Using Green Infrastructure as a Tool to Enhance Rural Land Use Planning

by

Paul Roy Kraehling

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ABSTRACT

USING GREEN INFRASTRUCTURE AS A TOOL TO ENHANCE RURAL LAND USE PLANNING

Paul R. Kraehling
University of Guelph, 2018

Advisor:
Dr. Wayne J. Caldwell

This paper explores the use of nature, herein referred to as Green Infrastructure (GI), as a new asset to improve the rural condition of communities in southern Ontario. The exploration includes the formulation of a planning framework that can create new understanding around the systems use of nature to address needs and challenges of life in rural areas. The exploration is made through the life lens of a land use planner who is principally interested in looking at mechanisms to improve health and wellness, resiliency and sustainability conditions for rural communities.

GI system planning uses nature to leverage beneficial attributes while minimizing risks and potential downsides. At a community level planning effort, matters of public and private interests are discussed, debated and prioritized in the overall formulation of a plan.

A simple explanation for describing this planning effort might be described as identifying ways and means to more fully exploit the assets of nature for human endeavour. A subtler and preferred explanation would be aligned with the following - to utilize nature/natural assets in a symbiotic association that maximizes utility, multifunctionality and sustenance for both the human and natural worlds.

The research employs a qualitative mixed methods approach to inquiry. GI planning as practiced in many other parts of the world may have application in the Canadian/Ontario context. The southern Ontario rural landscape was chosen as the case
study investigation area. This landscape, while being richly endowed with natural land and water assets, also may be described as having a land use system that is conflicted/contested – multiple activities vying for prominence, with differing time horizons for achieving success as defined by various public and private interests.

Rural planning leaders working within communities of this area provided inputs to this paper. A comprehensive research method comprising a literature review, surveys, key informant interviews, a focus group discussion and a research review meeting was conducted. Content analyses of the compiled information provided the principal data source.

As a conclusion, land use planning with green infrastructure can assist in addressing the unique challenges and aspirations for various types of communities within rural Ontario.

Keywords: living or natural infrastructure, Ontario, goods and services of nature, resiliency, sustainability, systems thinking, multifunctional, networked
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Abbreviations and Acronyms

ALUS – Alternative Land Use Services
CA – Conservation Authority (Ontario)
CBE – College of Business and Economics, University of Guelph
CC – Carolinian Canada
CO – Conservation Ontario
CIP – Canadian Institute of Planners
CPHA – Canadian Public Health Association
CRRF – Community Rural Revitalization Foundation
CWATS – County Wide Active Transportation System (Essex County)
DUC – Ducks Unlimited Canada
ECO – Environmental Commissioner of Ontario
ED – Executive Director
EEA – European Environment Agency
EPA – Environmental Protection Agency (United States)
EU – European Union
G+S – Goods and Services of Nature
GI – Green Infrastructure
GIS – Geographic Information System
ICRPS – International Comparative Rural Policy Studies
ICSP – Integrated Community Sustainability Plan
IIS – International Islands Studies
IPCC – Intergovernmental Panel on Climate Change
IWM – Integrated Watershed Management
KI – Key Informant
LID – Low Impact Development
MIZ – Metropolitan Influenced Zones
MNR – Ontario Ministry of Natural Resources (name of OMNR prior to 2014)
NGO – Non-Governmental Organization
NHS – Natural Heritage System
OFA – Ontario Federation of Agriculture
OMAFRA – Ontario Ministry of Agriculture, Food and Rural Affairs
OMMAH – Ontario Ministry of Municipal Affairs and Housing
OMNRF – Ontario Ministry of Natural Resources and Forestry
OMOEC – Ontario Ministry of the Environment and Climate Change
OPPI – Ontario Professional Planners Institute
OSCIA – Ontario Soil and Crop Improvement Association
PHAC – Public Health Agency of Canada
PPS – Provincial Policy Statement
RPP – Registered Professional Planner
ROI – Rural Ontario Institute
RPLC – Rural Policy Learning Commons
SEDRD – School of Environmental Design and Rural Development, University of Guelph
SNO – Stewardship Network of Ontario
SUDS – Sustainable Urban Drainage System
TEEB – The Economics of Ecosystems and Biodiversity
TUC – Trout Unlimited Canada
UK – United Kingdom
UN – United Nations
UNEP – United Nations Environment Programme
U.S.A. – United States of America
WHO – World Health Organization
Chapter 1 – Introduction

This chapter lays out the basic purpose for this dissertation. It begins with a problem statement with associated objectives for the dissertation research. A brief overview is presented as to why the research is necessary with an overview then on how the sections of the dissertation are organized.

