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Using 'Living' Green Infrastructure (GI) to Combat Climate Change & Build Resilient Rural Communities

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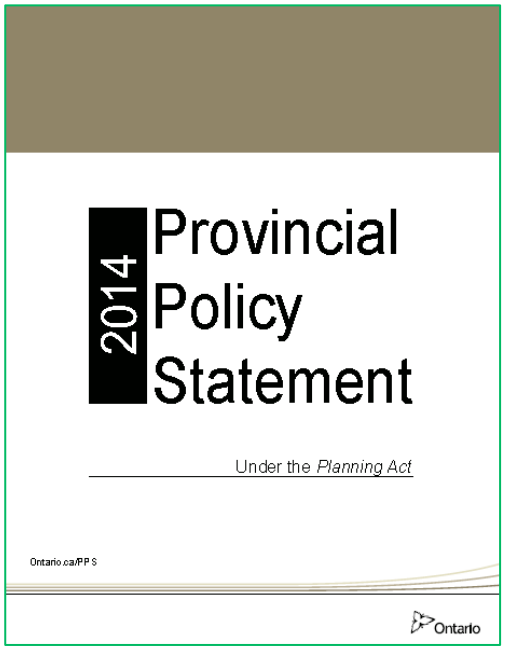
Outline

- Def'n of GI & elements
- Rural area resilience challenges:
  - Climate change impacts
  - General conditions
- A resiliency response using GI:
  - Observations from OMAFRA research
  - Other general comments
- Conclusion

Definition of Green Infrastructure

- Elements in the 'living' landscape that provide good works for humans as well as for nature
- Info taken from the PPS

  …Green infrastructure: means natural and human-made elements that provide ecological and hydrological functions and processes. Green infrastructure can include components such as natural heritage features and systems, parklands, stormwater management systems, street trees, urban forests, natural channels, permeable surfaces, and green roofs.

