



# Distribution of Brook Trout in the TRCA Jurisdiction and what Legislation, Policies, and Guidelines do Conservation Authorities have at their disposal to Protect Brook Trout Habitat

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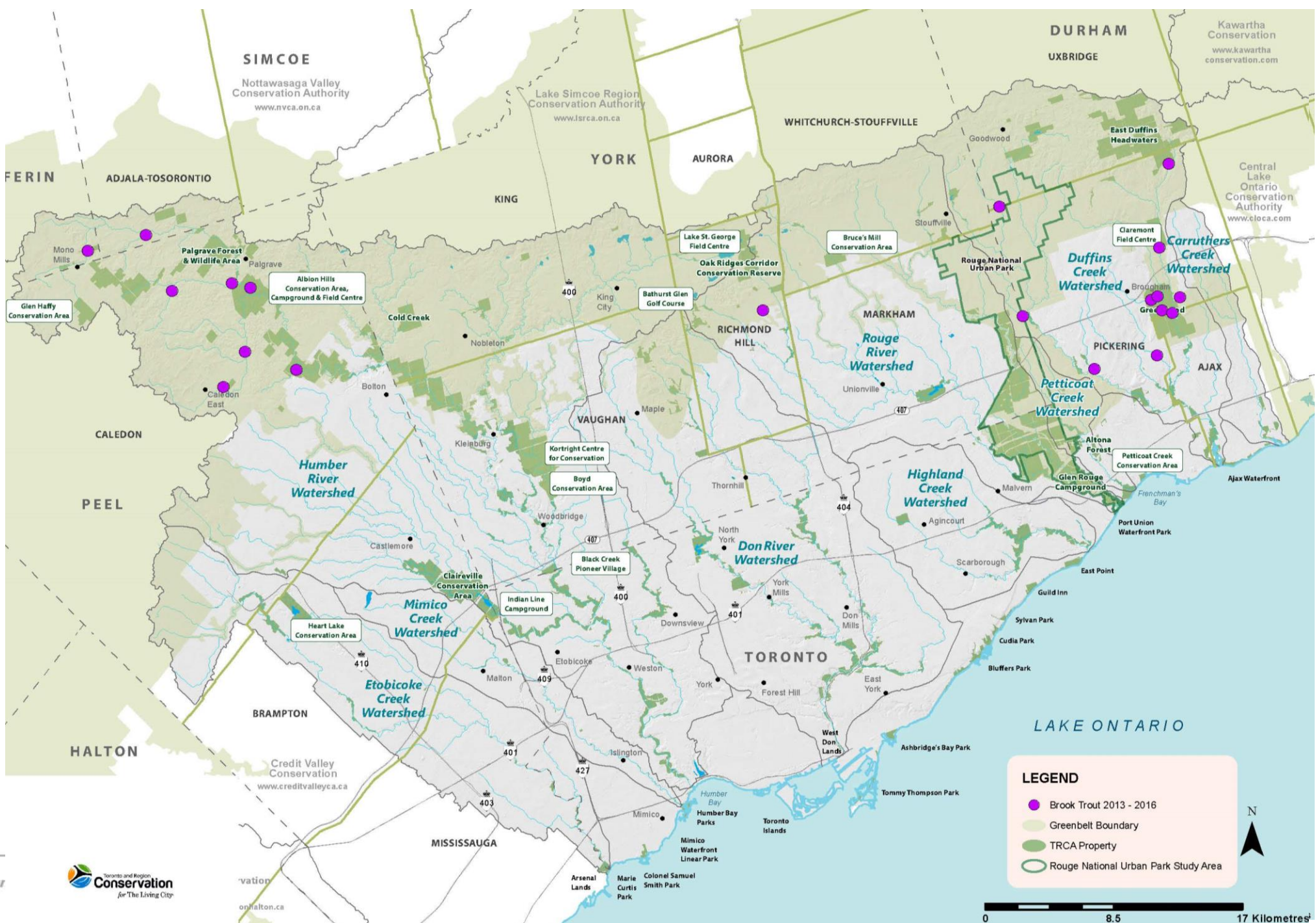




