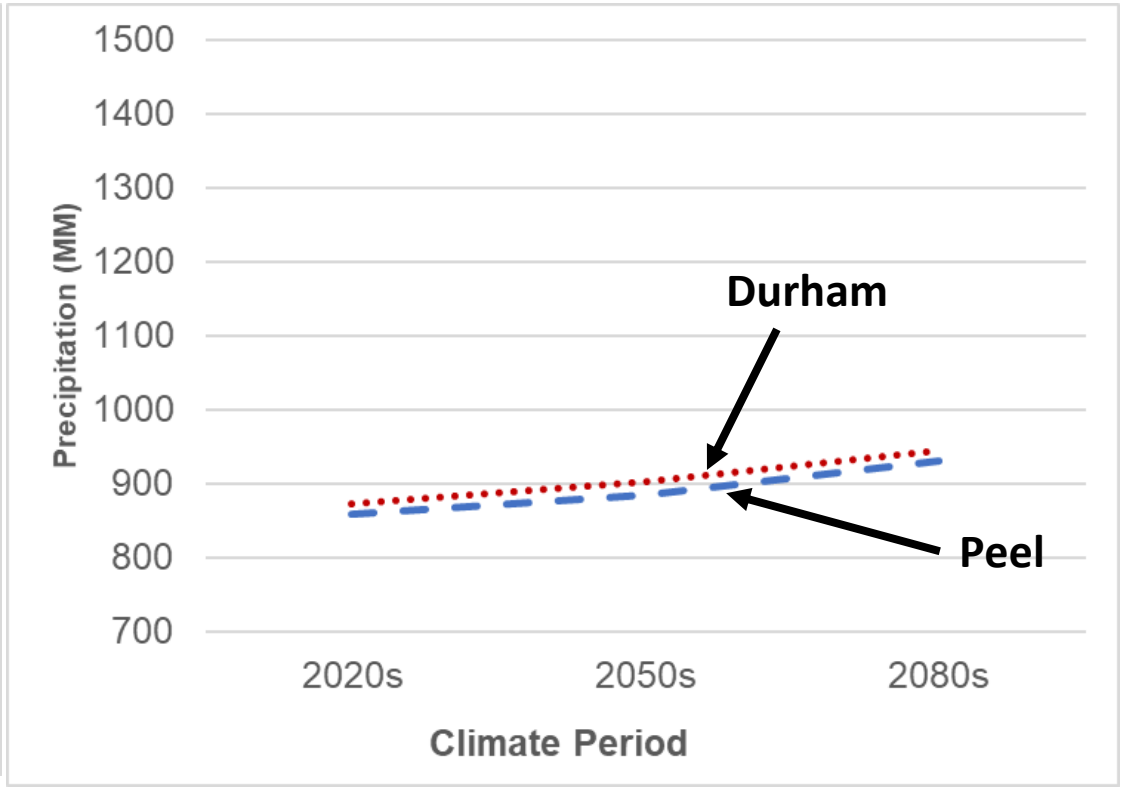

Climate Projections by Climatedata.ca

Conclusion

- Climate trends anticipated for Peel and Durham are similar for both high and moderate emissions scenarios

- Projected values are similar between the two regions for most of the climate variables that were analyzed under both high and moderate emission scenarios

- The NS-CCVA approach developed and applied in Peel Region is suitable for use in Durham Region, and that the differences identified do not warrant significant modifications to the NS-CCVA approach

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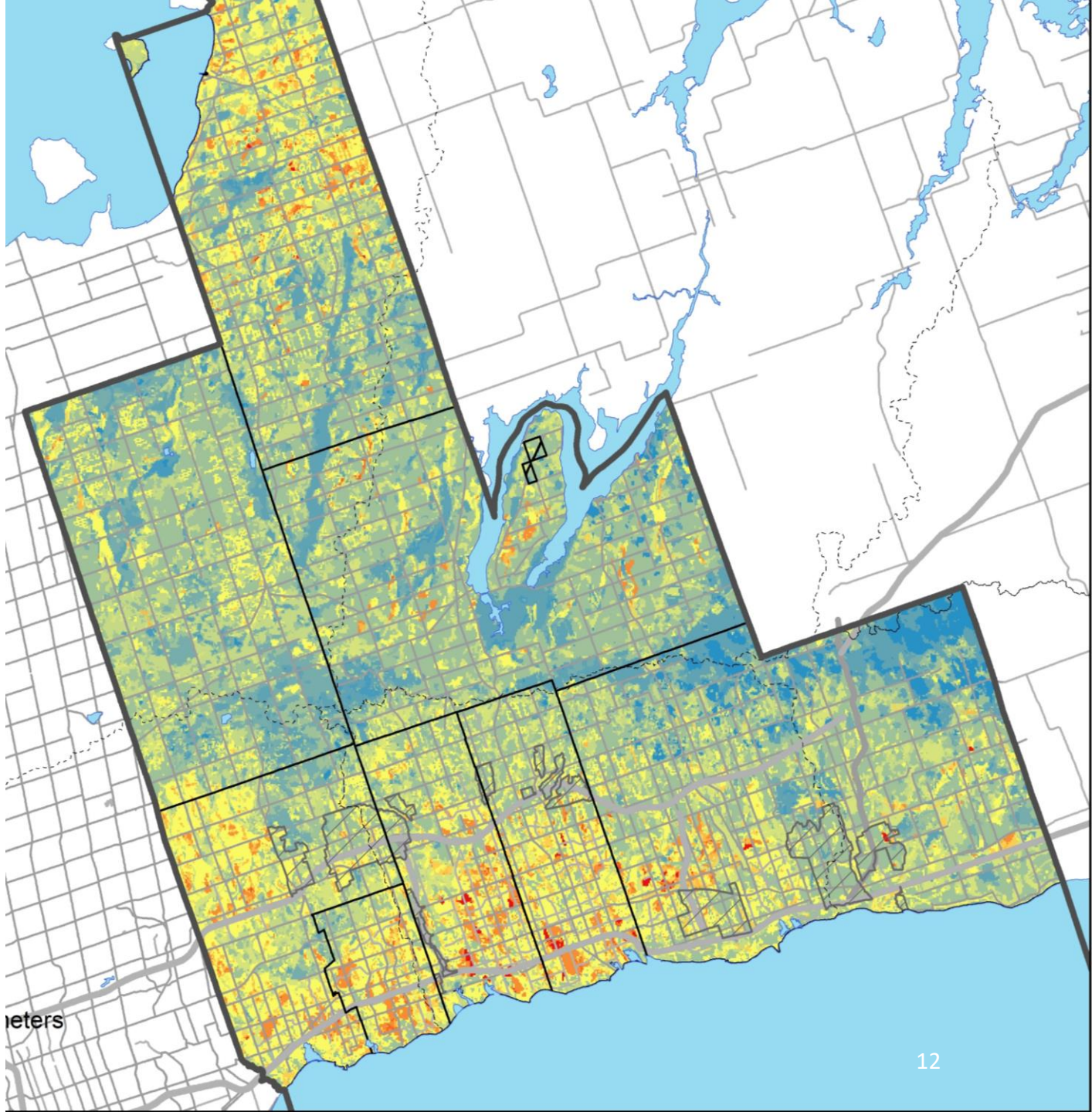
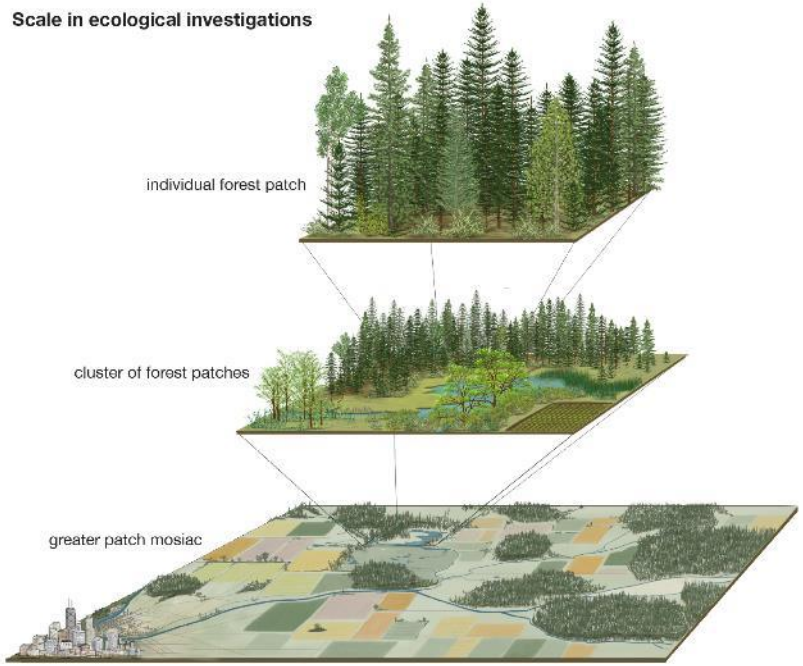
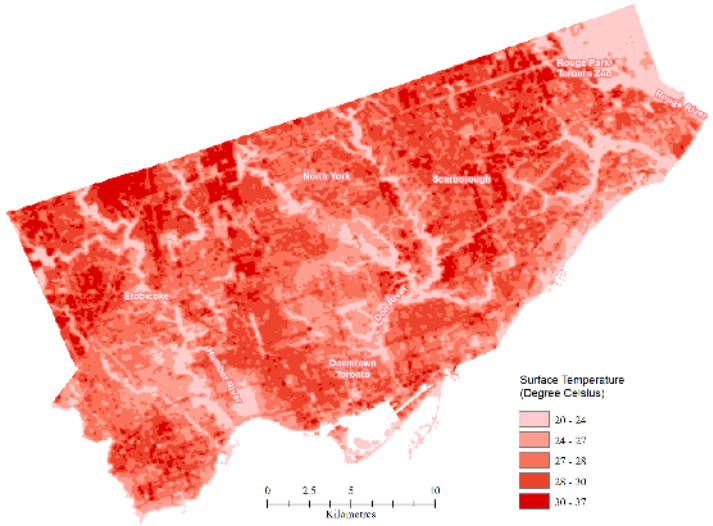