The work contained herein comes out of a life-time exploration of the notion of community sustainability. When I was a young man and newly graduated from planning school, I was eager to take on the challenges of planning healthy and vibrant communities, all within a perspective that balanced short and long-term planning horizons. As I quickly learned in the working world, I had my work cut out for me. A formative document to my way of thinking was released in 1987 by the Brundtland UN Commission that explored the notion of sustainability, not just for local communities but also for the global community (United Nations World Commission on Environment and Development, 1987). This document laid bare many of the large challenges that faced human-kind then and continues to this day. The balancing of various human priorities – economic and social, must also consider long term environmental health conditions. It is on this foundation that I have explored through my life as a land use planner, mechanisms that can enhance our human condition while also respecting the requirements of maintaining a healthy environment.

Throughout my planning career and academic life, I have been drawn to the rural condition. I have rural roots, as my family has come from an agrarian farming background which has worked over many generations in the Wellesley area of southern Ontario. Again, through a long lifetime exposure, I have been drawn to the specific challenges (as well as opportunities) that face rural parts of our world.

One general observation on the general rural condition can be made at the outset and this fact drives my research frame of reference. It is a global phenomenon that persons are moving from rural areas to urban settlement areas. This is not a recent event but has been going on for quite some time here and around the world. The resulting
demographic condition then in rural places is to learn how to adapt to changing local circumstances. It is a premise in this paper that nature can serve as a useful tool to build resiliency in the rural community condition.

This research explores the enhanced opportunities that our natural system can provide us if we only stop to see, and then understand these opportunities. The exploration of the topic has also moved from a sustainability long term perspective into a resiliency dimension which I argue, has a much shorter time horizon for consideration and implementation (Gunderson and Holling, 2002). The people residing in rural communities are known for being adaptive, creative and resilient to changing circumstances.

Additional explanation of the worldviews of the author will be outlined in several other sections of this dissertation: section 1.4, Research Scope and Justification as well as in section 4.2 which deals with the conceptualization of the research work.

1.1 Problem Statement

There are significant challenges in the world today regarding the environment, and these challenges in turn diminish the quality of life for human communities. A landmark United Nations (UN) commission report, *Our Common Future* documented the conditions that were diminishing the prospects for sustainable health and wellness conditions across the planet (United Nations World Commission on Environment and Development, 1987). For the most part, the conditions reported in the mid-1980s are still with us today and in many instances have gotten worse: degradation of soils, water, air and forests; acid precipitation, global warming, natural species loss, widespread desertification; air and water pollution, groundwater depletion, toxic chemicals and hazardous wastes; global unequal food production and distribution problems, and economic system food security distortions; wild lands destruction. *Our Common Future* advocated for new approaches to planning in consideration of the environment and human settlement development. It stated that sustainable development requires mechanisms to meet the needs of all and that an aspiration for a better life regarding health and wellness should be aspired to.
Since 1987 various other UN sponsored think-tanks have taken place in looking at big picture environmental circumstances in the world. Some of the most important events occurred around the topics of biodiversity protection (1992 Earth Summit), health and wellness with the Millennium Ecosystem Assessment Summit (2005), and several climate change forums – five held to date - by the Intergovernmental Panel on Climate Change (United Nations, undated).

In a recent UN Human Settlements publication, the following significant challenges respecting future sustainable communities in both developed/developing nations were noted: climate change, biodiversity change and loss, food insecurity, rapid urbanization, rapidly changing agro-industrial and agri-business landscapes. The authors went on to state that climate change and the use of ever more expensive fossil fuels would be the greatest environmental challenges of the 21st century (United Nations Human Settlement Programme, 2009).