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**2001 - 2012**

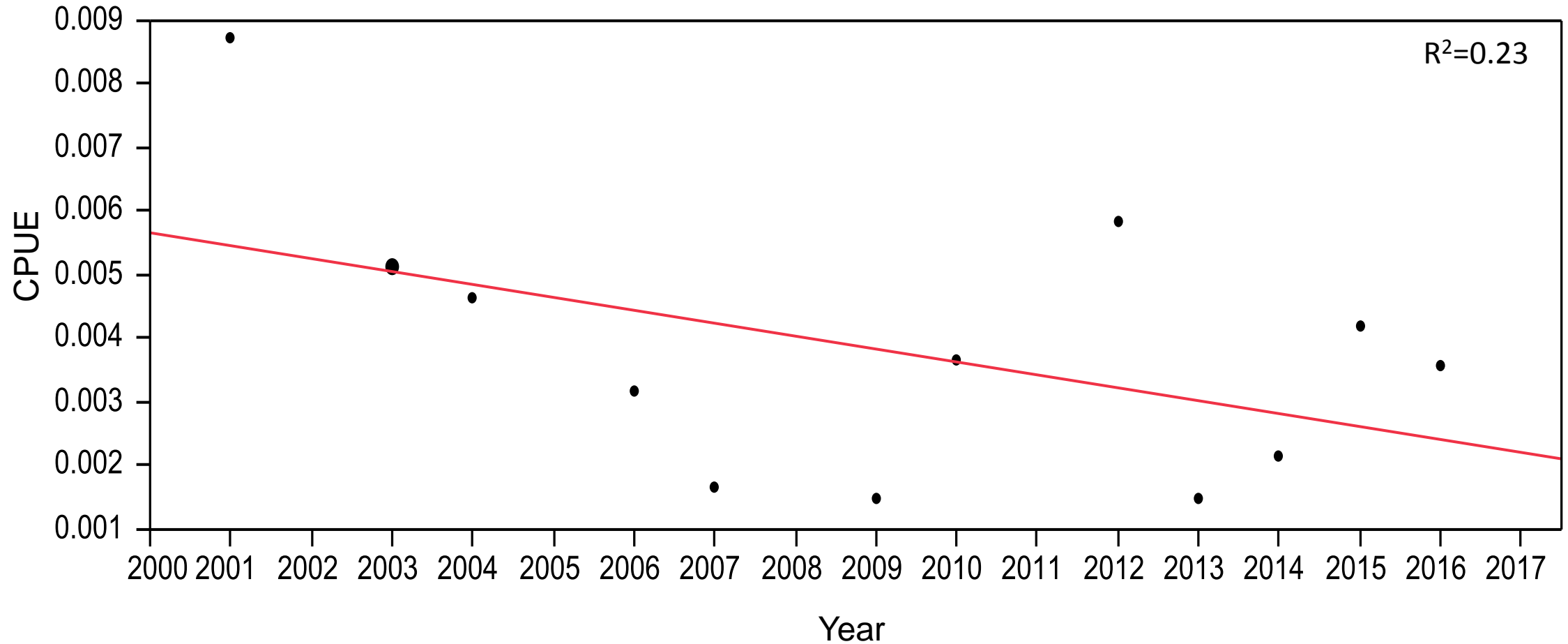
- 38 sites
- 3 watersheds (Humber, Rouge, Duffin's)
- Green Belt lands