NS-CCVA Indicators

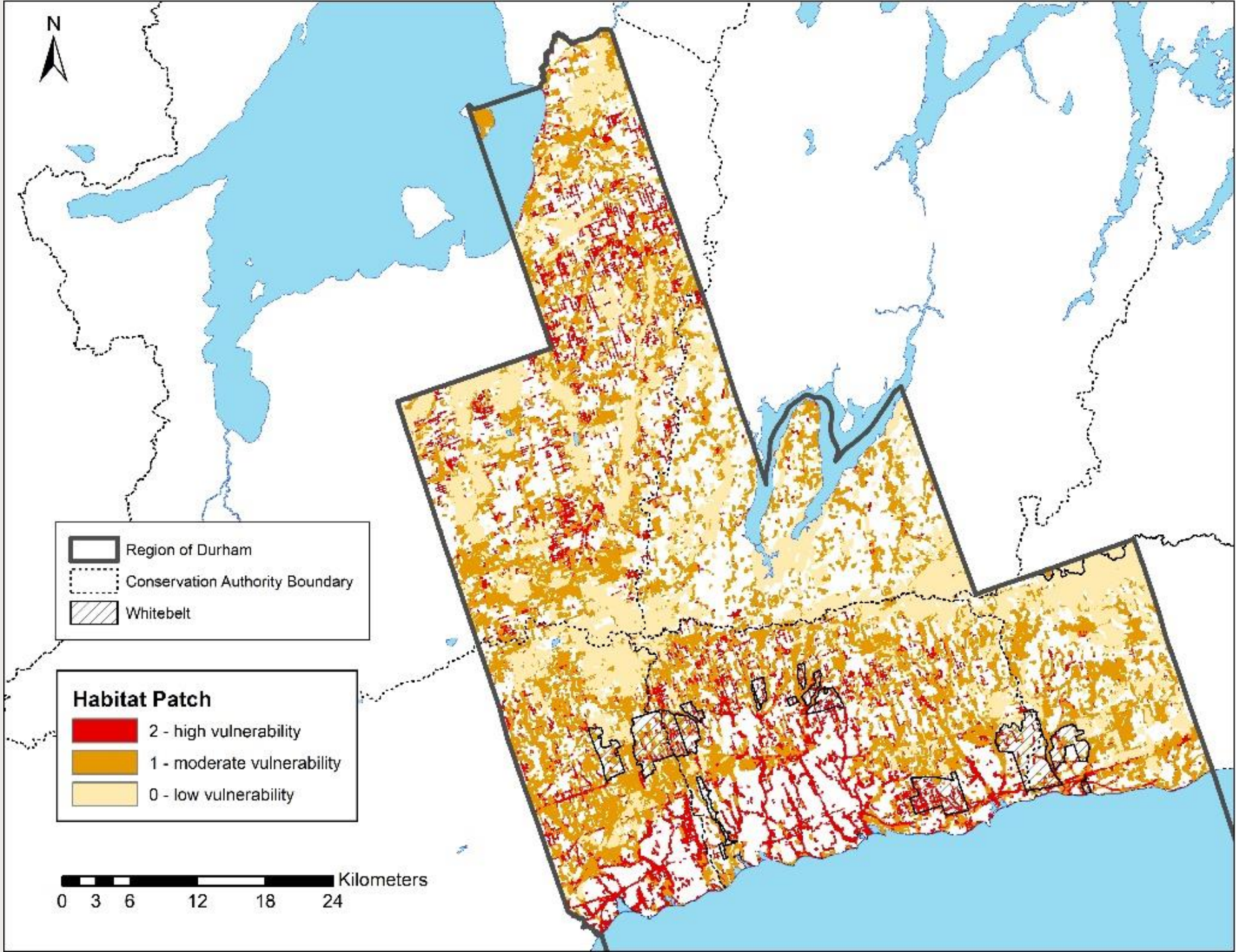
1. Natural System Habitat Patch
2. Sensitive Vegetation Communities
3. Vulnerable Wetlands
4. Soil Drainage
5. Ground surface Temperature





