

The Case for Using Green Infrastructure (GI) in a Land Use Planning Framework for Resilient Rural Communities

**CRRF Conference
September 21, 2017**

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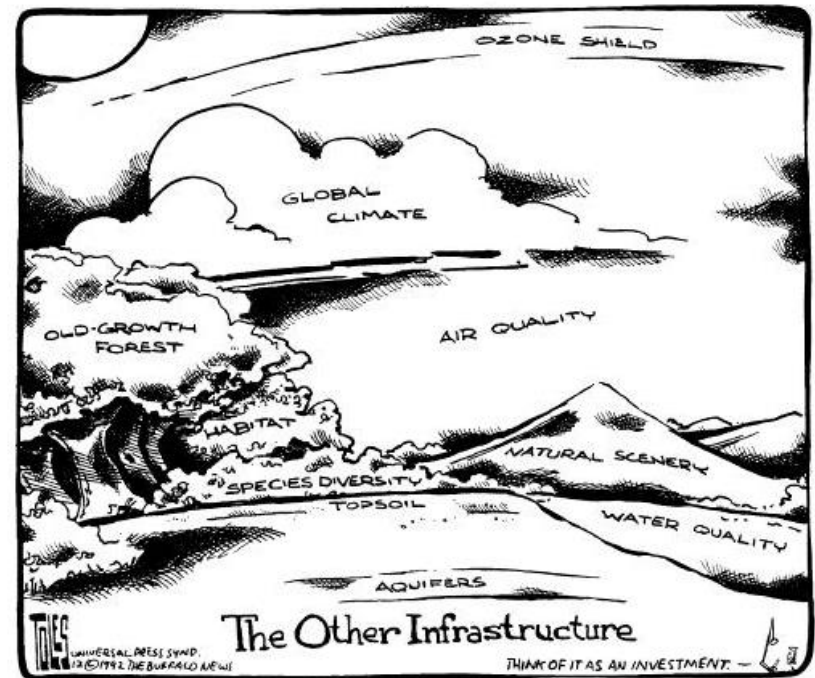
Outline:

- Green Infrastructure (GI) definition
- Review research work associated with the topic of using GI to frame a development/conservation program for resilient rural places:
 - a) OMAFRA research work on 'GI and the economic return to rural places'
 - b) PhD research on the potential utility of GI planning in rural Ontario
- Summary observations



Definition – GI Planning

- A form of land use planning based on a foundation integrating natural elements (both real/artificial) into linked environmental networks; these networks in turn provide multi-functional benefits to both human and natural environment communities.
- GI elements can work alongside of or in place of 'grey' infrastructure in our communities.



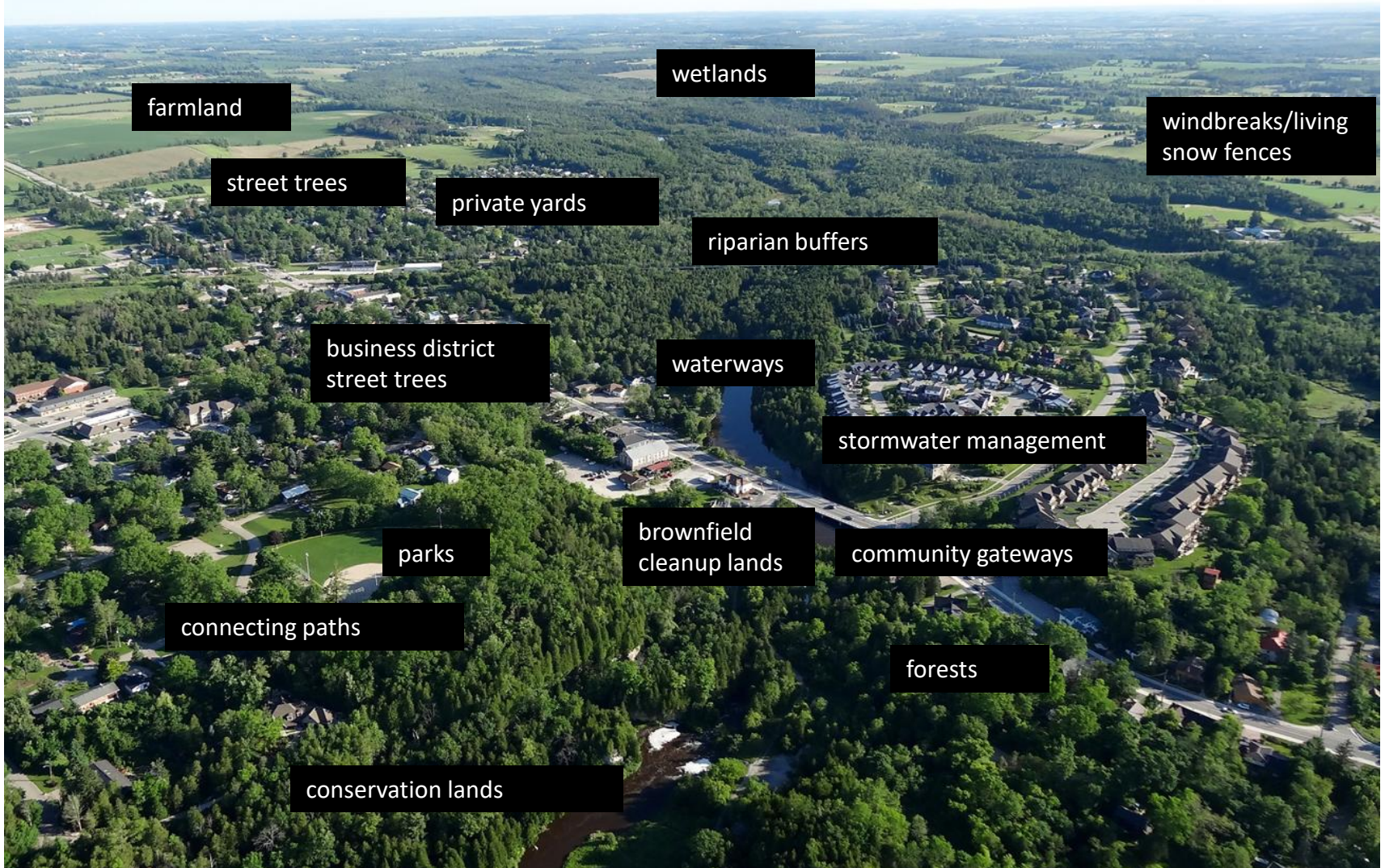
Fodor, 1998

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
<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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

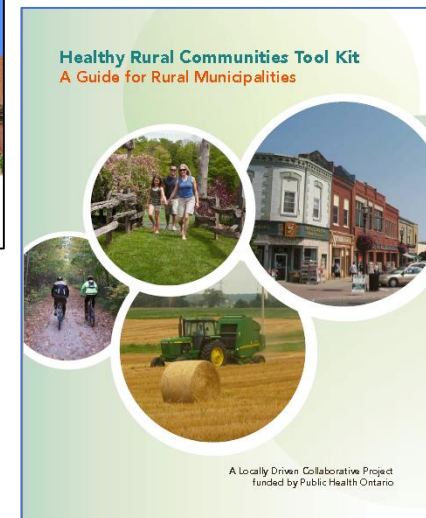
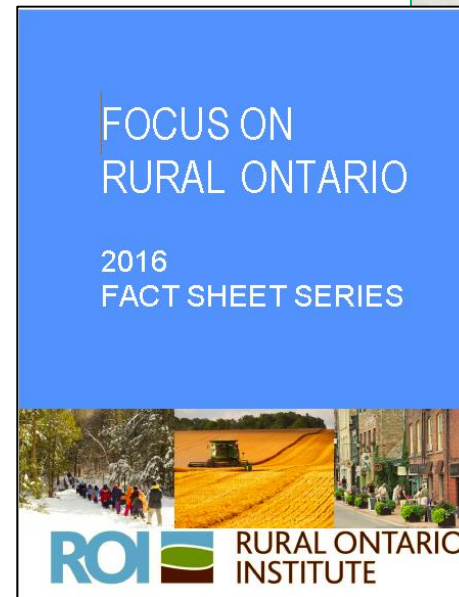
Source: European Environment Agency (2011). Green Infrastructure and Territorial Cohesion: The Concept of Green Infrastructure and Its Integration into Policies Using Monitoring Systems. Copenhagen, Denmark, European Union.

Illustrative Example of GI Elements – A Southern Ontario Community



Challenges to Rural Community Resilience – Economic & Social

- Socio-economic issues, i.e. job creation, population retention
- ‘Hard’ infrastructure upkeep
- Paying for/retention of local municipal services
- Rural municipal capacities
- Health & wellness conditions
- Climate change impacts



Challenges to Rural Community Resilience - Environment

- Ag soil health
- Great Lakes phosphorous input reductions, e.g., GLASI
- Watershed Conditions
- Biodiversity loss

Ontario
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Land Use

Agricultural Land Use Staff

Land Use Information

Legislation, Regulations and Protocols

Minimum Distance Separation (MDS)

Neighbour Relations

Normal Farm Practices (FFPPA)

Provincial Planning Systems

Provincial Policy Statement -

Development of an Agricultural Soil Health and Conservation Strategy

Healthy agricultural soil is a living and dynamic ecosystem, and one of the foundations of life, agriculture and the agri-food economy. Wise management can ensure the soil is fertile and full of the living organisms that are essential to grow food and other agricultural products, now and for future generations. It takes many years for natural processes to make healthy soil, and very little time to destroy it, so thoughtful stewardship is a must.