**2013 - 2016**

- 19 sites
- 3 watersheds (Humber, Rouge, Duffin's)
- Green Belt lands

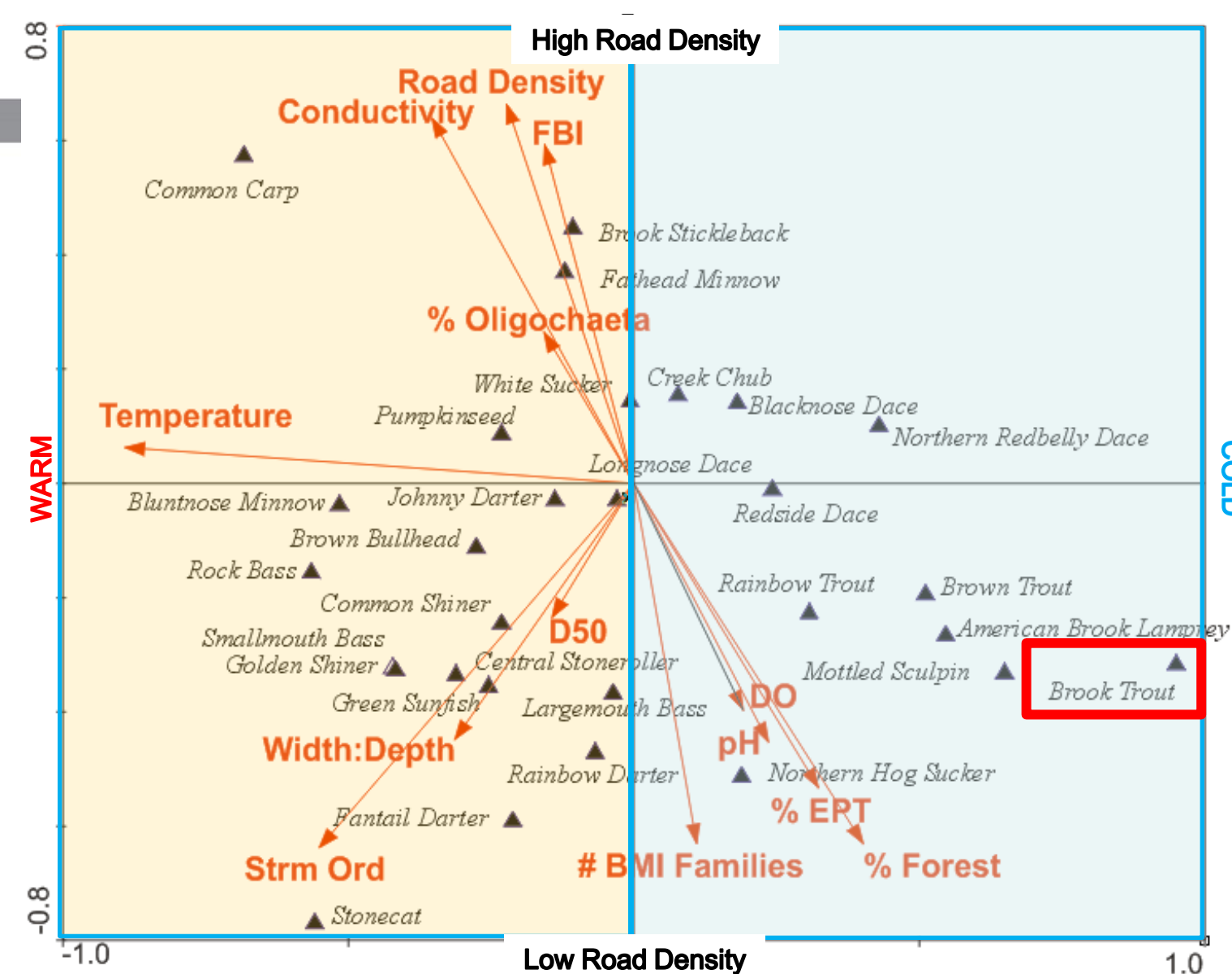


# Trend in TRCA Brook Trout Occurrence:



$$\text{CPUE} = 0.4143185 - 0.0002043 * \text{Year}$$

# What do these sites have in common?



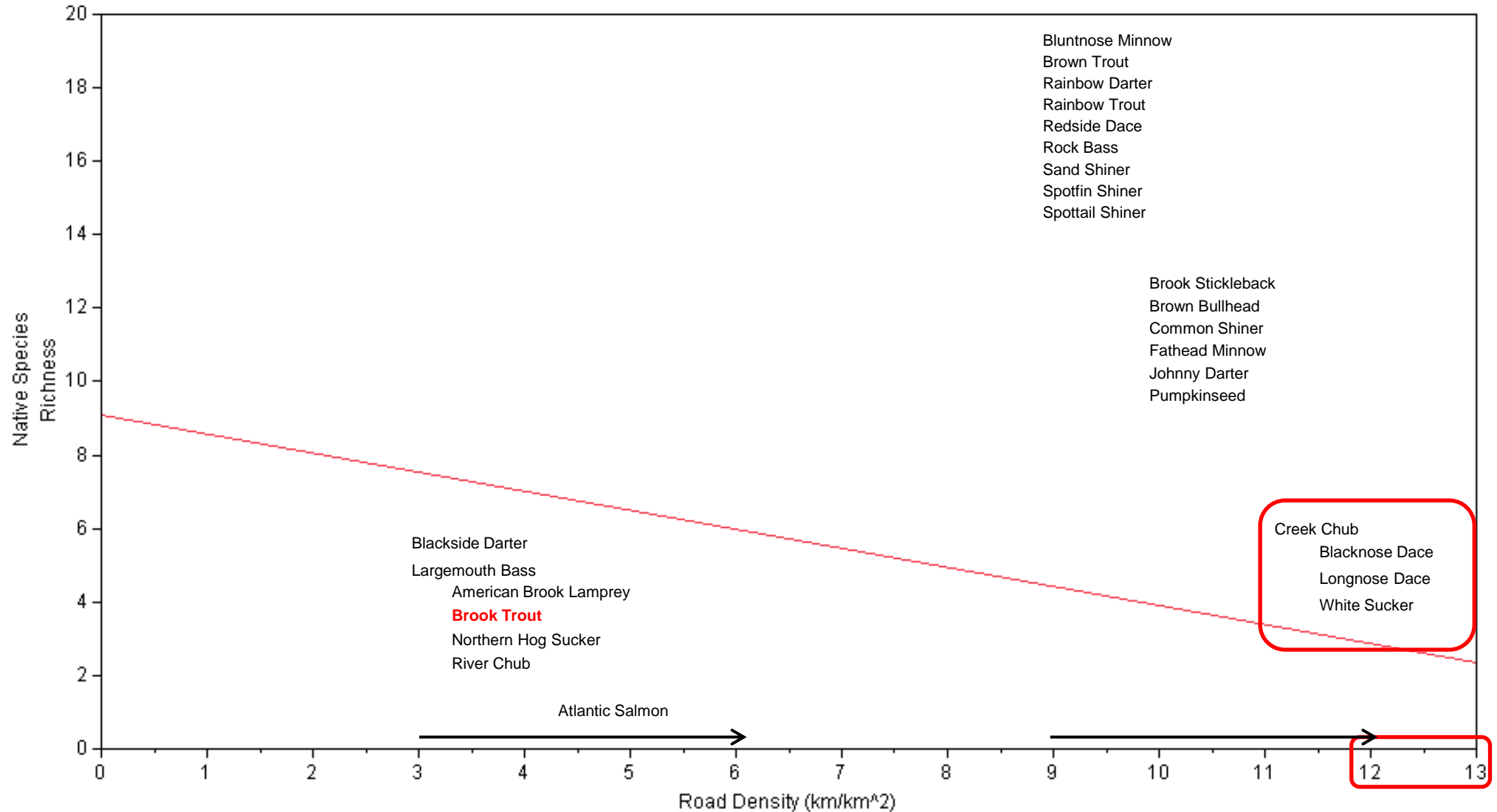
- High DO
- pH range from  $\approx 6.5 - 8$
- Water temperatures  $< 24^{\circ}\text{C}$ ,  $>$  rarely spikes
- Surrounding area has low to little land use change (% Forest)
- Stream sediment mainly gravel with lots of interstitial spaces (%EPT)
- Lower levels of urbanization (Road Density)
- Low levels of conductivity, less influence of NaCl.
- FBI is low hence influence of P and N is lower

Axis	% Total Variance	Cumulative %	Driver 1	Driver 2
1	27.7	27.7	Temperature	Stream Order
2	25.1	52.8	Road Density	Specific Conductivity
3	19.4	72.2	DO	Road Density





# Relationships and Road Density Thresholds?



**Regression:**  $p < 0.0001$   $R^2_{adj} = 0.24$ ,  $N = 399$ , Native Species Richness =  $9.07 - 0.518 * \text{Road Density}$ .  
**ANCOVA:** Significant difference between stream orders and non homogenous slopes.



## Threats to Brook Trout:

- 1) Climate Change
- 2) Stocking and Invasive Species
- 3) Habitat Fragmentation
- 4) Land Use change (Urbanization, Agriculture, Forestry, Mining, damming)
- 5) Exploitation
- 6) Water Taking (Groundwater)
- 7) Cumulative Effects