1. Habitat Patch

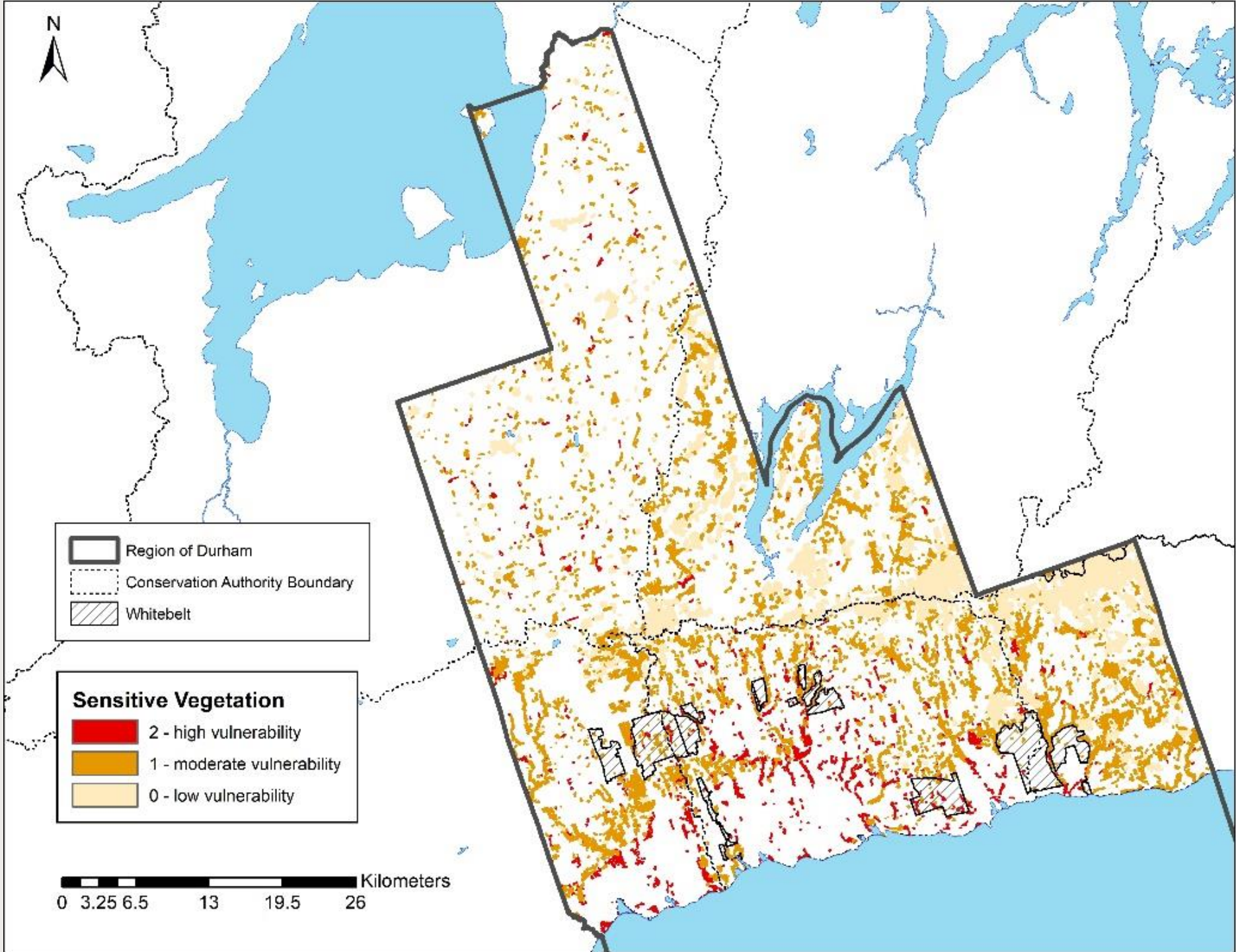
- Landscape analysis model (LAM) scores on patches based on **size, shape, and landscape influence**
- Patches are scored as L1 to L5
- High Vulnerability (L4 and L5)



2. Sensitive Vegetation

- Five Vegetation Types
  - coniferous forest
  - mixed forest
  - plantations
  - coniferous swamp
  - deciduous swamp

- LAM model
- Patches are scored as L1 to L5
- High Vulnerability (L4 and L5)