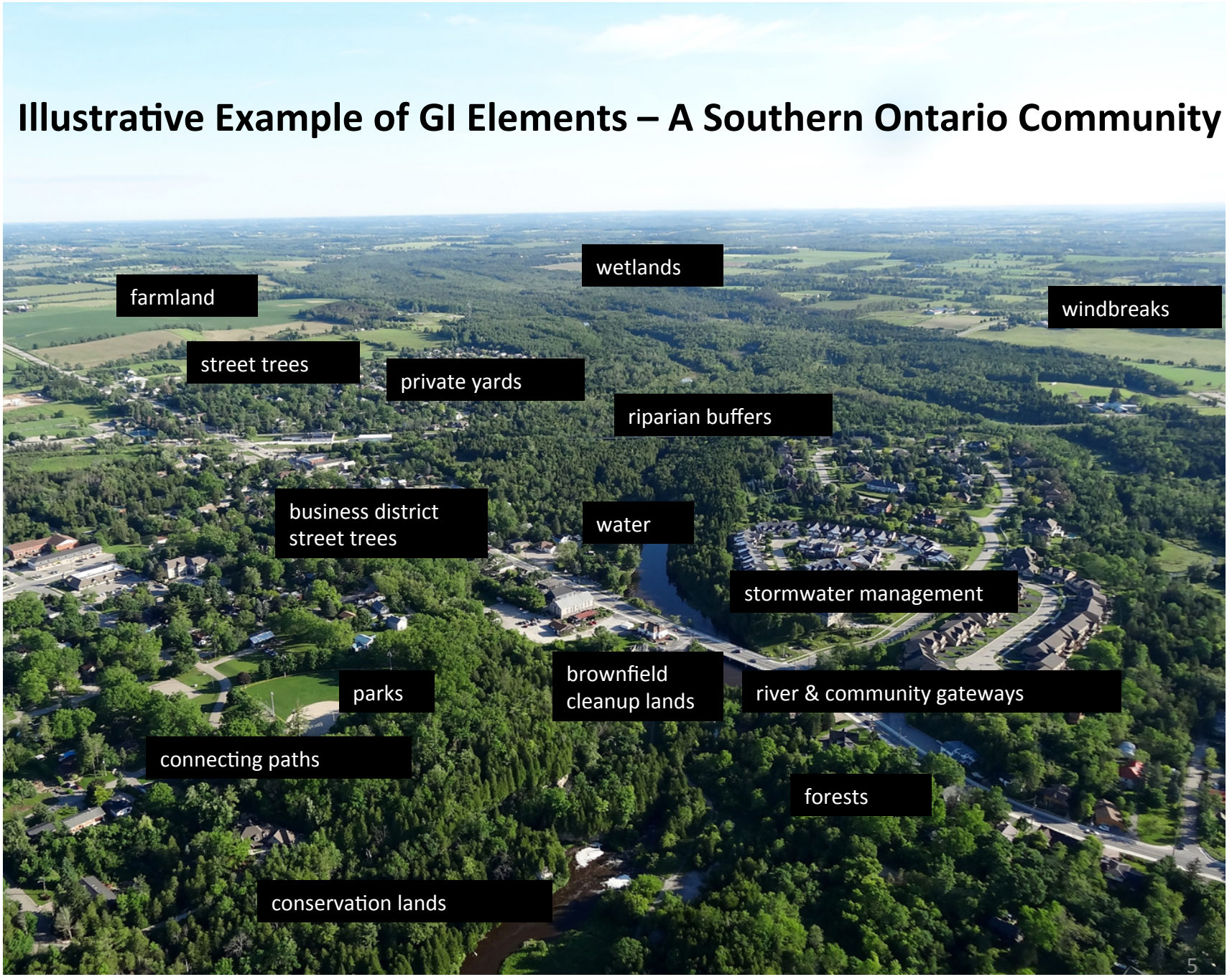


What are example elements contained within a GI planning framework?

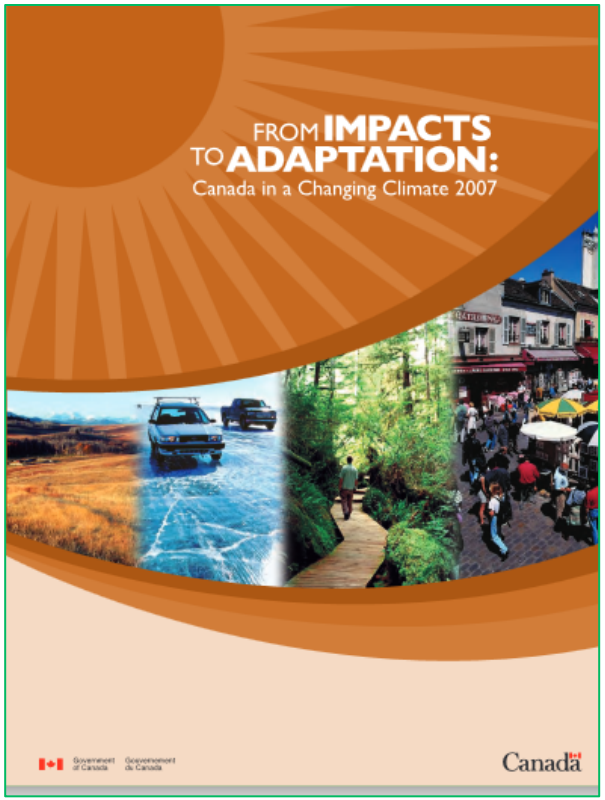
Local, neighbourhood and village scale	Town, city and district scale	City-region, regional and national scale
• Street trees, verges and hedges • Green roofs and walls • Pocket parks • Private gardens • Urban plazas • Town and village greens and commons • Local rights of way • Pedestrian and cycle routes • Cemeteries, burial grounds and churchyards • Institutional open spaces • Ponds and streams • Small woodlands • Play areas • Local nature reserves • School grounds • Sports pitches • Swales, ditches • Allotments • Vacant and derelict land	• Business settings • City/district parks • Urban canals • Urban commons • Forest parks • Country parks • Continuous waterfronts • Municipal plazas • Lakes • Major recreational spaces • Rivers and floodplains • Brownfield land • Community woodlands • (Former) mineral extraction sites • Agricultural land • Landfills	• Regional parks • Rivers and floodplains • Shorelines • Strategic and long distance trails • Forests, woodlands and community forests • Reservoirs • Road and railway networks • Designated greenbelt and strategic gaps • Agricultural land • National parks • National, regional or local landscape designations • Canals • Common lands • Open countryside

Source: European Environment Agency (2011). Green Infrastructure and Territorial Cohesion: The Concept of Green Infrastructure and Its Integration into Policies Using Monitoring Systems. Copenhagen, Denmark, European Union.