Against the backdrop of big picture issues, community planners are tasked with making conditions suitable and resilient for local resident health and wellness conditions. Acting locally while considering larger area impacts of actions is well entrenching within planning circles. The planner is tasked with making linkages in day to day work assignments of the environment, the economy and a social structure of the community that are relevant today but also in consideration of conditions that are important for future generations.

Land use planners working in rural areas have a host of intertwined issues that need to be considered in their work to build resilient rural places. Although it is hard to generalise across diverse rural settings, there are often common situational problems. For example, in looking at conditions in rural Canada rural inhabitants often exhibit poor health outcomes such as obesity and chronic diseases, relative to urban populations. Rural communities often face demographic challenges such as the loss of overall population due to general societal changes or an aging population with youth out-migration. Rural municipalities may also struggle with insufficient financial resources; deficient grey
infrastructure including transport/piped service facilities; lack of community services such as health, park, and recreation facilities; deficiencies in overall community social cohesion; and environmental degradation issues. Larger issues, such as addressing or mitigating the impacts of climate change or providing for biodiversity protection, may also present significant challenges to rural capacity (Caldwell, 2010; Canadian Rural Revitalization Foundation, 2015; Rural Ontario Municipal Association, 2015; Rural Ontario Institute, 2015; Breen, 2015). From the literature on GI, there are indications that many of the challenges identified for rural Canada/Ontario can be addressed partially by using the ecological goods and services (G + S) of nature, or as defined herein as Green Infrastructure (GI).

1.2 Research Aim, Objectives and Methods

The aim of the research is to devise a green infrastructure (GI) framework that can be used in the planning of resilient rural municipalities. GI comprises the natural assets that are found within any community. These assets comprise ecological G + S as defined by the World Health Organization’s Millennium Ecological Assessment (MEA)- provisioning, regulating, supporting and cultural attributes of nature that provide health and wellness to all living things (Corvalán, Hales, and McMichael, 2005). To add additional substance to the notion of using GI for land use planning purposes, it is interesting to note that the United Kingdom’s central planning office has provided a succinct definition of GI: A network of multi-functional green space. . . which is capable of delivering a wide range of environmental and quality of life benefits for local communities (United Kingdom Department of Communities and Local Government, 2012).

The research has three perspectives: sustainability, resilience, and application to a rural land use condition. Sustainability comes from the consideration of meeting environmental, social and economic conditions for a populace’s health and wellness needs. In addition, it encompasses the notion that development should be provided that can address the health and wellness prospects of present peoples without compromising
the capability of future generations to have their own needs met (United Nations World Commission on Environment and Development, 1987). Resilience is defined as the ability of a system to respond to change, and in the context of the present research, the ability of communities to adapt to various change states of affairs such as socio-economic conditions, land/water/air environmental stressors (Gunderson and Holling, 2002). This research is directed at rural landscapes which are those areas defined with low population densities, lying outside of urban settlements (Douglas, 2010; Frank and Reiss, 2014; Hodge and Gordon, 2014).

The objectives of the research are:

a) To identify current practices in Ontario that have GI planning characteristics. This is identified through survey work, literature review and key informant interviews. Best practices regarding the topic of GI planning includes literature from other parts of the world. In particular, the research identifies GI planning frameworks that are in place and work at a variety of differing geographic scales - national/state/provincial, regional or local municipal/watershed levels of geography.

b) To make observations on critical success factors that enable a GI planning system to evolve. This includes the identification of essential element ingredients to develop a GI planning framework in rural Ontario.

c) To investigate the applicability of a GI planning construct for rural municipalities in Ontario, particularly the southern Ontario landscape which is highly contested due to the pressures for development and alternative land uses on a mosaic of privately-owned lands. The measurement of the acceptance of use or potential use of this planning construct is completed through the research work program using surveys, key informant interviews and research group discussions.

d) To develop a conceptual framework that incorporates the community building blocks of green infrastructure with grey infrastructure working together to formulate a new planning foundational approach.
e) To consider various operational frameworks (i.e., mandatory regulation, volunteer collaboration) to operationalize the conceptual framework for Ontario municipalities and other regional planning interests.