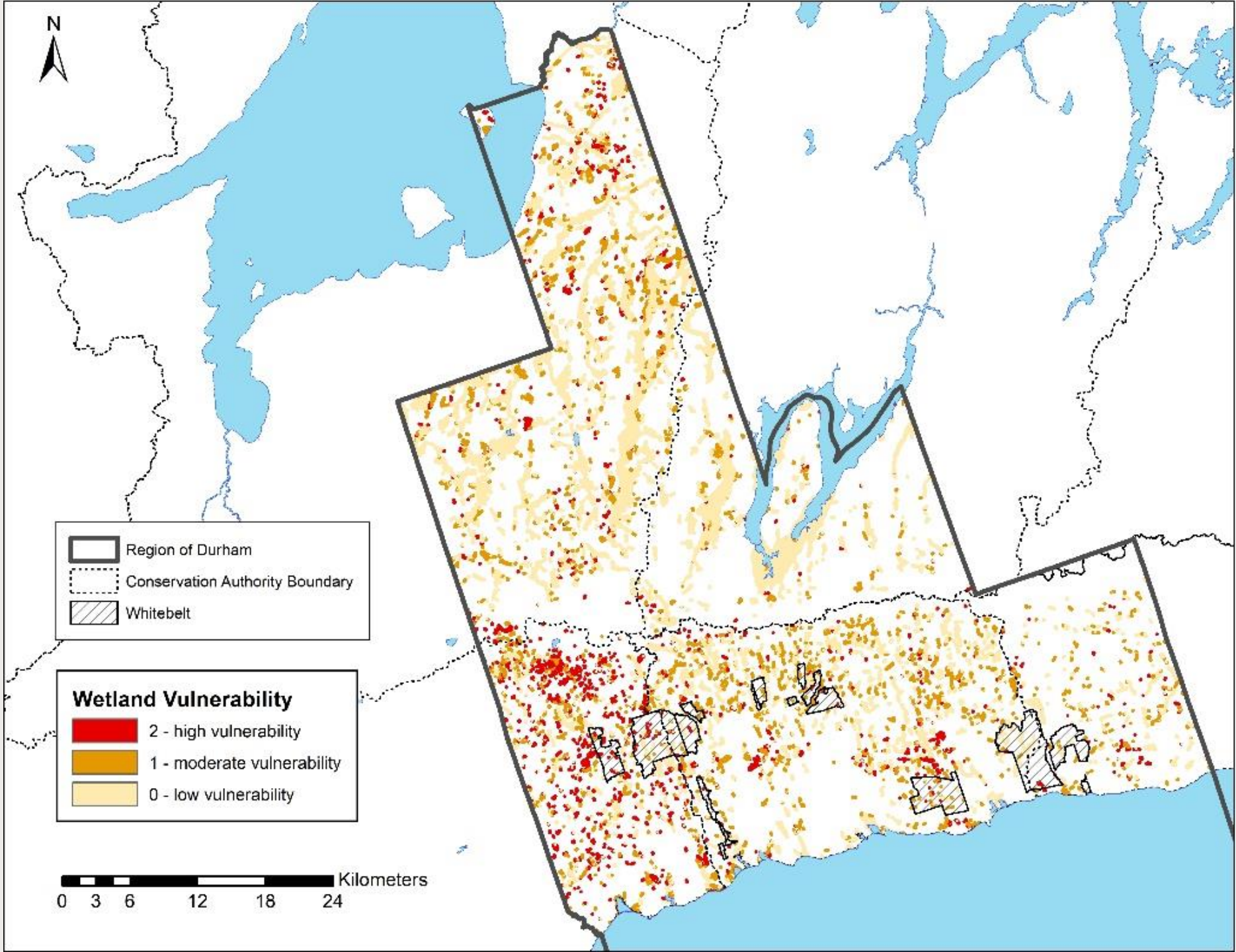


3. Wetland Vulnerability

- Number of potential water sources

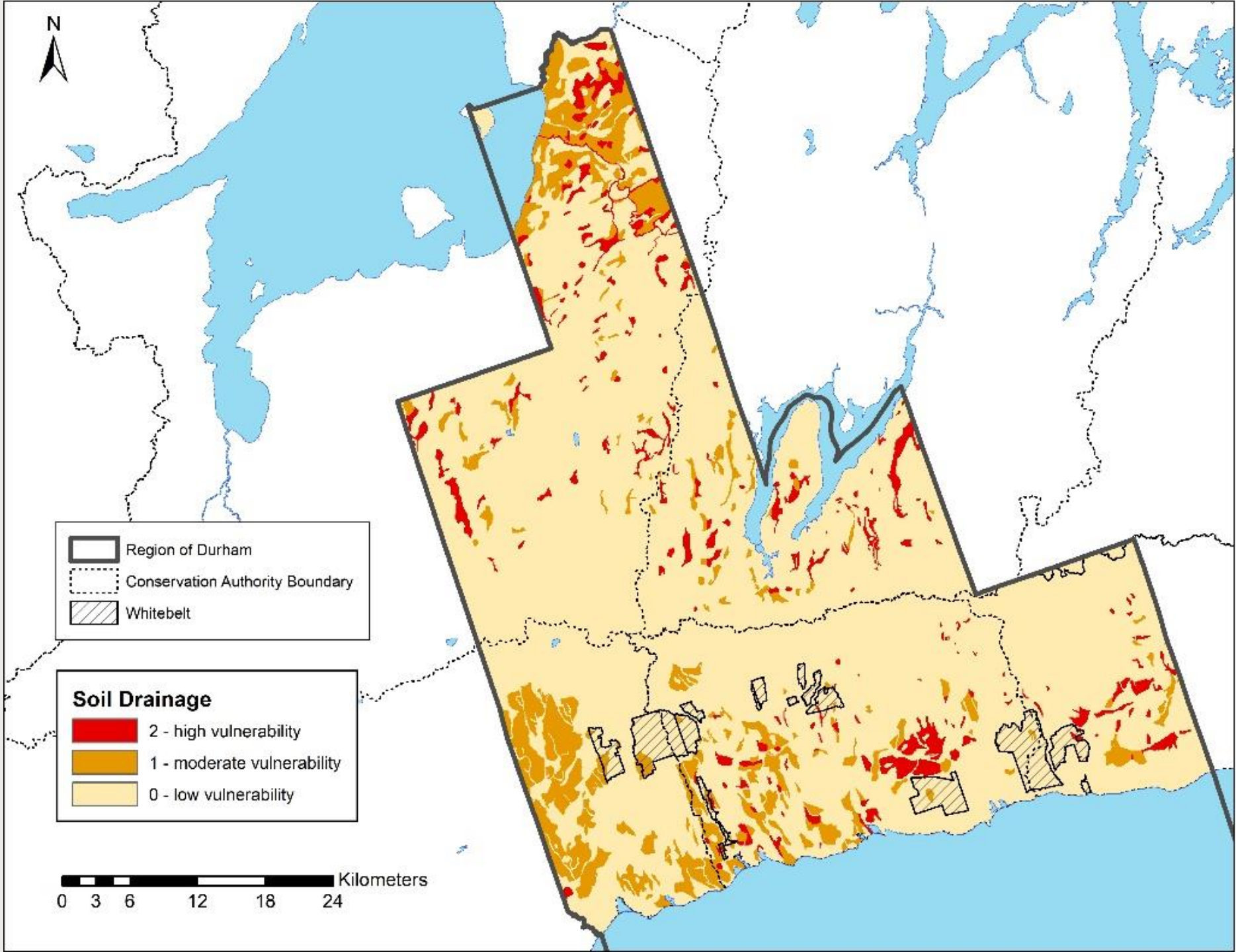
- Moderate Vulnerability:
  - Riparian OR groundwater

- High Vulnerability:
  - Precipitation only (no riparian and groundwater)



4. Soil Drainage

- Moderate Vulnerability:
  - Imperfect drainage
- High Vulnerability:
  - Poor drainage