Even being so critical to agriculture production and the environment, Ontario's agricultural soil is under increasing stress:

- Increasing demands on soils to grow food for an increasing provincial and global population.
- Changes in cropping, tillage and other practices may be affecting soil health.
- Climate change is bringing extreme wet weather and drought events that increase soil erosion. Extreme temperature swings may also increase stress on soil and crops.

Watershed Checkup

Why Report? Benefits of Healthy Watersheds How Are We Monitoring

Resource Categories & Indicators Stewardship Counts What Can You Do?

Resource Categories & Indicators

Conservation Authority Watershed Report Cards measure and report on three resource categories: Surface Water Quality, Forest Conditions, and Groundwater Quality with a set of [65% 80%] text=indicators|http://watershedcheckup.com/drinking_water_myths/indicators.html|rokbox|for each category. Many other factors impact environmental health, which are also important and these are often reported through other means.

The Conservation Authorities chose these three resource categories because they relate to two key Conservation Authority business functions: protecting and enhancing water quality, and preserving and managing natural areas. Some Conservation Authorities have added additional categories, however, standardized criteria and grades have not been developed for any additional indicators at this time.

The following are the indicators for the three resource categories:

Surface Water Quality

Total Phosphorus
Bacteria (*E.coli*)
Benthic Macroinvertebrates

→

Forest Conditions

% Forest Cover
% Forest Interior
% Riparian Zone Forested

→

Groundwater Quality

Nitrite + Nitrate
Chloride

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You are here: Home > Programs > Great Lakes Agricultural Stewardship Initiative

GLASI

Great Lakes Agricultural Stewardship Initiative

Supporting activities in the Lake Erie and Lake St. Clair watersheds and the Lake Huron southeast shores watershed

Farmland Health Check-Up

Assess the health of your farm by working one-on-one with a Certified Crop Advisor

Farmland Health Incentive Program

Supporting the implementation of BMPs identified through the Farmland Health Check-Up

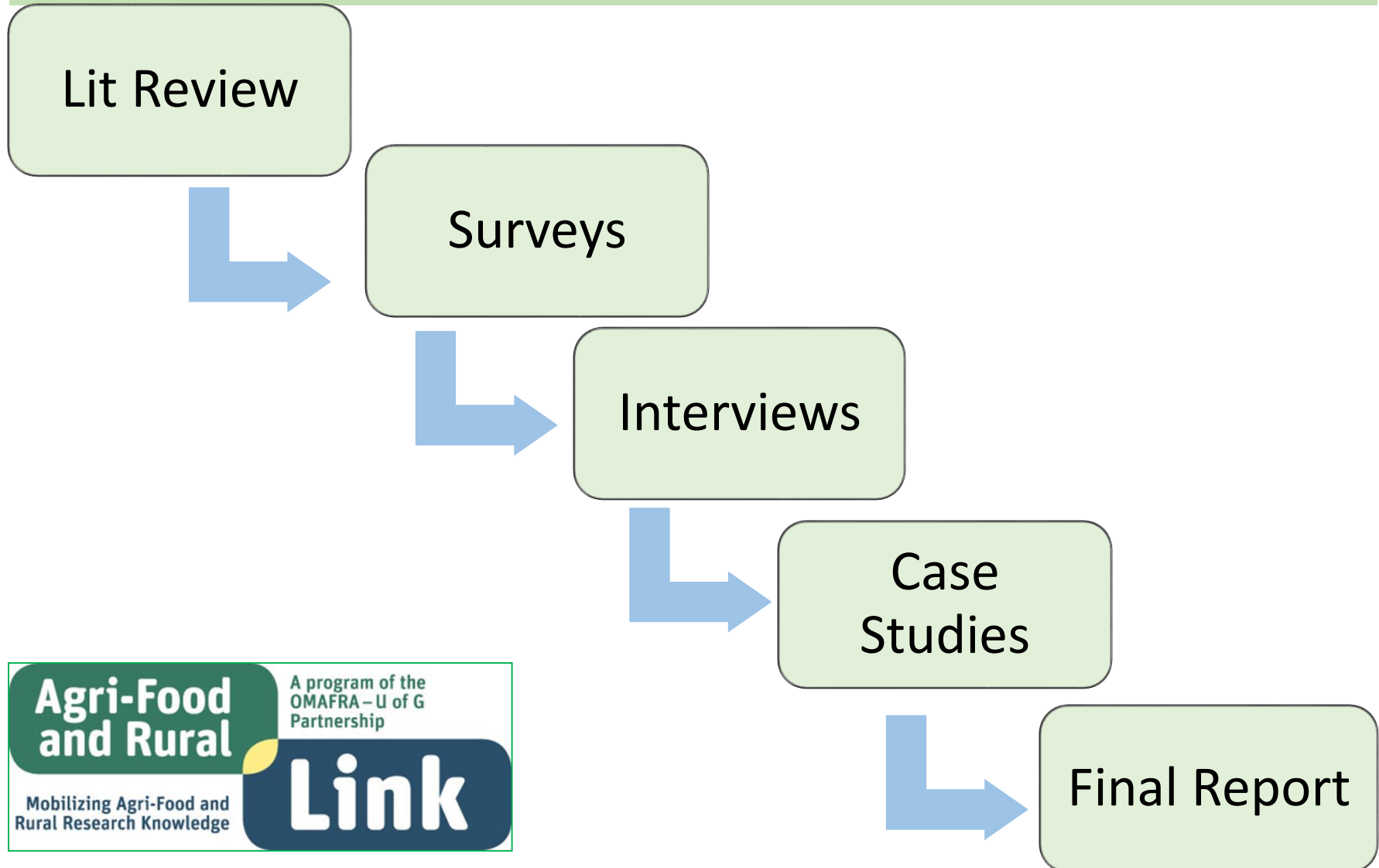
Priority Subwatershed Project

Working with delivery partners to fund highly targeted BMPs in eligible subwatersheds

Education and Outreach

Education and outreach initiatives

OMAFRA Research Project: Green Infrastructure (GI) for Ontario's Rural Communities: Using Nature for Economic Development and Community Resilience



OMAFRA Case Studies - Economic Benefits

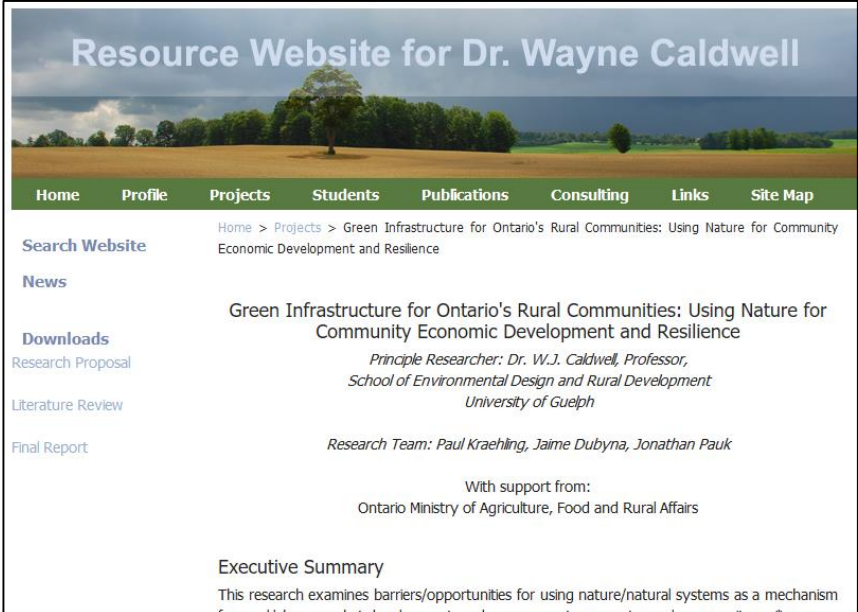
- Growth of green industry: jobs in design, construction, maintenance
- Horticultural/landscaping jobs
- Less spending by municipalities
- Decreased energy costs
- Avoids cost of flooding road repair
- Mitigates drought costs
- Attracting visitors – spending in local economy
- Eco-tourism
- Economic spinoffs
- Attracting young professionals
- Attracting & retaining residents
- Increased property value
- Timber sales
- Reduced healthcare costs – clean air & water, green space, increased physical activity
- Local food production
- Generates money from fees
- Creates niche markets – i.e. permaculture
- Environmental resilience
- Cost savings to farmers (inputs)
- Safeguarding soils
- Increase yields
- Education
- Preserves wildlife habitat
- Complements ‘grey’ infrastructure provision