It is envisaged that a GI planning framework may provide both tactical and strategic planning functions for local planning efforts. As seen in the literature, the linking of individual natural/open space elements can provide multi-functional, networked attributes that assist in building resilience conditions to both human and natural communities (Sandström, 2002; Weber, Sloan and Wolf, 2006; Williamson, 2003; Benedict & McMahon, 2006; Center for Neighborhood Technology, 2010; Mell, 2010). A number of GI planning conceptual frameworks are available that have been derived through research in other parts of the world (Tzoulas et al., 2007; European Environment Agency, 2011; Rouse and Bunster-Ossa, 2013). The research tests the applicability of these frameworks to the conditions found in Ontario and adaptations required for them to work here.

One additional qualification on the nature of the research being proposed here is associated with its general location. Rural areas within southern Ontario are the primary focus. These areas are distinctly different from urban areas in that they comprise low density, dispersed land use activities; they usually comprise lands that have many natural and ecosystem beneficial attributes; they also have many differing land use and community development challenges. A variety of differing geographic place contexts are explored to be able to compare and contrast differing circumstances that may impact the potential delivery/acceptance of a GI planning framework for differing locales. Areas may be distinguished by their land use base description, e.g., extensive versus few resource extractive activities, areas with significant versus low urban development pressures.

In summary, based on the background identified above, it is believed that a land use planning framework, embodying a traditional rational comprehensive planning approach (Hodge and Gordon, 2014), can link GI elements with grey infrastructure networks to form resilient community foundations.
1.3 Structure of Dissertation

The dissertation is organized in a broad to a narrowing perspective on the topic of GI and its application to planning and land use matters in rural communities. Chapter 2 contains the literature review, with topics involving a definition of GI, a generalized overview of land use planning, definitions concerning sustainability, resilience, health and wellness conditions. The chapter also provides a review of the use of GI in various planning endeavours in the world today and concludes with a review of its use in Canada.

Chapter 3 provides a contextual overview on how land use planning is conducted in Ontario today. It also outlines some of the challenges that land use planners face in planning healthy and resilient rural communities. The chapter concludes with some observations on changing general societal circumstances that this dissertation author views as being relevant in the consideration of GI planning.

Chapter 4 provides an overview of the research methods. The chapter begins with epistemological and ontological perspectives that frame the research. A conceptual framework for examining the value of nature/natural systems is presented with its associations to assisting in building healthy communities, whether they are human or natural. The research methods are outlined: a mixed method case study approach using available literature; a general survey of rural community leaders; key informant interviews with planners working in the field as well as organizations associated with rural land use activity; a planners focus group; and a research review meeting.

Chapter 5 provides review of the findings. It begins with an overview of the results of the general rural community leader GI Use Survey that was distributed to individuals across the Province. It then presents the Key Informant (KI) interview results from selected planners in various locales across southern Ontario as well as the summary discussion of the planners’ Focus Group. There is then a summary overview of the various perspectives on GI provided through KI interviews with several organizations that are involved in rural Ontario land use issues.
A synthesis of the in-the-field research discussion is presented at the end of Chapter 5. This information provides a basis for the formulation of a new systems conceptual planning framework, combining green and grey infrastructure for a community. This was vetted through a panel that was convened at the University of Guelph. Details of the discussions from KI involved in the research as well as individuals interested in the topic area from the University, Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and other invited interested parties are noted.

In Chapter 6, a discussion of the material assembled in the dissertation is provided. This critically assesses some of the challenges as well as opportunities that a GI planning system could provide to rural planners and the communities where they work. The chapter addresses the primary goal and objectives of the research and provides observations on the relevancy and utility of a GI planning approach for rural communities.

Chapter 7 provides summary remarks on the overall perspective of GI planning in rural Ontario. Observations are provided on the contributions that the research has made to individuals living and working in rural Ontario, as well as to the general research community. Limitations are identified, and opportunities for future research are highlighted.