## The Brook Trout in Ontario

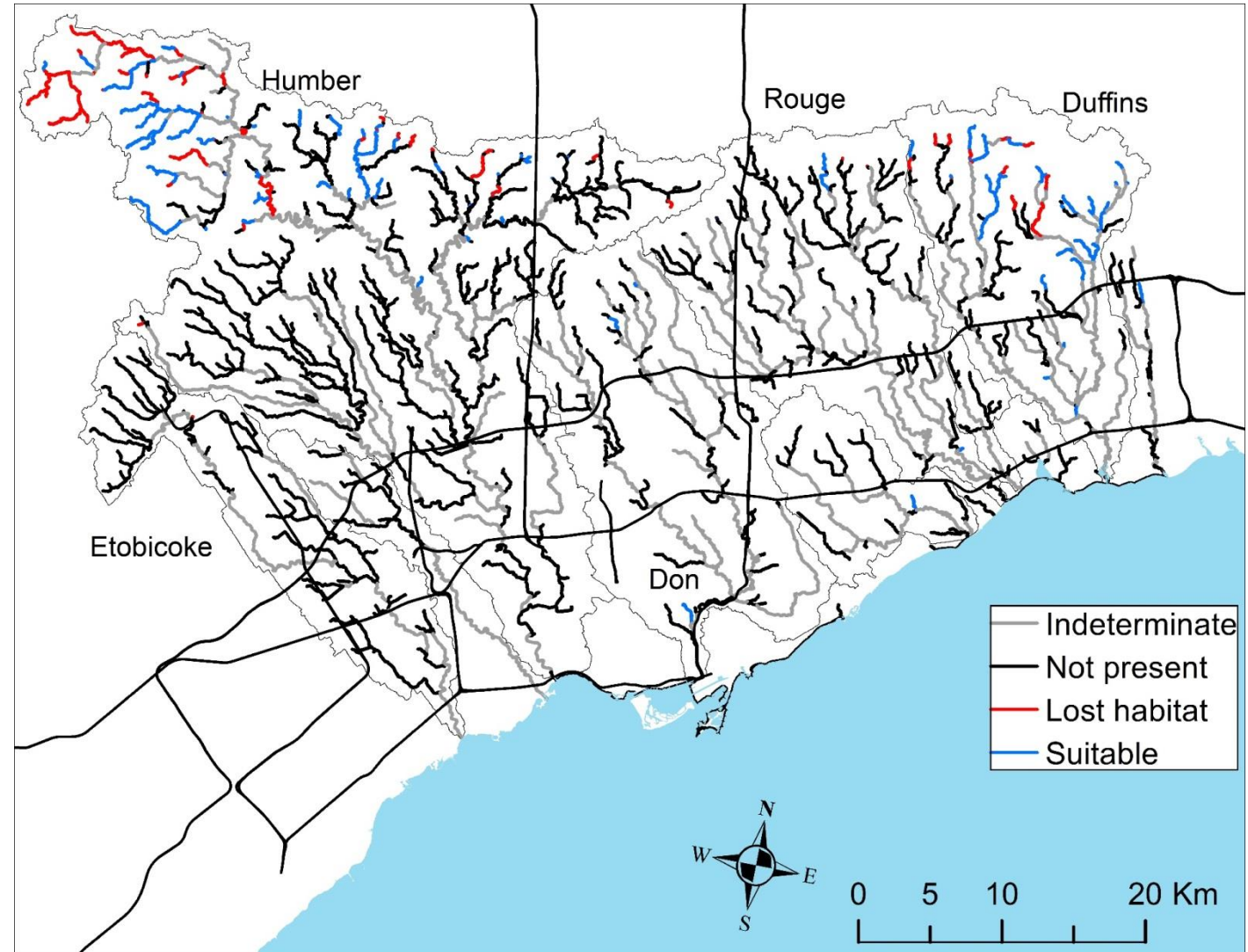


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# Future Brook Trout presence prediction



- Habitat Suitability Model with boosted regression trees
- Using climate change projections (water temperature)
- 50 yrs into the future







# Legislation, Policy, and Guideline (LPG) overview

## Legislation:

1. Planning Act: Provincial Policy Statement
2. Places to Grow Act
3. Greenbelt Act
4. Oak Ridges Moraine Conservation Act
5. Niagara Escarpment Planning and Development Act
6. Conservation Authorities Act, s.28 regulations
7. Clean Water Act
8. Environmental Assessment Act
9. Ontario Water Resources Act
10. Invasive Species Act
11. Lakes and Rivers Improvements Act
12. Drainage Act
13. Fisheries Act (federal)