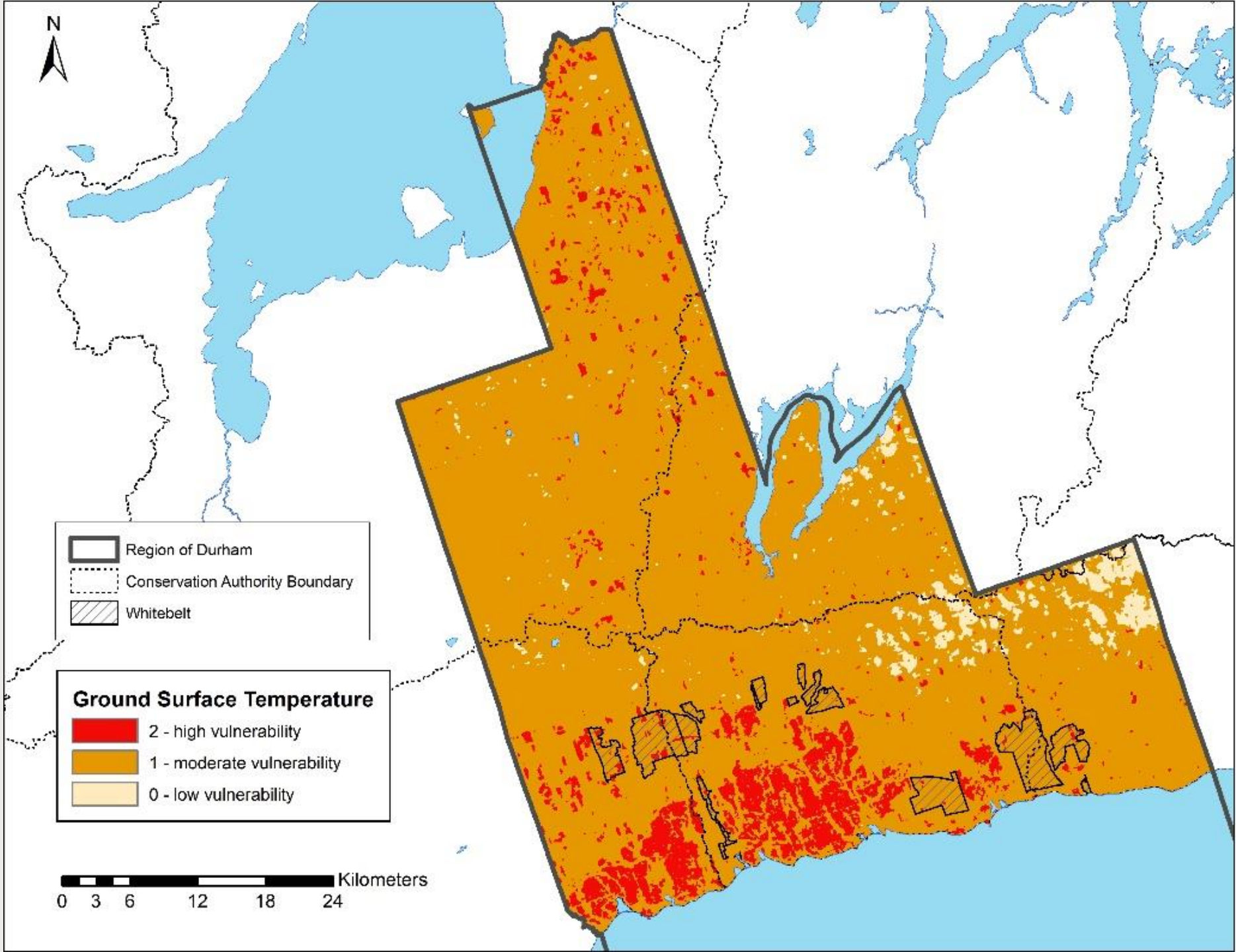


5. Ground Surface Temperature

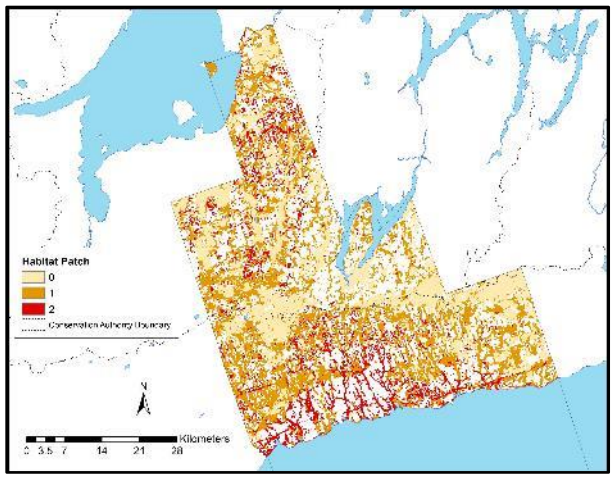
- Relative data percentiles (equal thirds)

- Moderate Vulnerability:
  - 20.7 – 26.3˚C

- High Vulnerability:
  - 26.3 – 33.0˚C



Overlay Analysis (Additive Scoring)



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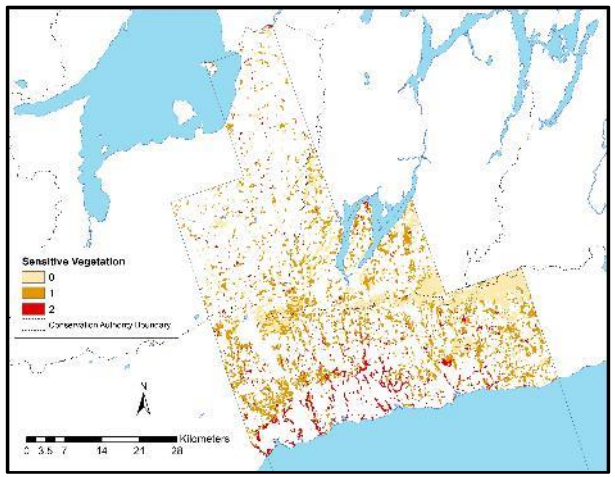

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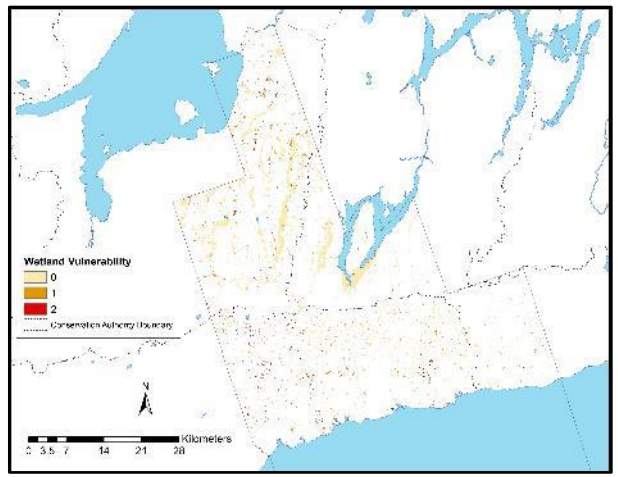

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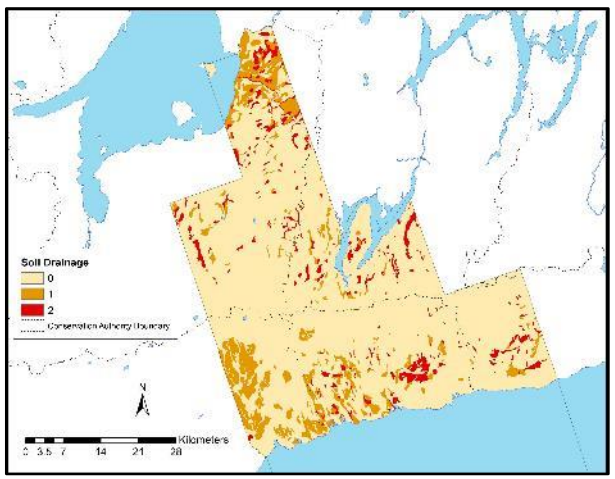