GI provides multiple opportunities for stimulating economic activity, providing jobs, and offering cost benefits to rural municipalities

OMAFRA Research General Observations

- Many varied opinions on what constitutes 'green' infrastructure – ideas not always associated with nature or 'living' things
- Systems consideration of integrating/linking various GI elements not generally present
- Opportunities for multi-functionality and synergistic applications

<http://waynecaldwell.ca/Projects/greeninfrastructure.html>



Resource Website for Dr. Wayne Caldwell

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Research Proposal

Literature Review

Final Report

Home > Projects > Green Infrastructure for Ontario's Rural Communities: Using Nature for Community Economic Development and Resilience

Green Infrastructure for Ontario's Rural Communities: Using Nature for Community Economic Development and Resilience

Principle Researcher: Dr. W.J. Caldwell, Professor,
School of Environmental Design and Rural Development
University of Guelph

Research Team: Paul Kraehling, Jaime Dubyna, Jonathan Pauk

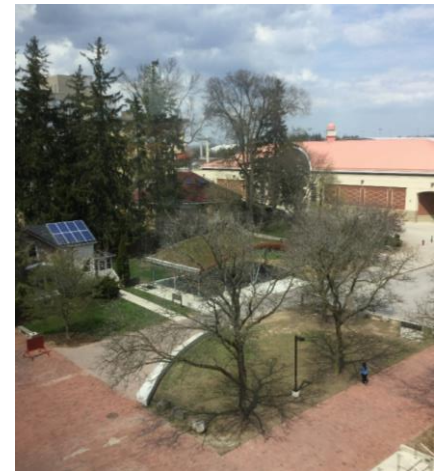
With support from:
Ontario Ministry of Agriculture, Food and Rural Affairs

Executive Summary

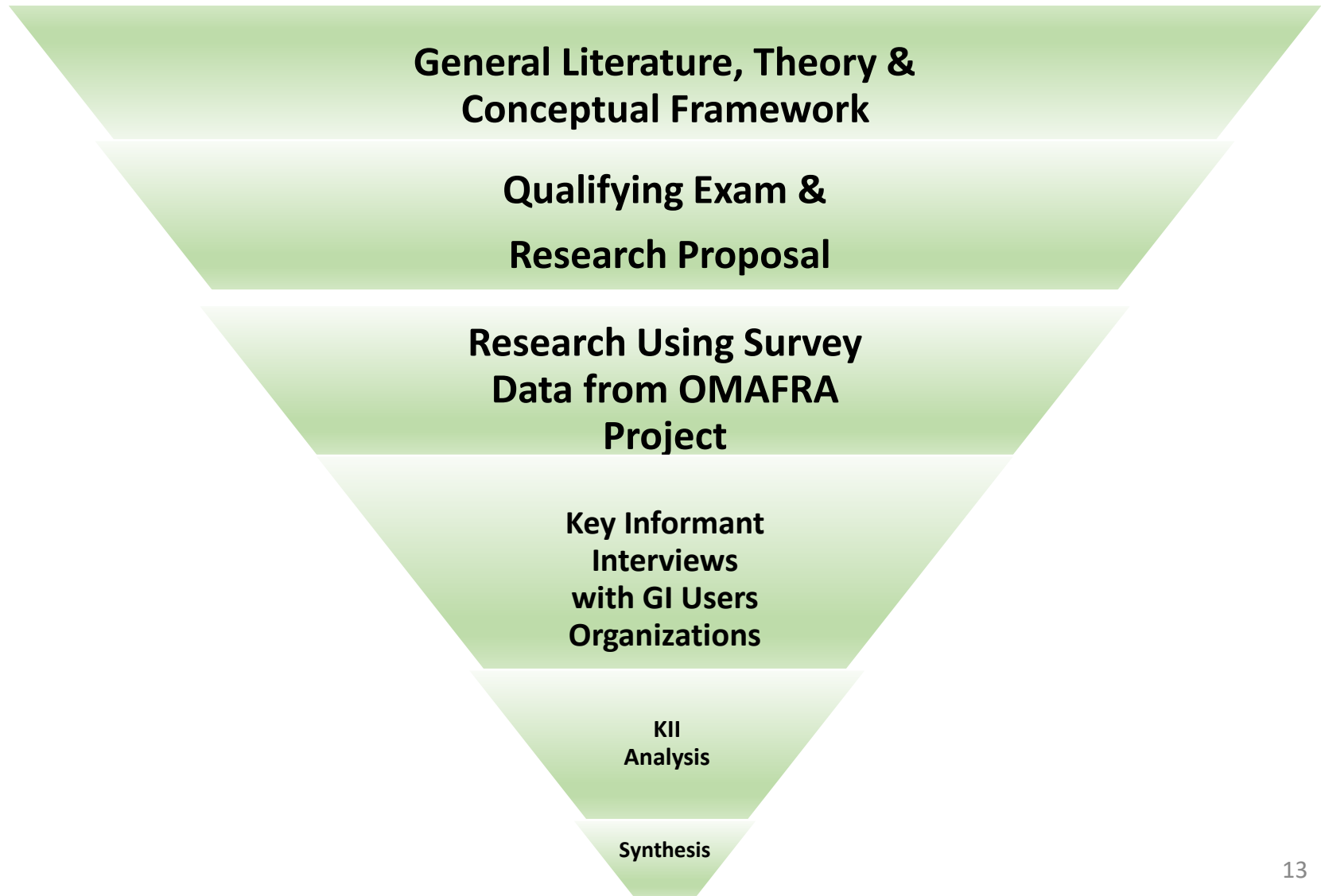
This research examines barriers/opportunities for using nature/natural systems as a mechanism for rural/urban market development, and as a means to generate rural community resilience.

PhD Research Overview

- PhD Research Question – What is the potential of using GI in a comprehensive planning framework to build resilient rural communities?
- Research Objectives:
 1. Build on background research materials on the topic, i.e., the OMAFRA research project 2014-2016
 2. Examine practicality/applicability/etc. of using a GI-focused planning approach to address rural Ontario land use challenges
 3. Devise a GI systems planning tool for building resilient/sustainable rural places
 4. Consider needed operational parameters

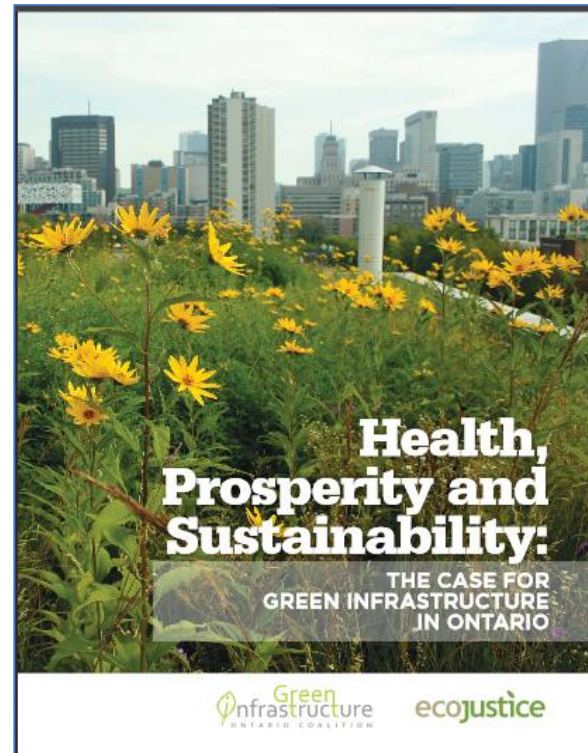


PhD Research Process



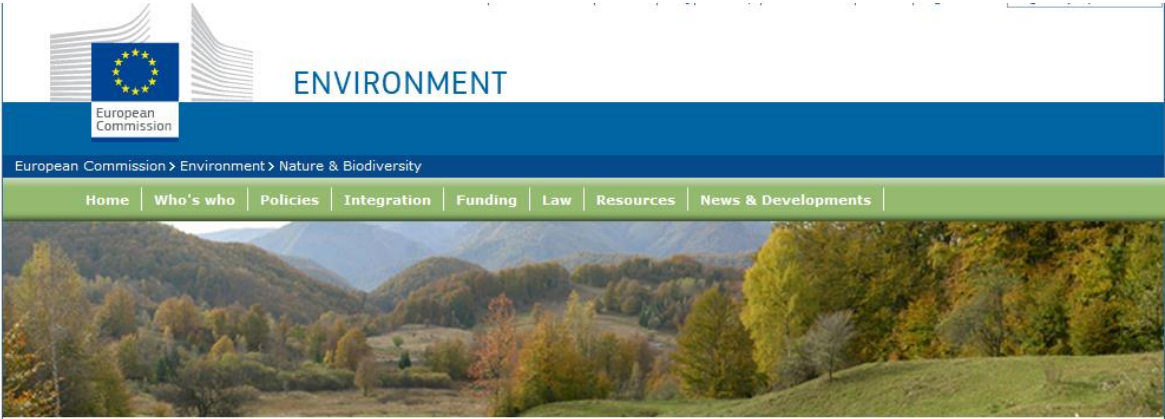
Research Lit Review

- Not much available in Canada
... Even less so for rural areas



Literature Review - GI Planning in Europe

Significant literature on the subject. . . Strong EU interest in biodiversity protection/climate change impacts on communities