## Policies:

1. Four Provincial Plans
2. CTC Source Protection Plan
3. Official Plans and Zoning By-laws
4. TRCA Living City Policies Chapter 7 and 8 or specific CA policies
5. Greening/Natural Land Securement Strategies
6. SWM Retrofit programs

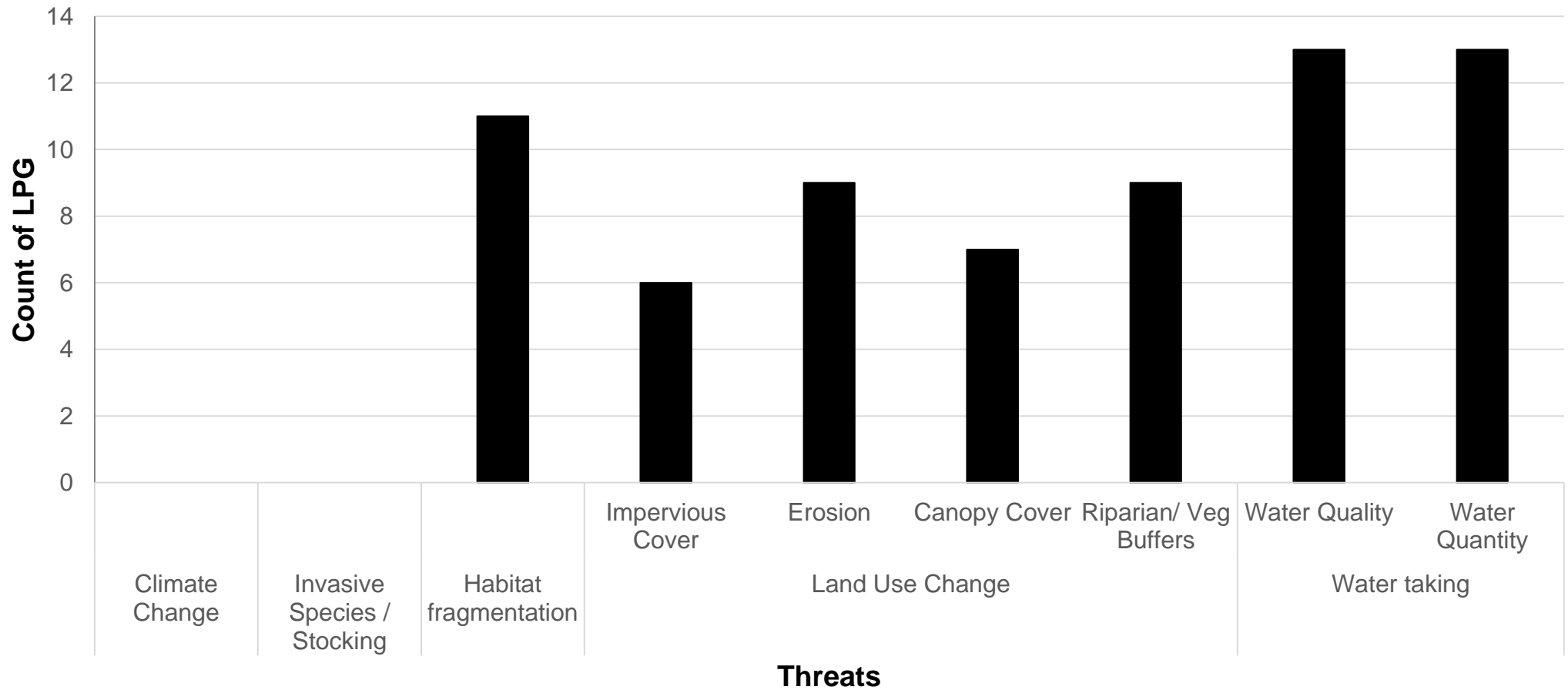
*\*This is not an exhaustive list and is a summation of policies and their applicability based on TRCA's experience in Planning & Development. It should not be relied upon for legal advice.*

## Guidelines

1. Evaluation, Classification, and Management of HDFs
2. Crossing Guidelines for Valley and Stream Corridors
3. EIS Guidelines
4. SWM Criteria document
5. Erosion and Sediment Control Guideline
6. Technical Guidelines for Provincial Plans



# Legislation, Policy, and Guideline (LPG) Summary





## What is TRCA doing regarding the threats?

- CAs are also directly involved in **watershed / waterfront ecosystem monitoring** in order to gauge the health and the response of both aquatic and terrestrial ecosystems in order to better understand the impacts of the threats.
- CAs **apply the Legislation, Policy, and Guidelines** during the permit application / review process
- CAs either act as a **regulator** or **commenting body providing technical guidance** to our municipal partners.
- Technical guidance / commenting role: **Climate change, Invasive Species, Water taking, habitat fragmentation and land use change.**
- Regulatory role: pollution, erosion, conservation of land (**habitat fragmentation**).
- Both roles directly and predominantly apply to mitigating or preventing **habitat fragmentation**, or un-sustainable **land use change**.
- **Restoration Ecologists** via habitat restoration and creation projects.