Illustrative Example of GI Elements – A Southern Ontario Community



Climate Change Impacts to Ontario



- + 1.4 degrees since 1948
- Changing weather patterns – warmer winters
- Overall more weather extremes – intensive rain events, heat/smog events, droughts, ice & windstorms
- Several Impacts – lower Great Lake water levels, flooding, forest fires, reduced agriculture production, damage to infrastructure & property, power outages, water borne disease outbreaks, human & ecosystem effects

Climate Change Impacts to Southern Ontario

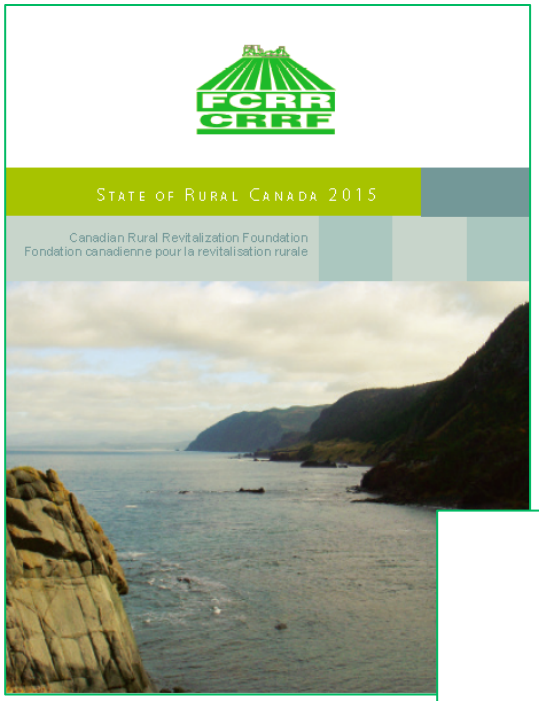
Huron County Planning

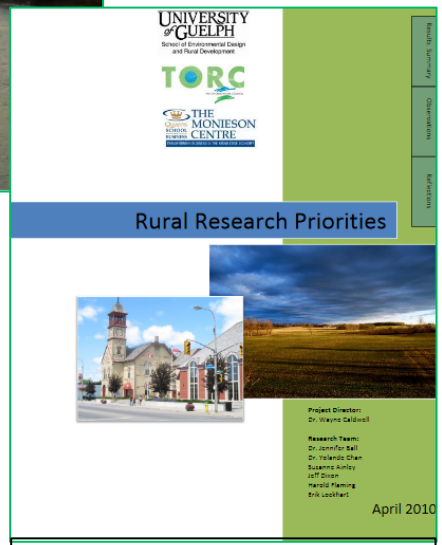
Windsor Star, Sept 29, 2016

Maitland Valley Conservation Authority

Other Challenges to Rural Community Resilience

- Socio-economic issues, i.e. job creation, population retention, population age schisms
- 'Hard' infrastructure upkeep
- Paying for/retention of local municipal services