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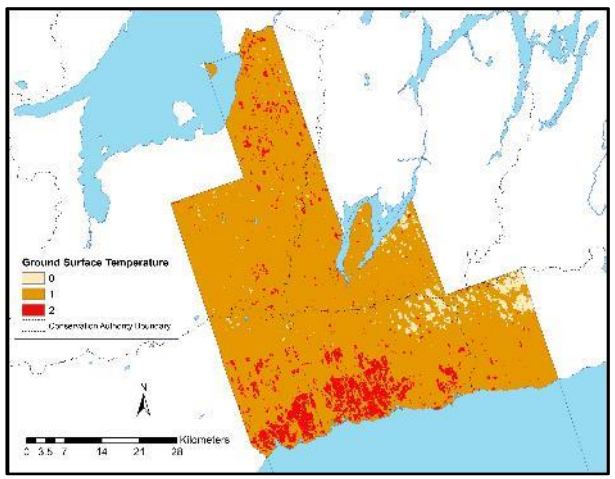
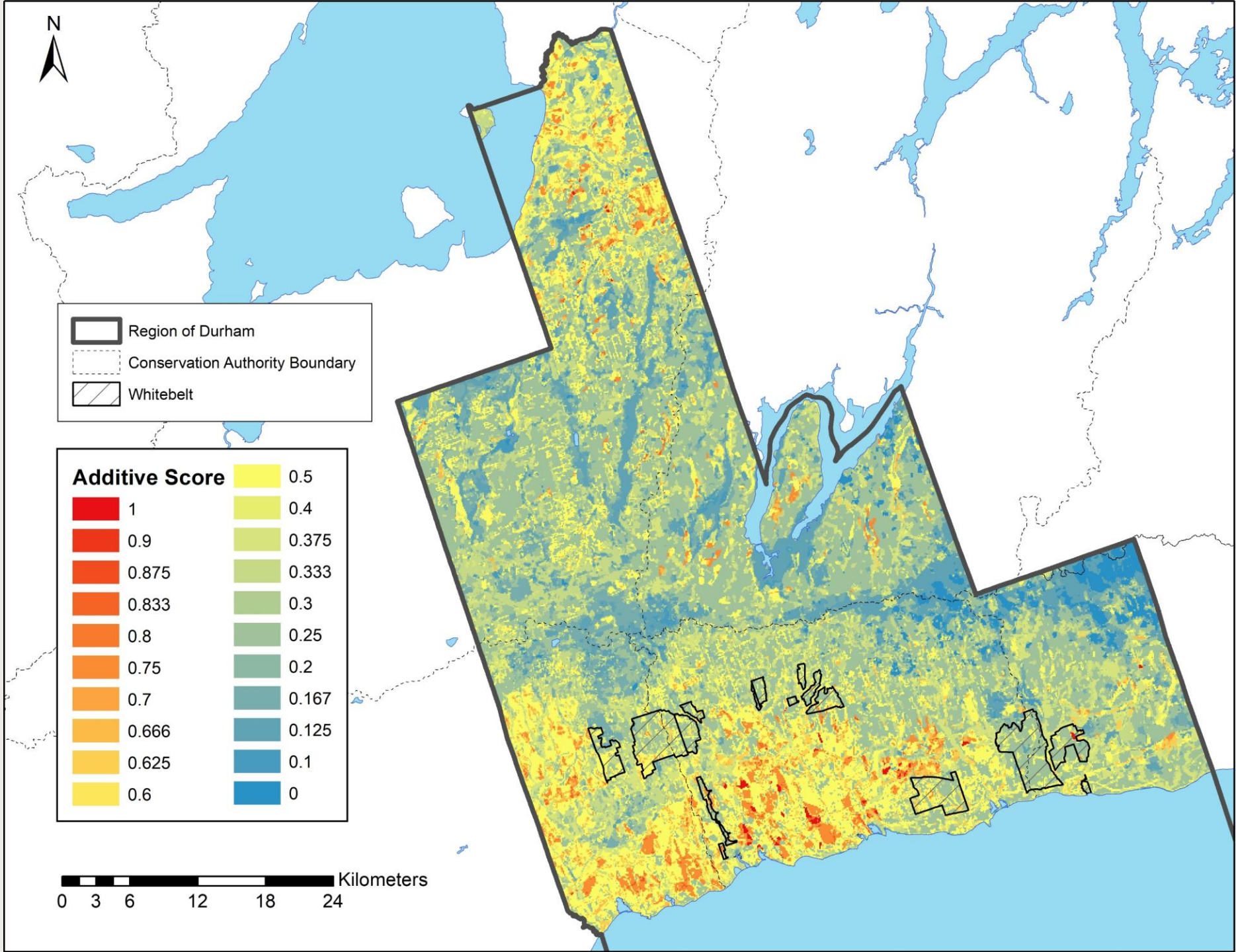


Additive Vulnerability Score

- Relative additive score based on total maximum score in a cell
- Scoring from 0 (low) to 1 (high)
  - Low (64%; <0.33)
  - Moderate (31%; 0.34-0.66)
  - High (5%; >0.66)