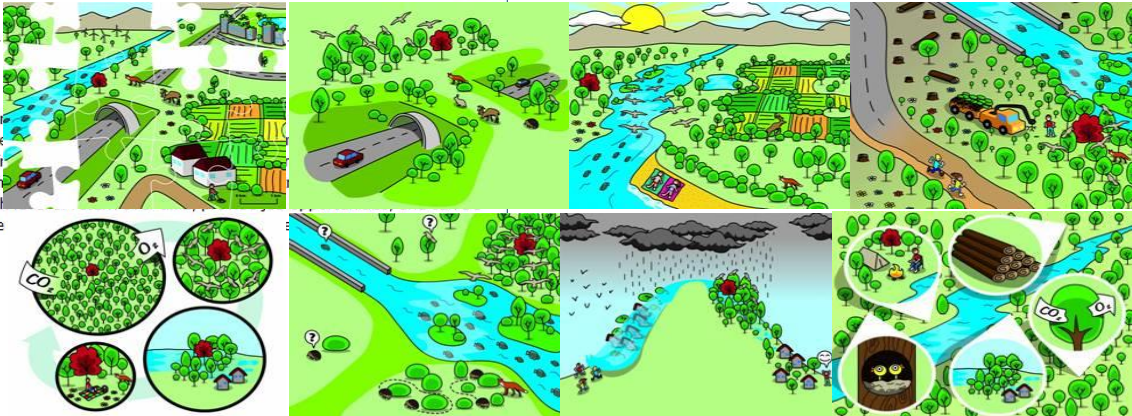
- NATURE & BIODIVERSITY
- EU Biodiversity Policy ▶
- EU Nature Legislation ▶
- Natura 2000 Network ▶
- Species protection ▶
- Green Infrastructure
- Invasive Alien Species
- Climate Change
- Partnerships

Green Infrastructure

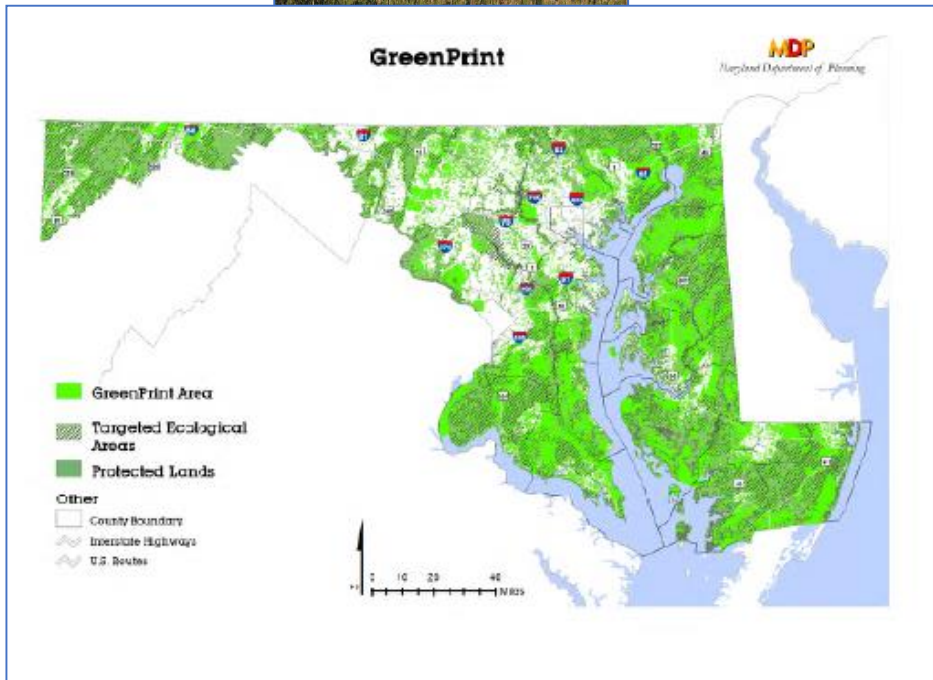
What is Green Infrastructure?



Green Infrastructure is addressing also other environmental features. The underlying principle of Green Infrastructure is multiple benefits if its ecosystem generally characterized by a high a cost-effective alternative or be



Literature Review - GI Planning Examples in the USA – State of Maryland Smart Growth Planning

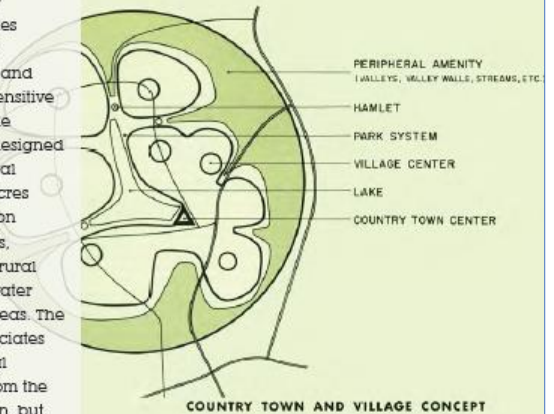


Best Practices

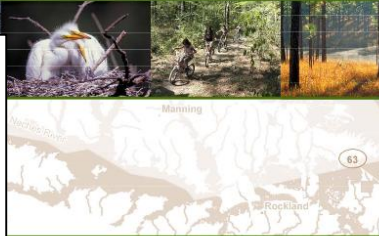
The Plan for the Valleys

The Plan for the Green Spring and Worthington Valleys in Baltimore County has been widely recognized as a seminal model for sustainable growth management. Baltimore County was one of the first jurisdictions in the country to use urban growth boundaries and conservation design as a method for controlling sprawl and directing growth away from sensitive landscapes. The results include resource conservation zones designed to protect farmland and natural resources, more than 50,000 acres of land in permanent protection under conservation easements, and the creation of an urban-rural demarcation line restricting water and sewer service to urban areas. The plan by Wallace-McHarg Associates (now WRT) received a National Planning Landmark Award from the American Planning Association, but the county deserves recognition for sustained implementation efforts.