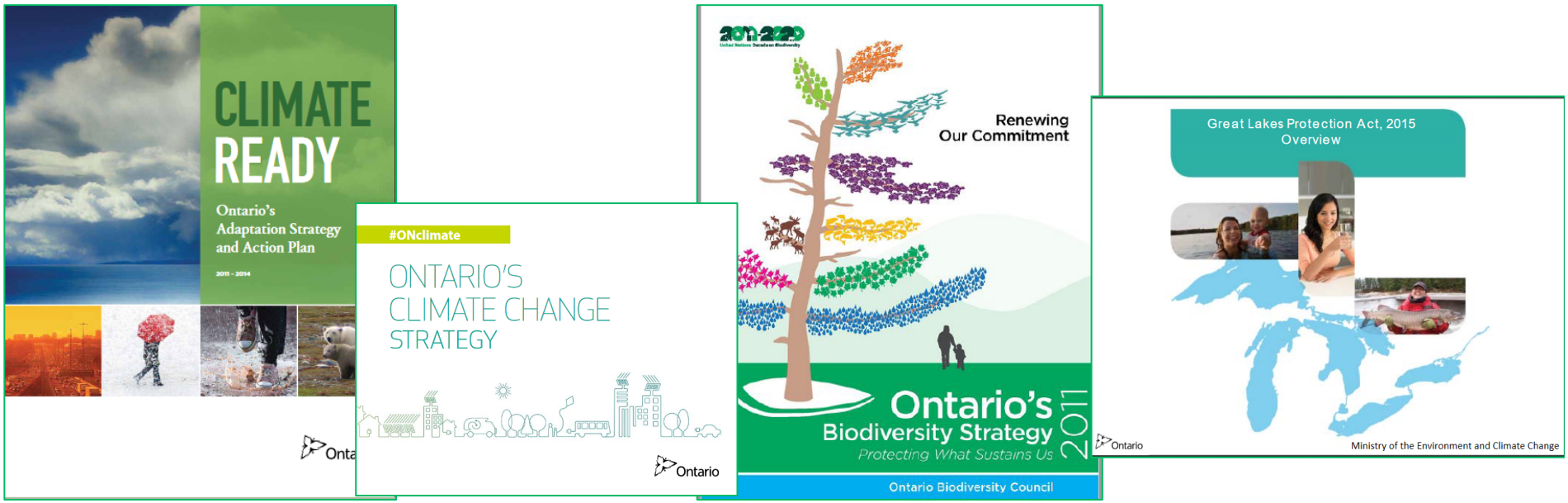




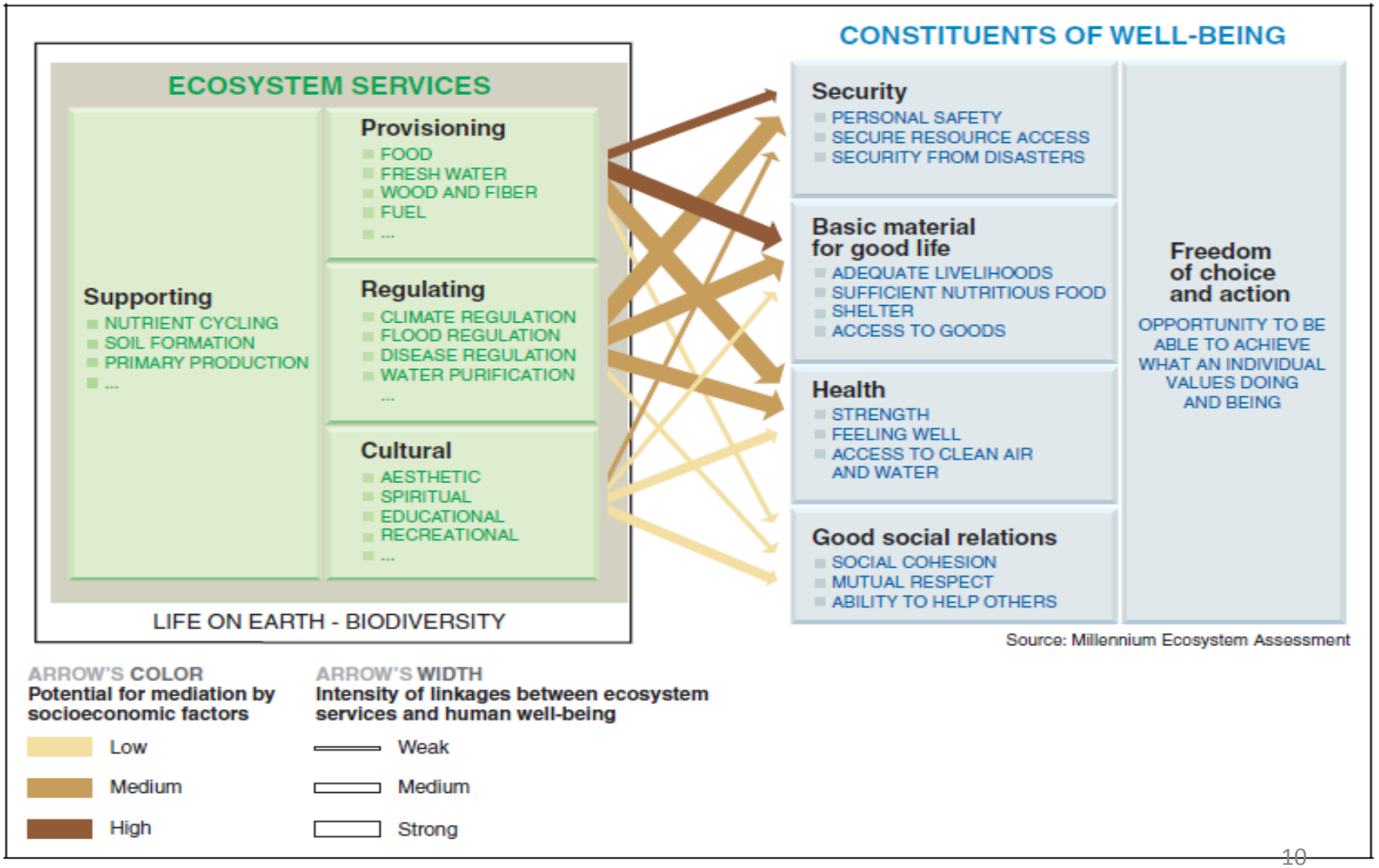
Rural Ontario Institute

General Societal Aspirations Impacting Rural Places

- Climate change adaptation/mitigation
- Biodiversity protection
- General environmental stewardship (Great Lakes Clean Water)