## What is TRCA doing regarding the threats?

- **Ecosystem approach** that is not species-specific but the decisions made will also benefit Brook Trout
- Restoration Ecologists through The process of habitat creation or restoration (not species specific)
- **Habitat fragmentation** (re-establishing habitat connectivity)
- Mitigating **Impacts of land use change** (Erosion, canopy cover, riparian / vegetative buffers, SWM)



Before



Before



After





## Example 1: Brock North Site 4



Before

Removed fish barrier and daylighted creek resulting in access to an additional **6.8km** of stream and stopped the deposition of eroding sands and gravels into the creek.



After

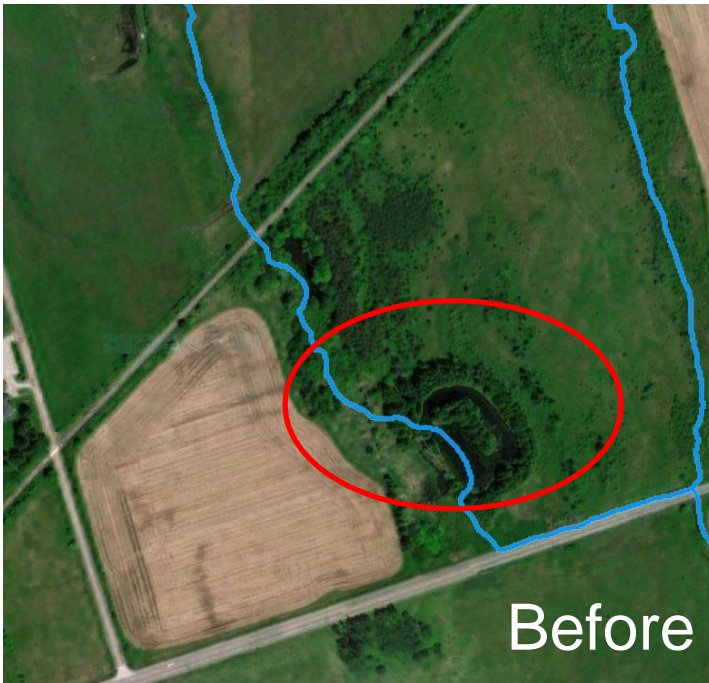




## Example 2: Transport Canada Lands – RR5 (2014)

### Restoration Activities

- Natural channel design (created new watercourse)
- Planted riparian vegetation
- Occupied RSD habitat + targeted for Atlantic salmon



Before

Member of Conservation Ontario



After

TORONTO AND REGION CONSERVATION AUTHORITY



## Conclusion and Knowledge Gaps

- All threats are similar if not identical to the threats affecting Redside Dace
- Trends in Redside Dace and Brook Trout populations are very similar
- CA roles (regulatory, guidance, restoration/habitat creation) mainly influences **land use change and habitat fragmentation**
- All of the threats span multiple municipal, federal, and organizational jurisdictions
- Therefore a multi organizational, multi government level, cooperative approach is needed
  
- Both species have very low tolerance to urbanization and aquatic habitat disturbance and change
- How much habitat is enough habitat to support or prevent the decline of Redside Dace and Brook Trout in urban areas? **CA monitoring activities are essential for this!**
- What does a healthy population look like (10 fish per km<sup>2</sup> or 100 per km<sup>2</sup>) and what is realistic in urban areas? OR have we already passed a threshold of no return?
- Where are our restoration priorities? Should we rather focus our effort on prevention vs. habitat restoration (cost-benefit analysis)?





# Acknowledgments



## TRCA staff:

**Policy, Restoration Projects, Watershed Strategies, Planning Ecology, Environmental Monitoring and Data Management, GIS**

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