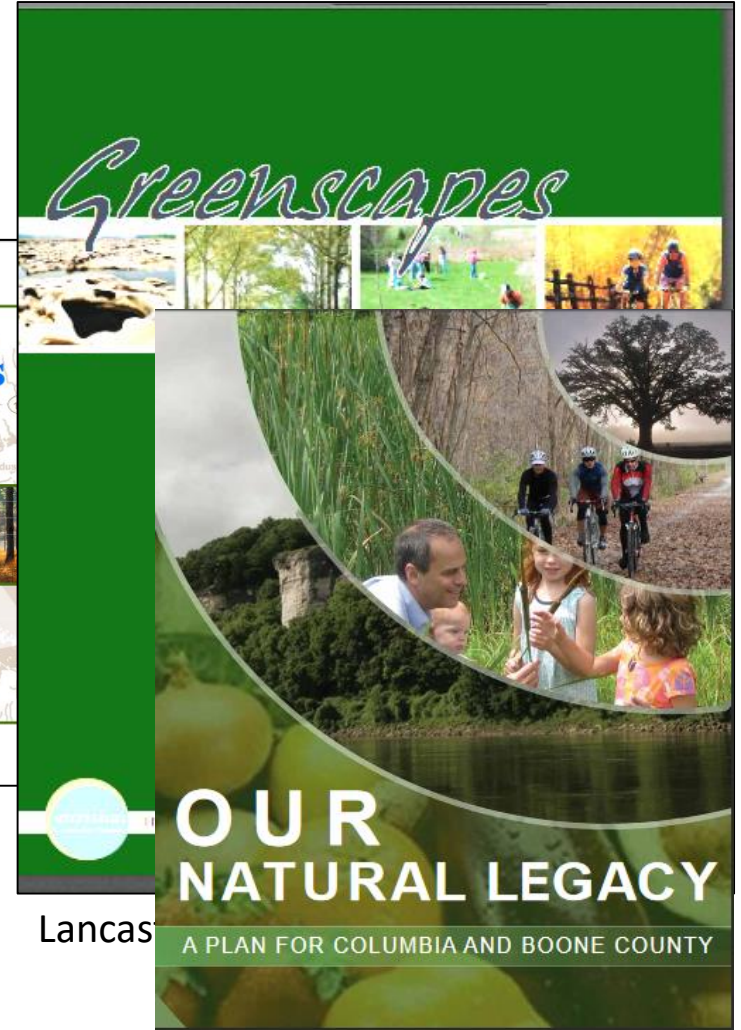
The Plan for the Valleys



USA - GI Plans for Various Jurisdictions



Texas, 2008



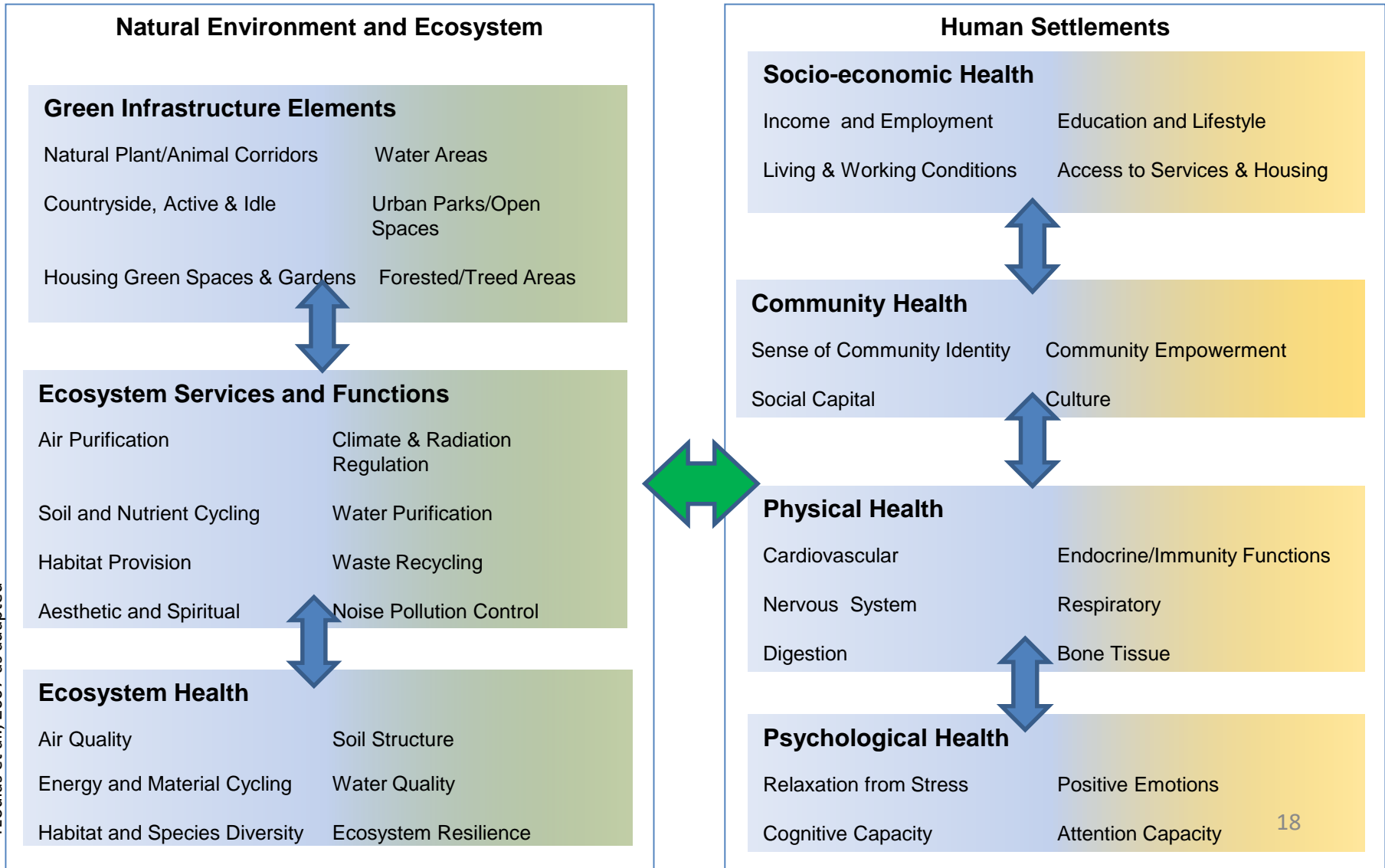
Lancas

Central Missouri State, 2014



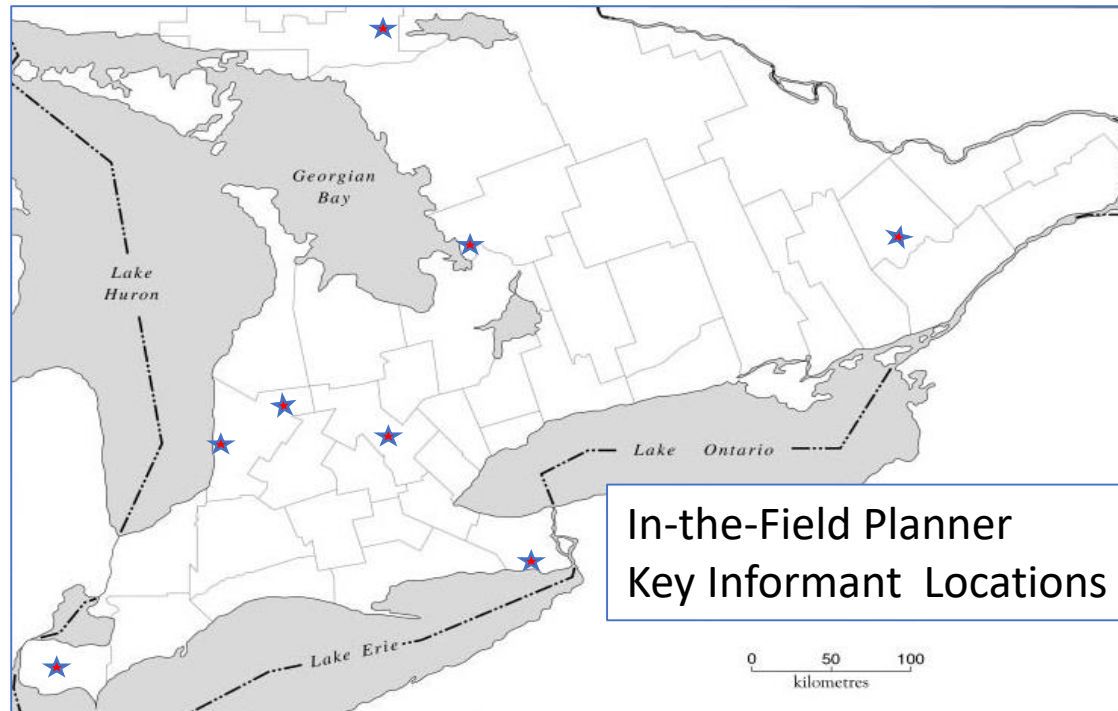
Central Indiana State, 2012

Theory - G + S of Nature, (i.e., GI) Can Benefit Both Natural/Human Communities



PhD Research Key Informants

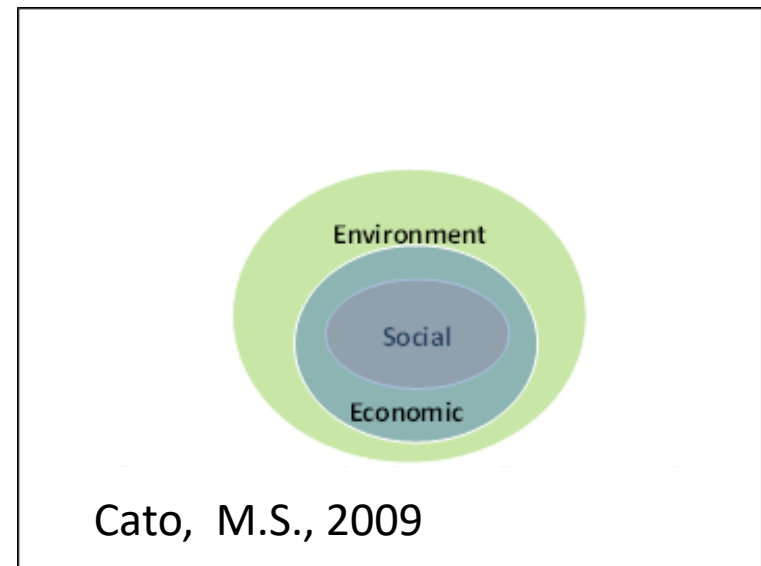
- Municipal planners in varying locales of southern Ontario:



PhD Research Key Informants (con't)

General organization reps involved in rural Ontario land use:

- Economic: Community Futures DC, Essex Region Conservation Authority, OFA, Ontario Soil and Crop Improvement Association
- Social/Cultural: EcoHealth Ontario/Stewardship Network of Ontario, GI Ontario Coalition, Rural Ontario Institute
- Environment: ALUS, Carolinian Canada, Conservation Ontario, Ducks Unlimited, Greenbelt Foundation, Ontario Nature, Trout Unlimited



PhD Research Methodology via Standardized Questionnaire:

Script intended to:

- Test understanding and/or perspective on planning using GI elements to further rural community health/wellness
- Consider use of a green/grey infrastructures framework for foundational community planning work

**Green Infrastructure (GI) for Ontario's Rural Communities:
Best Practices in the Use of Nature/Natural Systems to Create New Rural Community Resilience:
Part II for PhD Student Research (OMAFRA Previous Research)**

INTERVIEW GUIDE: KEY INFORMANT INTERVIEWS

Introductory Commentary

Key informant interviews are being held with various municipal and organization leaders in the Province to get an understanding and appreciation of the potential use of nature/natural systems in a new planning framework for resilient rural communities.