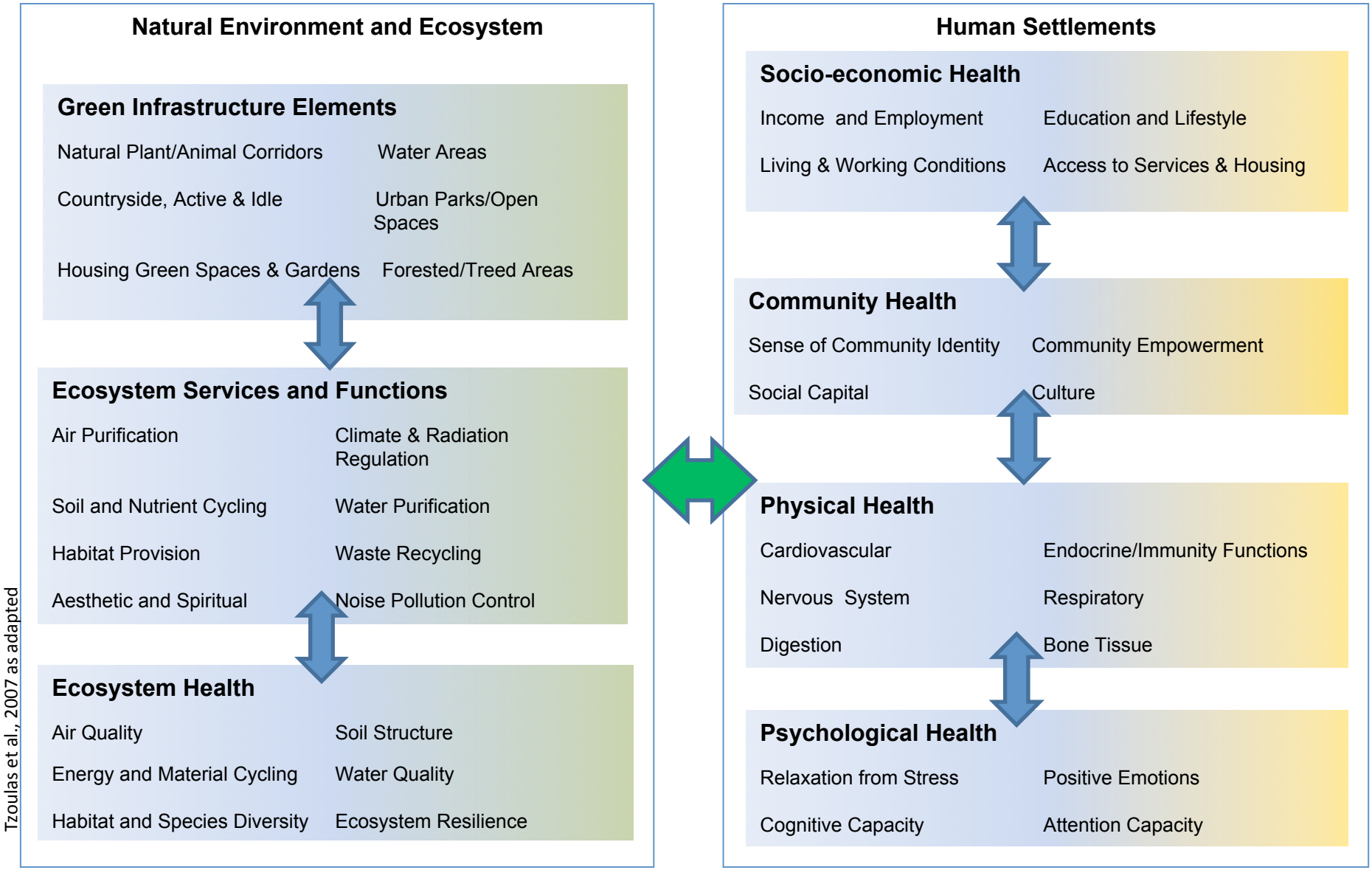


A Conceptual Framework:
Goods + Services of Nature Assisting Humankind



Millennium Ecosystem Assessment, 2005

Conceptual Framework for Planning Resilient Communities using GI



Tzoulas et al., 2007 as adapted

OMAFRA Research: Using the G+S of Nature, i.e., Green Infrastructure (GI) to Assist in Building Resilient Rural Communities