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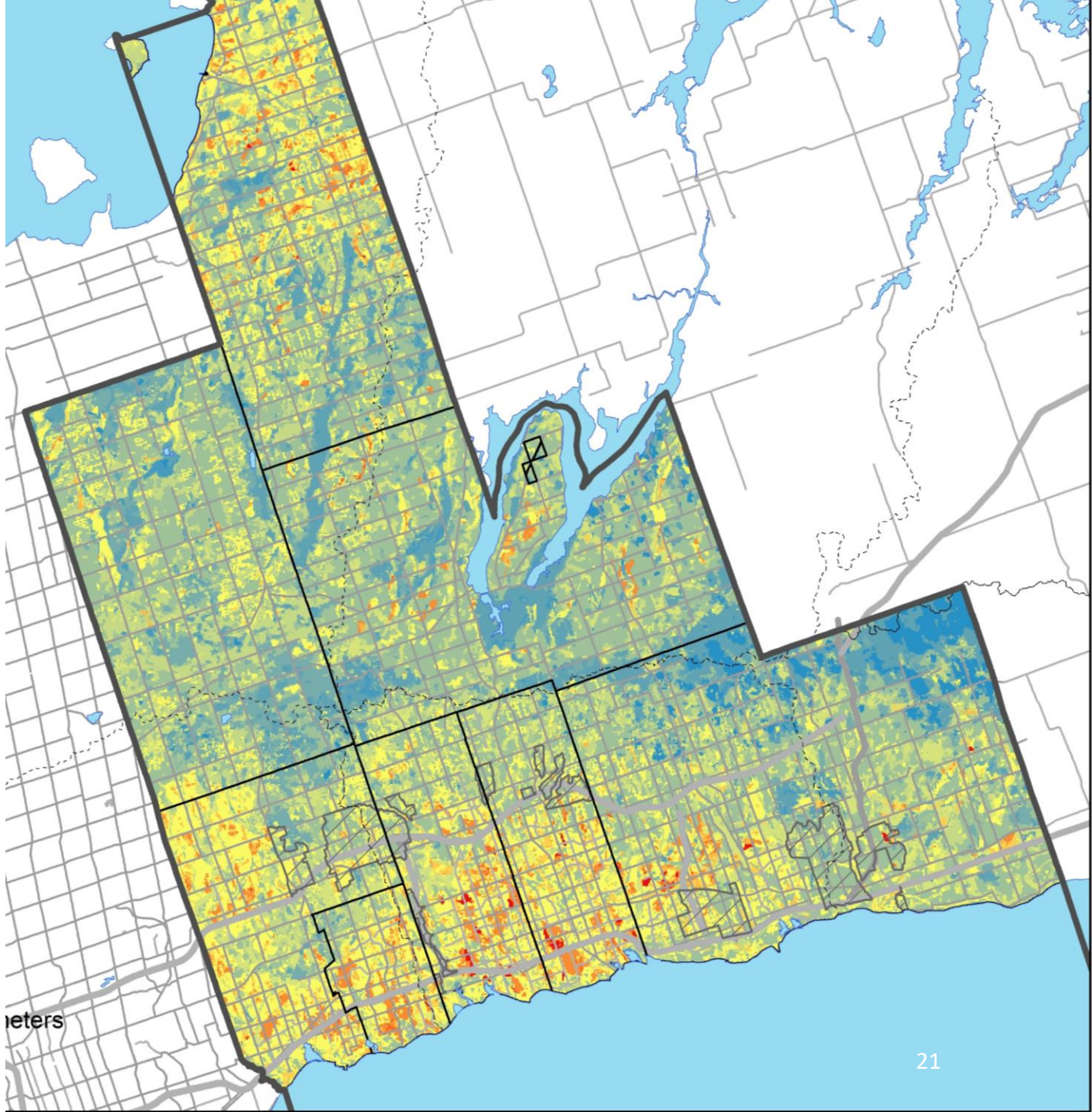
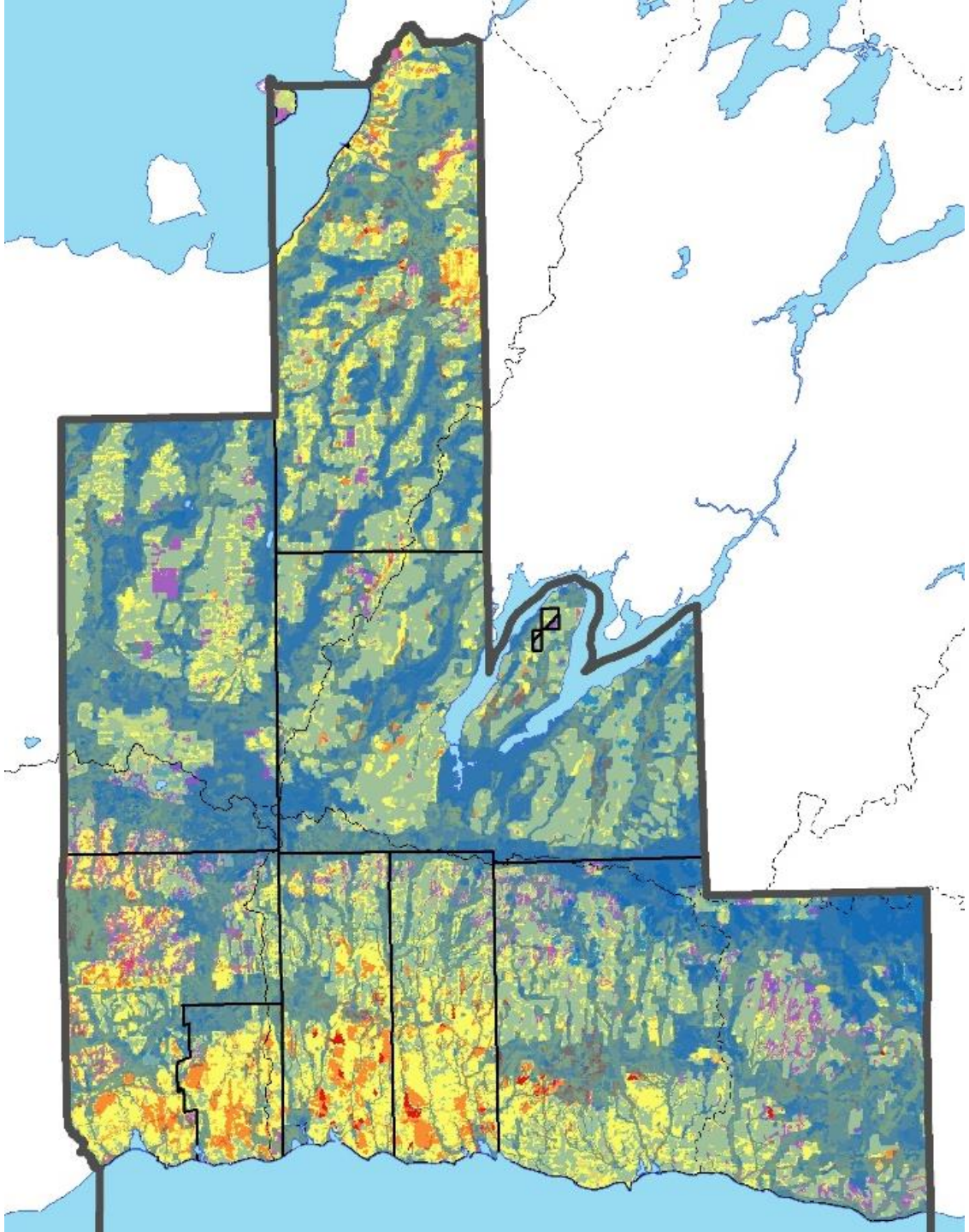