For the purposes of discussion here, the new planning framework is referred to as Green Infrastructure (GI) Planning. It is defined as: GI Planning is a form of land use planning based on a foundation integrating natural elements (both real/artificial) into linked environmental networks; these networks in turn provide multi-functional benefits to both human and natural environment communities.

To outline various elements of green infrastructure, the attached photo may be of use (see attached aerial view of rural community).

From the literature, much of the interest in the topic has been focused on cities where 'managing rain where it falls' in a storm water management context is the primary focus. Other topics of interest in the city are methods that can break up the 'grey' infrastructure that abounds in this locale - this may be by way of tree plantings, green roofs/walls, etc.

For the purpose of this research, we are exploring the usefulness of GI as it can be applied to rural settings. Our focus consists of the following notions: 1) GI involves many elements that provide valuable functions to both humans and nature; 2) nature/natural systems can assist in addressing many challenges that rural locations face; 3) knitting GI elements together can create a strong, interconnected, multi-functional, natural-based system that may assist an area to prosper.

Question Script

This interview is being conducted with you as you have previously outlined in our research as innovative practice, plan or program that uses a GI element in your work.

1) In consideration of the above definition of GI planning, do you believe that the GI element that you have previously identified (Interviewer to insert idea here) can be a component of an overall GI planning system? Yes/No/Maybe... please explain your answer.

2) Can you please outline how your GI element assists in deriving notions of resiliency in your area/community? Is resiliency defined to deal with future impacts and existing conditions.

3) Can you please outline how your GI element assists your community/area in dealing with sustainability objectives? i.e., balancing the pillars of the economy, social and environment perspectives, and giving consideration to short and long term aspirations and needs.

4) What do you believe are important elements to include within a GI planning framework as discussed above? Please use a piece of paper to jot down up to 5 point or draw a sketch/diagram that outlines your ideas.

After outlining your material, I'd like to discuss your ideas with you (Respondent to provide information on a separate piece of paper).

1 | Page

NVivo Analysis-Key Informant Interviews Summary Thoughts



PhD Research Findings

1. Is there utility in GI planning?, i.e. a framework with connected GI elements
2. What should a generic GI planning framework look like?
3. What are opportunities/challenges in using the concept?

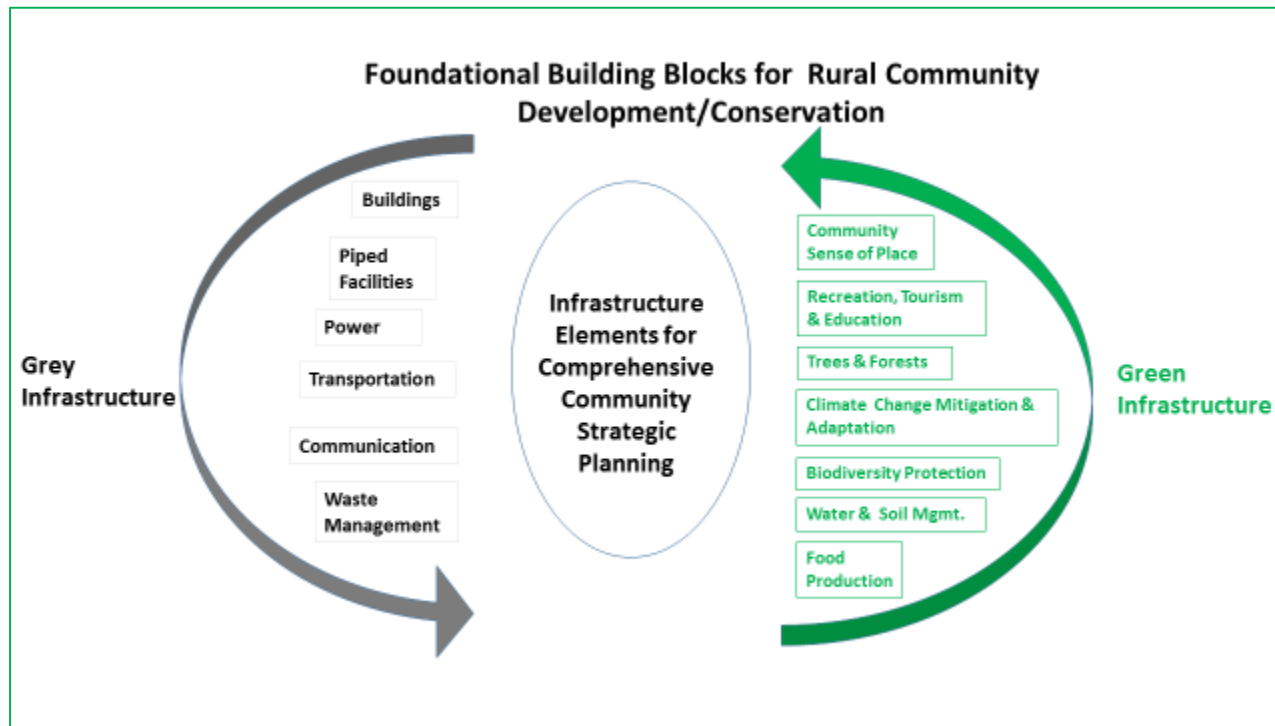
Question 1: Is there utility in GI planning?

- Yes (with provisos)
 - Both planners and organizations found some utility in the concept, i.e., stormwater management, land use and water 'need' planning co-ordination.
 - Overall acknowledgement: GI planning is an adaptable framework that can focus discussion around green elements that are found in any community.

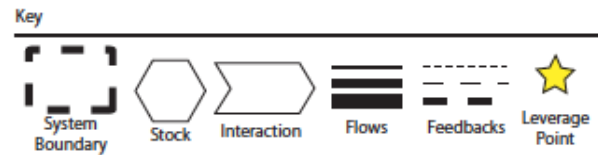
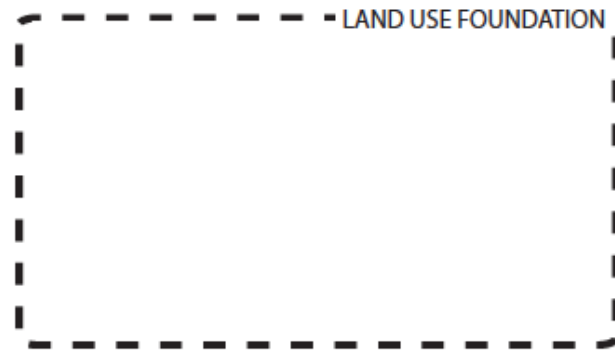


Question 2: What should a GI Planning framework look like?

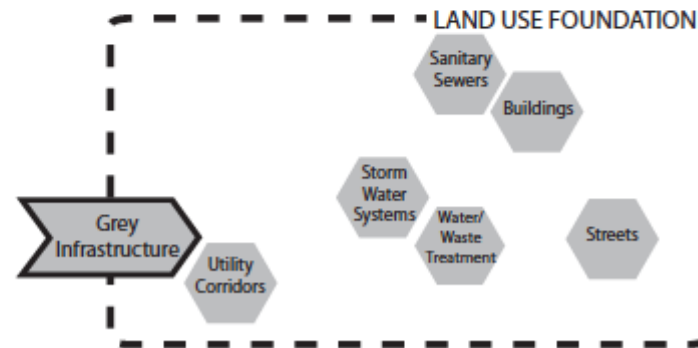
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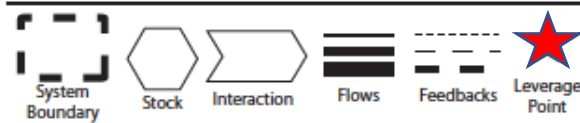
GI Planning Conceptual Framework