- Literature review
- Survey
- Key informant interviews
- Case study write-up

Innovative Practice Survey Result – Innovative Use of GI Practices in Rural Ontario

Agri-Food and Rural Link

A program of the OMAFRA – U of G Partnership

Mobilizing Agri-Food and Rural Research Knowledge

Innovative GI Elements

- Official Plans
- Sustainability planning
- Stewardship incentives
- Eco-cultural tourism
- Permaculture projects
- Local food
- Active transportatio
- Parks, trails
- Soil erosio
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- Natural
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- ies at risk
- Watershed protection
- Source water protection
- Wetland protection
- Shoreline protection
- Climate change adaptation planning
- Sense of place vision statements

Research shows varied approaches to integrating GI into rural municipalities

GI Element Themed Categories

Community Livability (strategic planning)
Culture, Education, Recreation, Tourism
Local Food, Soil Quality Enhancement
Biodiversity, Habitat/Species Protection
Climate Change Adaptation & Mitigation
Water, Stormwater Management
Woodlands, Woodlots, Street Trees
Other (recycled land, brownfields)

Source: European Environment Agency, 2011

Source: Pollination Guelph

Source: Urban Toronto

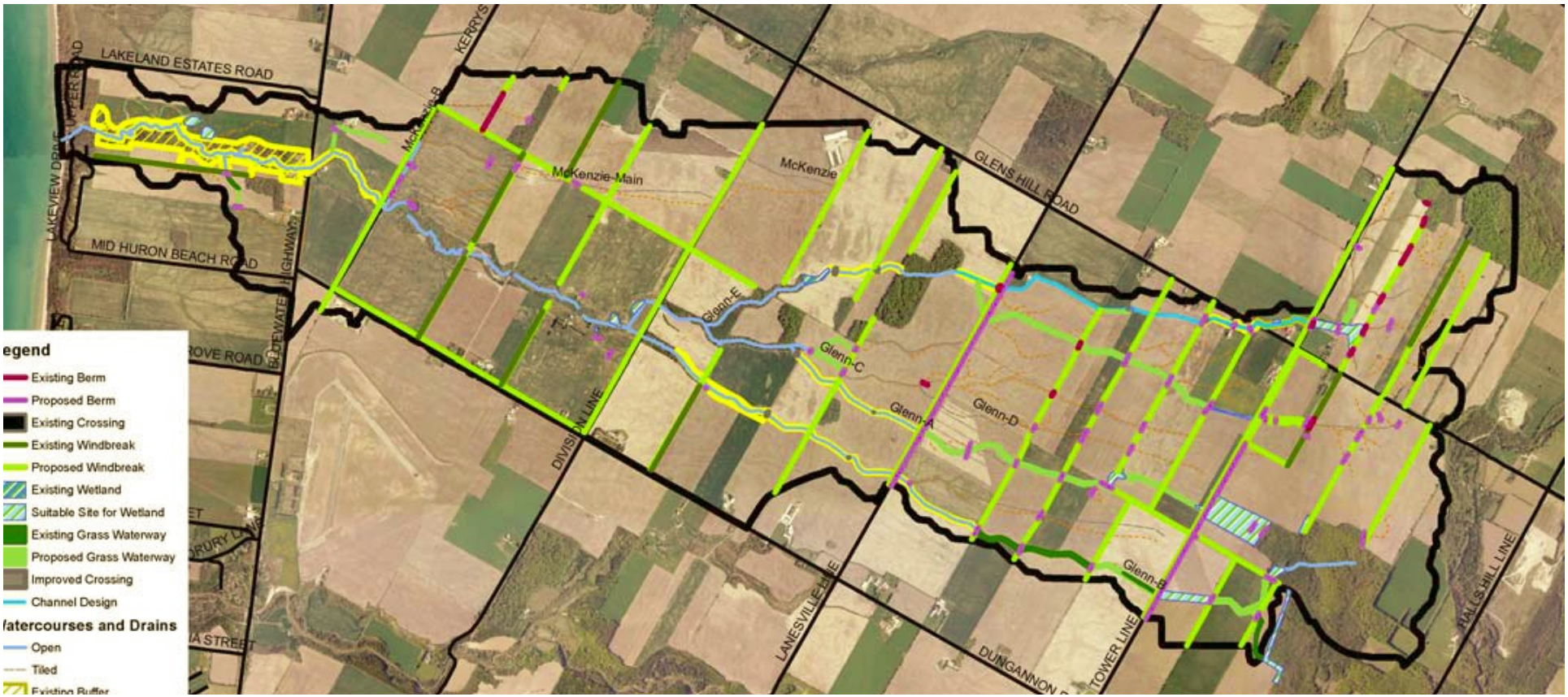
Source: Tourism Windsor Essex

OMAFRA Research Case Study/GI Theme Matrix

Themes / Case Studies	Community Livability	Culture Educ. Rec. Tourism	Local Food, Soil Quality Enhancement	Biodiversity, Habitat & Species Protection	Climate Change Adaptation, Mitigation	Water, SW Mgmt.	Forests Trees Woodlots	Other (AT, brown-fields)