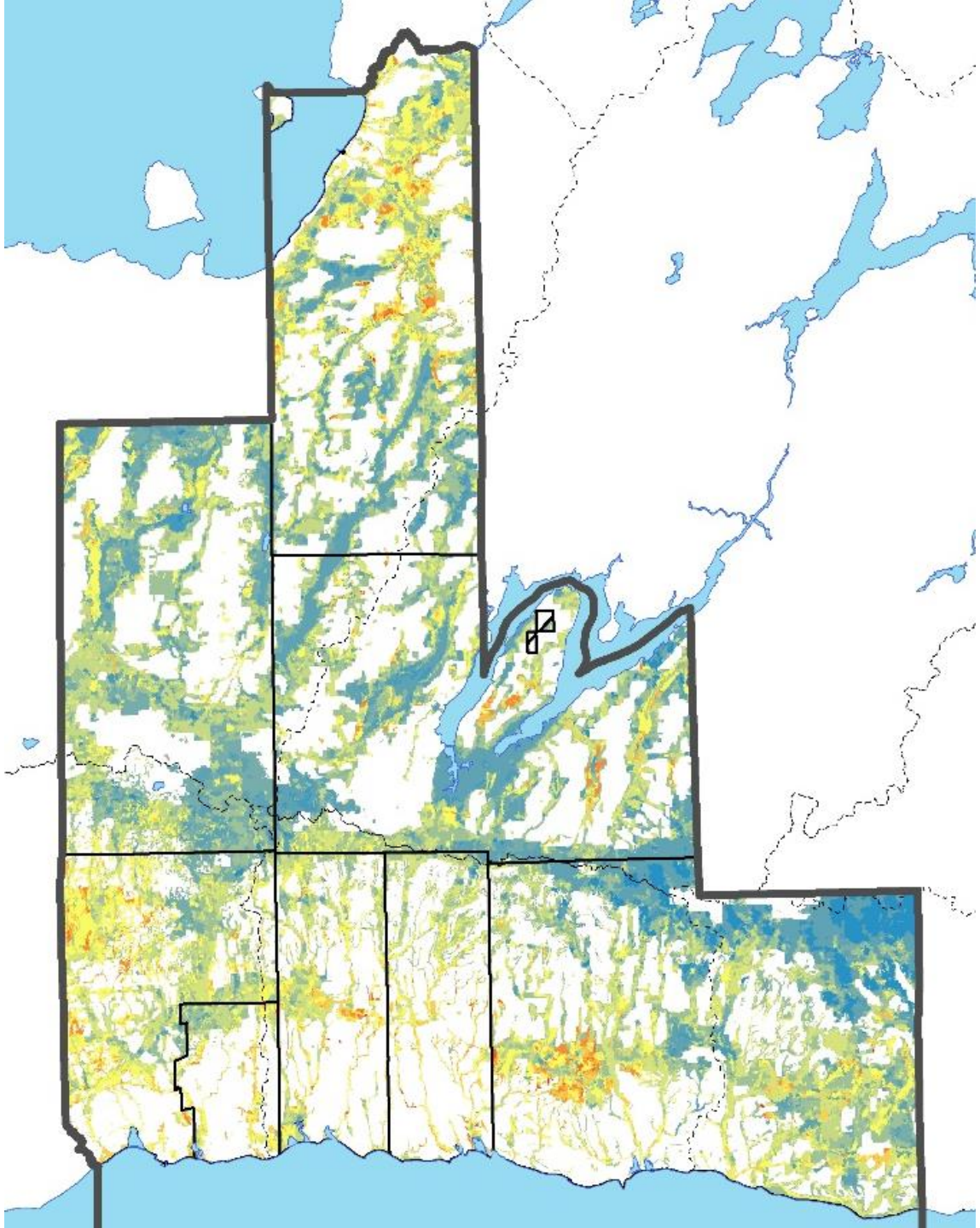
NHS + EO Areas



- Across Durham Region 5% of areas are highly vulnerable
- Another 31% of areas are moderately vulnerable
- What seems to be driving this is smaller and more fragmented habitat patches in urban and agricultural landscapes

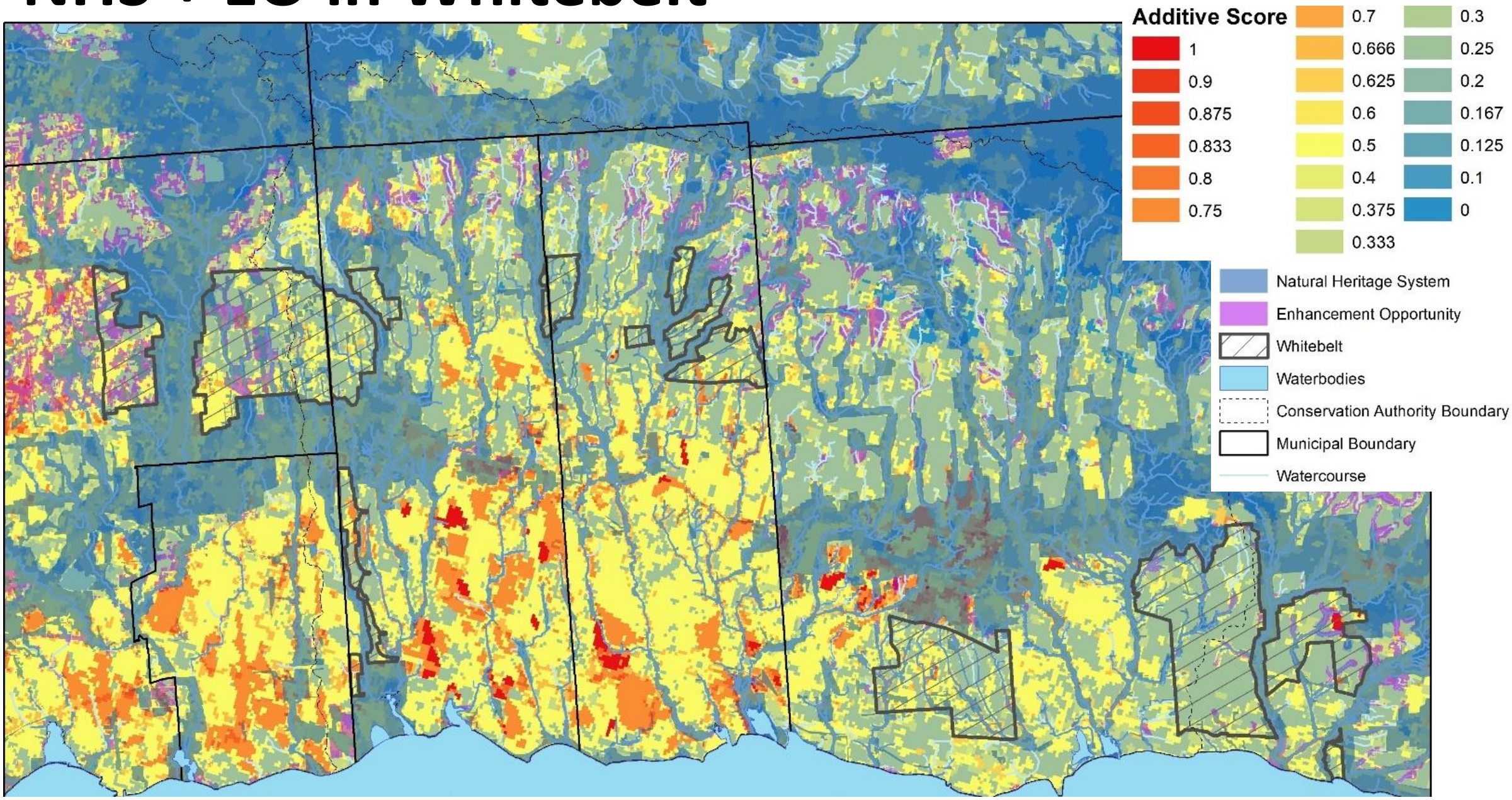
- Overall, 17.5% of moderate to highly vulnerable areas remain outside the NHS/EO areas

NHS + EO Areas



- Across Durham Region 64% of areas are of low vulnerability
- Most low vulnerability areas dominate the middle portions of the region within NHS/EO areas (35%)
- Also 18.4% of moderate to highly vulnerable areas are within NHS/EO areas
  - Specifically, 1.6% in **EO areas**

NHS + EO in Whitebelt



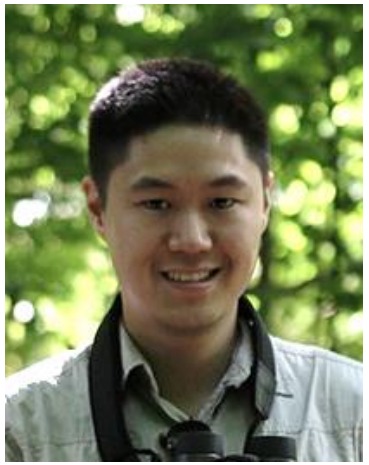
Conclusions

- CCVA tool is used as an initial step in the climate adaptation planning process
- Results support NHS enhancements (EO areas) which contribute to increasing the NHS footprint
- Most natural features are found to be included in NHS and EO areas
- CCVA broadly shows that actions on-the-ground will undoubtedly help to mitigate future climate vulnerability
    - Including more natural features within NHS/EO areas (by expanding the NHS/EO footprint where possible)
    - Implementation of enhancements in developed areas would also be encouraged (e.g., green infrastructure, urban tree canopy)

Acknowledgements

Project Team @ TRCA

Dr. Jonathan Ruppert



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