GI Planning Conceptual Framework



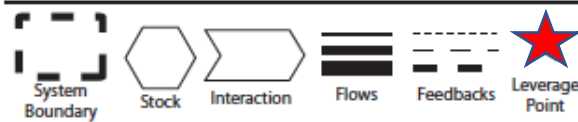
Key



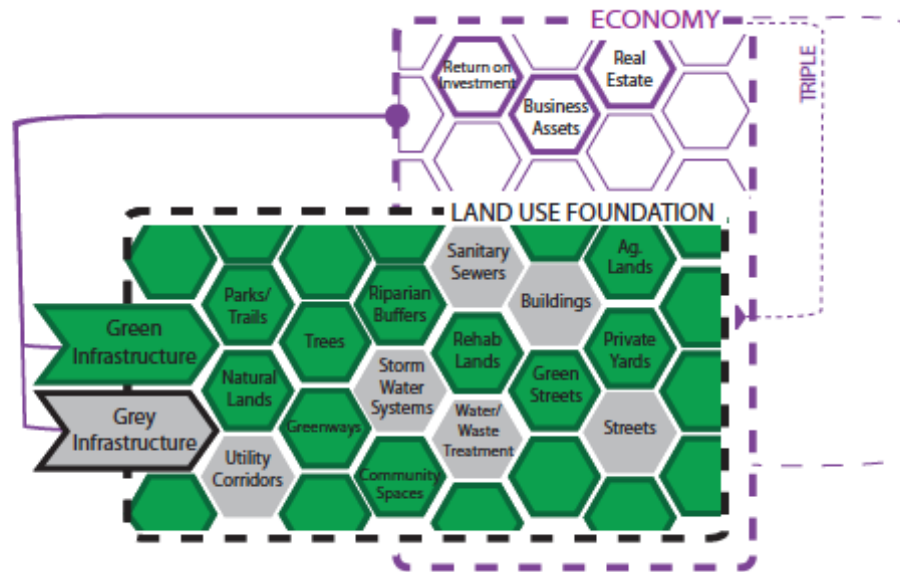
GI Planning Conceptual Framework



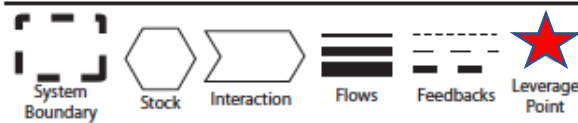
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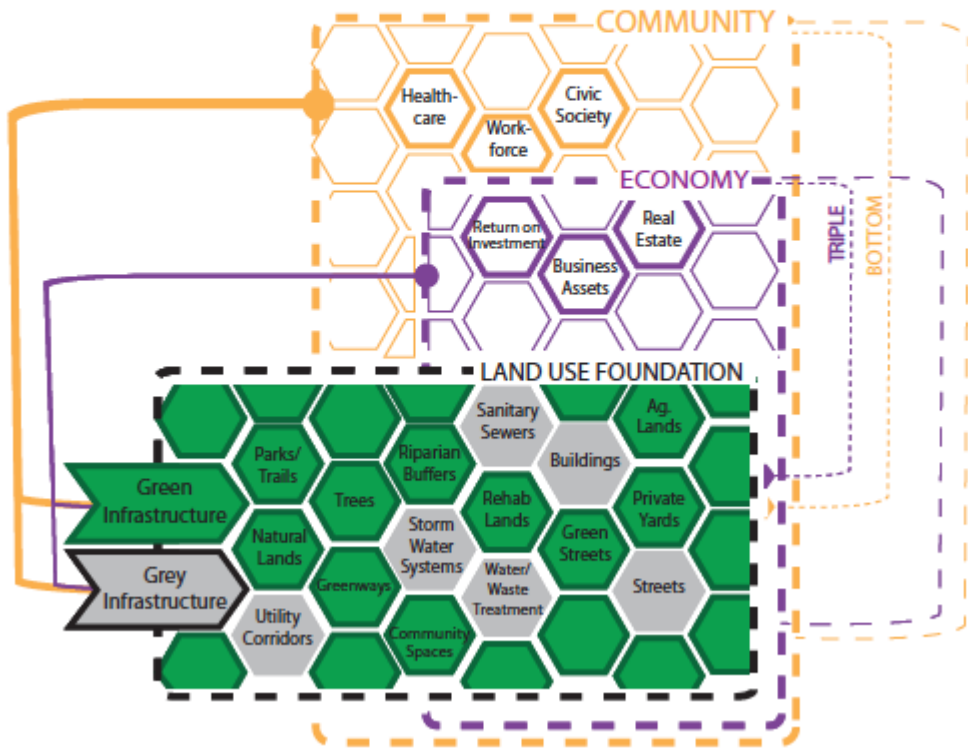
GI Planning Conceptual Framework



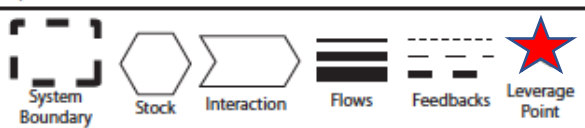
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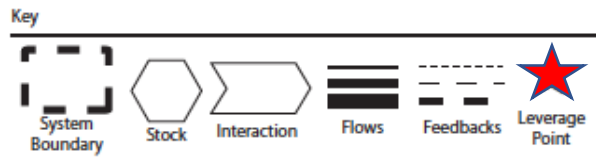
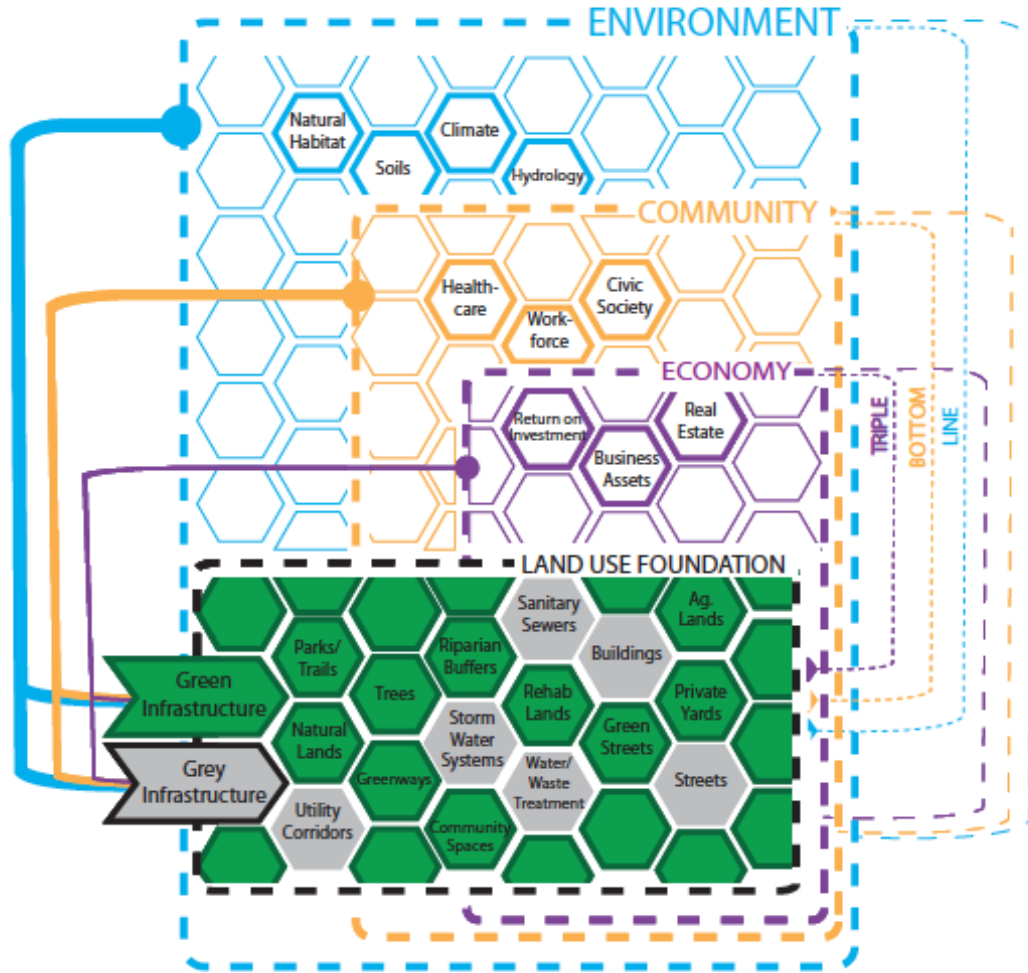
GI Planning Conceptual Framework