Take Action for a Sustainable Huron	X	X	X	X	X	X	X	X
Georgian Bay Official Plan	X	X		X		X		X
Essex - CWATS	X	X						X
Clean Water ~ Green Spaces	X		X	X		X	X	X
Garvey / Glenn drain	X		X		X	X		
Maitland River video	X	X						
Rainscaping, Phosphorous Offsetting	X				X	X		
Mississippi Valley CA Climate Change model	X	X			X	X		
Transition Perth permaculture	X	X	X		X			
Simcoe Forests	X	X		X	X	X	X	X
Temagami Tourism	X	X		X				
Wingham Ecological Park	X	X		X		X		X
Green Legacy	X	X	X	X	X	X	X	X

County of Huron

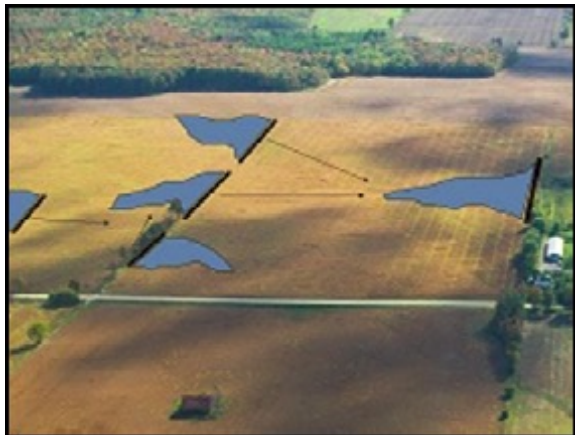
Case Study –
Garvie Creek - Glenn Drain Rural Watershed Management



- Protect water and soil resources though ‘low impact development’ water control actions on the land

Garvey-Glenn Stormwater Structures

- Natural channels
- Constructed wetlands
- Erosion control berms
- Grassed waterways



Case Study –
Green Legacy Tree Planting Programme

County of Wellington

County-wide tree planting initiative to increase understanding around the value of trees and the environment

+2 million trees planted within a 2500 hectare area over a 12 year period

Source: The Rural Route

Trees used for:

- Community capacity development
- Used for adaptation/mitigation impacts of climate change
- Windbreaks/living snow fences
- Micro-climatic controls
- Agricultural field soil/water enhancement
- Increased biodiversity

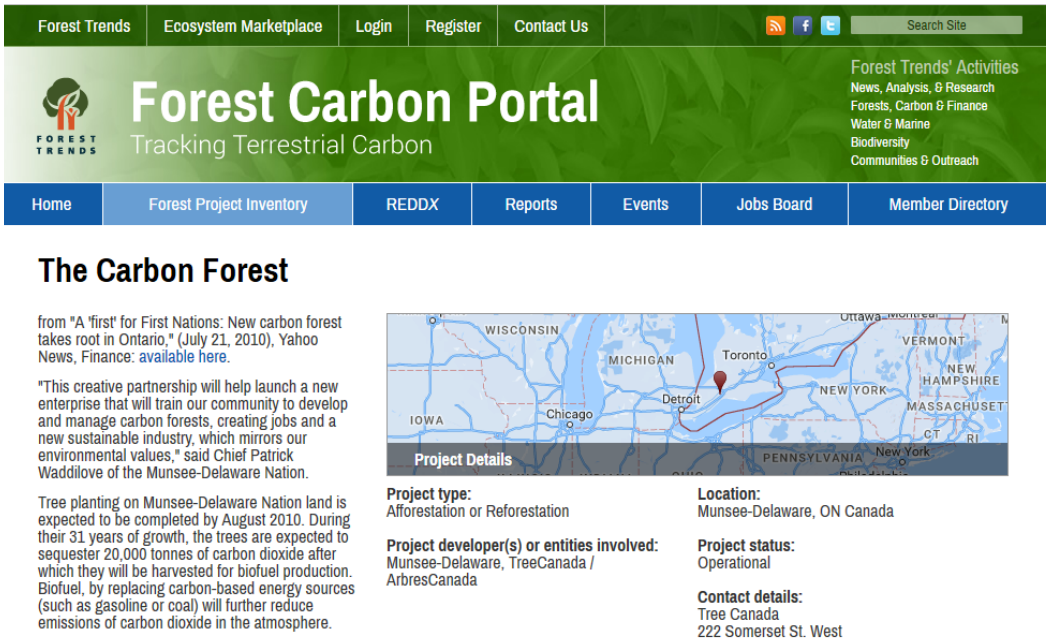
Other GI Initiatives Addressing Climate Change/Rural Resilience