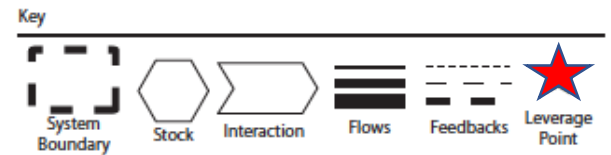
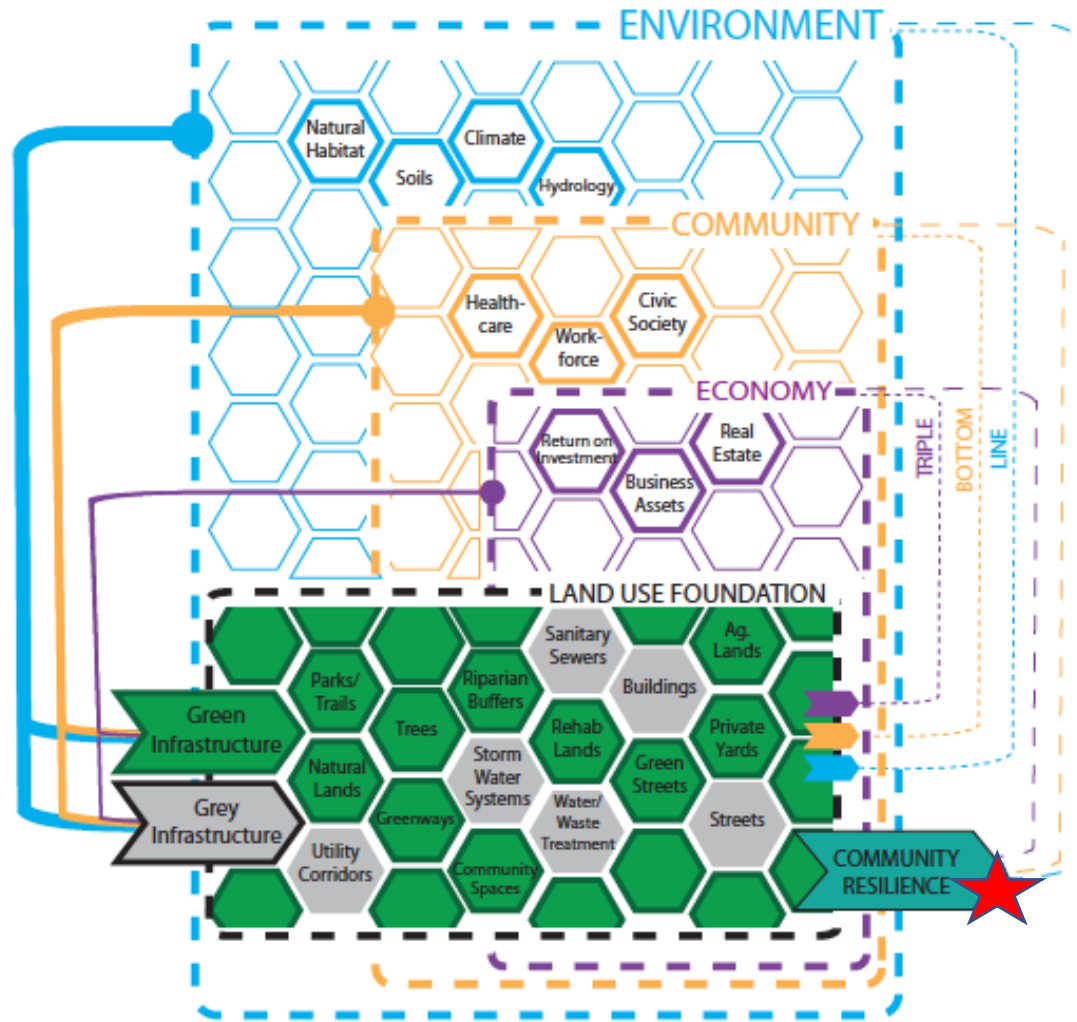
Key



GI Planning Conceptual Framework



Comprehensive Green-Grey Infrastructure Planning Framework



Adapted from Rouse & Bunster-Ossa, 2013

Question 3: What are opportunities/challenges in using a GI planning framework?

- Opportunities - Framework is adaptable – can fit diverse rural settings & address diverse issues
 - Storm water management systems – rural lands as well as rural settlements
 - Grey/green sewage and/or water works
 - Strategic tree planting schemes
 - Tourism development & place making
 - Parks and recreation facilities
 - Local food production and community gardens
 - Greenway connections (street trees, riparian buffers, grassed swales, etc.)

Question 3: What are challenges in using a GI planning framework?

- Definition? – multiple-meanings
- GI concept overly focused on stormwater management issues, with an urban focus
- Any system approach can be quite challenging, i.e., lack of resource guides
- Funding for plan/planning process



Conclusions

- From the research, opportunities for GI planning are available
- Can build on the natural base that is situated within any community

The screenshot shows the Infrastructure Canada website. The main heading is "Green Infrastructure". Below it, there is a sub-heading "Investing in Green Infrastructure". A green leaf icon is next to a paragraph that reads: "To ensure that Canada's communities are healthy and productive places to live, Budget 2016 included investments of \$5 billion over five years towards infrastructure projects that protect communities and support Canada's ongoing transition to a clean growth economy. Of this, \$2 billion will flow through Infrastructure Canada's Clean Water and Wastewater Fund (CWWF) to provide communities with more reliable water and wastewater systems." Below this, another paragraph states: "To advance Canada's efforts to build a clean economy, Budget 2017 lays out the Government's plan to invest \$21.9 billion in green infrastructure, including initiatives that will support the implementation of the Pan-Canadian Framework on Clean Growth and Climate Change." At the bottom, there is a list of additional information on Budget 2016 green infrastructure initiatives, including: "Adapting to Climate Change Impacts - Building Design Guides and Codes", "Addressing Waste Management for First Nations Communities", "Advancing Regional Electricity Cooperation", "Building Capacity in Municipalities to Address Climate Change", "Developing Community Capacity for Asset Management Best Practices", "Funding Innovative Green Municipal Projects", "Investing in Electric Vehicle and Alternative Transportation Fuels Infrastructure", and "Strengthening On Reserve Water and Wastewater Infrastructure".

Province supporting municipalities in fighting climate change

TORONTO - Ontario is investing in local projects that will help to reduce greenhouse gas (GHG) pollution by launching a new program for municipalities across the province. This initiative is part of Ontario's Climate Change Action Plan.

Ontario protecting the environment and fighting climate change

By GUELPH MERCURY TRIBUNE
MORF NEWS RELEASE AUGUST 22, 2017

Ontario grant supports riverland protection program

By GUELPH MERCURY TRIBUNE
MORF NEWS RELEASE AUGUST 23, 2017

Ontario is investing in programs to improve ecosystem health in urban and rural communities across the province in order to help fight climate change. These programs are part of Ontario's Climate Change Action Plan and are funded by proceeds from the province's carbon market.

Kathryn McCherry, Minister of Natural Resources and Forestry, was in Guelph today to announce support for two programs that aim to reduce greenhouse gas pollution. They include: Support to reduce the costs of tree planting for landowners in urban areas, as part of the province's initiative to plant 50 million trees by 2025. The development of a Land Use Carbon Inventory which will allow Ontario to assess the potential of agriculture, forestry and other land uses, such as wetlands and grasslands, to sink, remove and store carbon. "Fighting climate change while protecting the environment is part of our plan to create jobs, grow our economy and help people in their everyday lives."

Ontario is helping OPIRG Guelph with a grant of \$3,000 to support their project, Local Community Engagement in Riparian Enhancement at the Speed and Eramosa Riverbanks, as part of the Great Lakes Guardian Community Fund.

OPIRG Guelph will work to control and manage invasive species and enhance native plant diversity along the banks of the Eramosa and Speed Rivers. Student volunteers of all ages will have the opportunity to learn to identify and remove garlic mustard, Japanese knotweed, and common buckthorn.

Native plants will be planted in their place to attract native pollinators and increase available wildlife habitat within the watershed. This project will help by protecting water quality for human and ecological health and by protecting habitat and species in the Eramosa and Speed Rivers and their tributaries in Guelph.

Other community-based projects supported by this year's fund include: Leading 100 liter cleanup events along the north shore of Lake Ontario. Partnering to create riparian

Conclusions (con't)

- In BC, e.g. can leverage senior gov't actions with local interests:

Millions of trees on the way for ravaged B.C. forests, according to new climate plan

By CBC NEWS, AUGUST 26, 2016

The B.C. Climate Leadership Plan was met with lukewarm reviews last week, but the province's reforestation industry sees the potential for a major surge in tree planting operations.

To meet carbon reduction goals, the province has called for 300,000 hectares of forests damaged by wildfire and pine beetle to be rehabilitated over the next five years in order to turn the forests back into a carbon sink. It's titled the Forest Carbon Initiative.

While the overall Climate Leadership Plan was panned by environmentalists who don't believe it will lead to any meaningful reduction in GHGs, for many members of the province's forestry sector, the commitment stands out.

"If this is really 300,000 hectares that are going to be treated over five years, then that would amount to the replanting of hundreds of millions of seedlings," said John Betts, director of the Western Silvicultural Contractors' Association.

"That would be huge."

Betts says the Forest Carbon Initiative represents the largest commitment the industry has seen out of the government in decades.

B.C. spends \$150M to plant millions of trees, create 3,000 rural jobs

By CANADIAN PRESS,

FEBRUARY 17, 2017

PRINCE GEORGE, B.C. - British Columbia is spending \$150 million to plant tens of millions of trees, which it says will help fight climate change and create over 3,000 jobs in rural parts of the province.

Premier Christy Clark says the funding will go to the Forest Enhancement Society of B.C. to advance environmental stewardship and focus on reforestation initiatives throughout the province.

She says the new trees are one plank in the province's plan to fight climate change and over the next 10 years her government will invest \$800 million in B.C.'s forests and create 20,000 jobs.

Clark says her government will also seek innovative ideas to help it meet its climate goals, but the most basic solution is Mother Nature's solution, which is sequestering carbon in forests.

The province's Climate Action Plan drew criticism from environmentalists last year who said planting trees would not pay off for decades, as forests need to be mature in order to capture significant amounts of carbon.

The Forest Enhancement Society is an arms-length organization created by the B.C. government that supports projects that aim to miti-

Thanks and Questions/Comments

“The best time to plant a tree was 20 years ago. The second best time is now.”

– Chinese Proverb

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Sources:

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