- Enacting GI 'low impact development' stormwater management controls in rural communities (in conjunction with traditional grey systems):
  - Bioswales
  - Raingardens
  - Artificial wetland/stormwater ponds
  - Rainwater harvesting/cisterns
  - Permeable pavers
  - Etc.

Other GI Initiatives: Carbon Sequestration & Community Capacity Development

- The Munsee-Delaware First Nation Tree Corporation

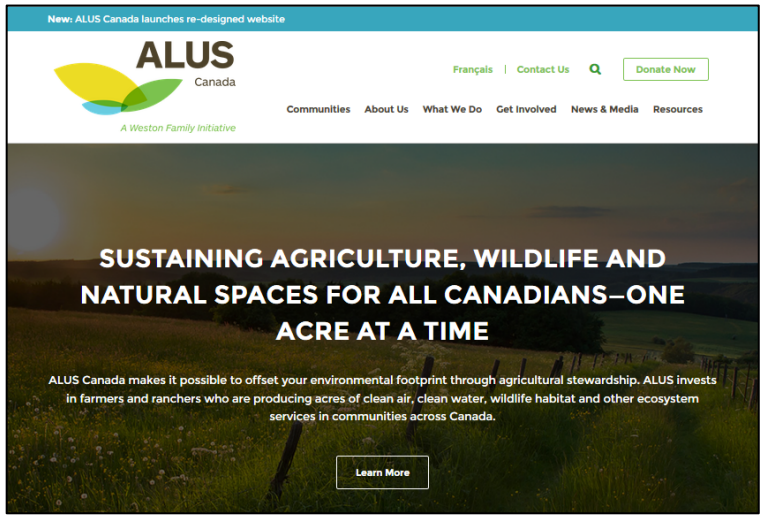
- Poplar tree plantings/ maintenance
- Annual payments for carbon capture services
- Economic development & community education

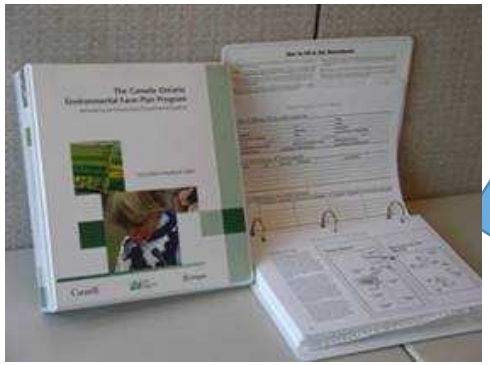


treecanada.ca/growcleanair

Other GI Initiatives: Local Payments for Environmental Stewardship

- Stewardship works on private lands, e.g. Environmental Farm Plan, Ducks Unlimited, Alternative Land Use Services (ALUS)
- Infrastructure Canada $/federal gov't climate action plan





Other GI Initiatives:

- Micro-climatic tree/landscape plantings/local food
  - Living snow fences
  - Street pavement shading
  - Local food
  - Strategic landscaping (green roof/wall)

Conclusions

- Using green infrastructure elements can…
  - Address challenges of climate change through both mitigation and adaptation mechanisms;
  - Can set a foundation for building rural community resilience.

Kraehling, 2015

- Planning for Rural Community Resilience – Coping with Climate Change and Energy Futures
  - https://uofmpress.ca/books/detail/planning-for-rural-resilience
- Green jobs for Midwestern Ontario project 2011
  - http://workgreen.ca/content/climate-changepeak-oil-views
- OMAFRA Project - Green Infrastructure for Ontario's Rural Communities: Using Nature for Community Economic Development and Resilience
  - http://waynecaldwell.ca/Projects/greeninfrastructure.html

Sources:

Kraehling, 2015

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- Thanks for listening. . . .

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