1.4 Research Scope and Justification

Efforts to increase rural community resilience and sustainability conditions are a very real concern. This is reflected in a variety of ways through various thinktanks that are exploring these topics: Community Rural Revitalization Foundation (CRRF); the Rural Policy Learning Commons (RPLC); International Islands Studies (IIS) program; Comparative Rural Policy Studies (ICRPS) program; research programs at universities in Canada and elsewhere; and government efforts such as with OMAFRA.
The interest in promoting health and wellbeing is prominent in the work of the professional planning associations in Canada such as the Canadian Institute of Planners (CIP) [nd], and the Ontario Professional Planners Institute (OPPI) [2007]. There are several aspirational and goal achievement statements in each of these organizations’ mandates that point towards making communities more resilient and sustainable in the face of the challenges that confront them.

The natural environment should be examined as a durable foundation of all activity on the land. In the southern Ontario context, there is intense alternative land use prescriptions applied to the land base either for resource extraction (agricultural, lumber, minerals/aggregate production) or for urban development activities. In land use planning, often the general uses of land are seen as either comprising economic development activity, resource management or human health/safety matters. In this context, the natural environment is often seen as a development constraint that gets in the way of progress. Based on lessons learned from other parts of the world, this either-or scenario does not need to be how the environment is treated in the landscape. Borrowed from an ecology perspective, a healthy environment – clean air, water and land – is a necessary pre-condition to create healthy communities.

Figure 1 provides an overview of the matters the researcher wishes to consider in examining GI as one of the key components to planning healthy, resilient and sustainable rural communities.
Figure 1 - Using GI in a Land Use Planning Framework to Build Resilient Rural Communities
Chapter 2 – Literature Review

This chapter is intended to give a substantive overview from the literature that is associated with GI and land use planning.

2.1 Topic Areas

This chapter provides a distillation of definitions on GI that have been taken from the literature and are aligned with the meaning that the dissertation author wishes to use for the purposes of research. The topic of land use planning is broken into a number of subcomponents that are important to the overall topic area of planning for rural land uses in Ontario, Canada. The general topics included here include the general role of land use planners according to the general literature as well as the prescription of professional certification specifications for planning in Canada. Further discussion is provided on the specific application of planning pertinent to a rural context and brings in associated important topics that planners are expected to work with – these matters include health and welfare of community inhabitants and matters of long term sustainability and community resiliency consideration.

With the completion of a general overview of what constitutes GI and land use planning, an exploration is then made as to how GI is used in various planning endeavours in differing parts of the world. A description is outlined how GI planning has evolved over time - the past century - and then remarks are made as to what the literature conceptualizes a general GI planning framework to contain.

2.1.1 What is Green Infrastructure (GI)?

GI has a number of definitions. Several authors have provided extensive discussion on this topic, and how the term is used in various locations of the world (Davies, MacFarlane, McGloin and Roe, 2006; Mell, 2010 and 2013; Roe and Mell, 2013).

The GI idea is most often defined within terms associated with biophilic\(^1\) design or matters included within landscape architecture. Several authors have discussed the term in relation to design attributes of planning (Sandström, 2002; Natural England, 2009). There are on-line resources on GI from a number of sources – the GI Ontario Coalition (2016), and the American Society of Landscape Architects (2014). The last noted organization’s website has 100s of links/articles on the GI topic. Their major information themes are categorized under the following: the benefits of GI, forests and nature reserves, wildlife habitat and corridors, cities, constructed wetlands, green streets, and green roofs and walls.

GI is viewed as a topic that has meaning to many different fields of interest. In reviewing journal article entries, the following different academic disciplines have interest in GI:

- ecology, economics, engineering, planning, landscape architecture, architecture (artificial green environments), plant science, sociology, philosophy, and psychology. The wide-ranging interest in the topic has both advantages in terms of a common vernacular amongst many differing interests, but it also presents challenges of soliciting one common understanding for its use (Mell, 2013; Wright, 2011).

In consideration of the various definitions of GI, a choice needed to be made to guide the completion of the research in this dissertation. For this purpose, the following definition has been adopted:

*GI is defined as natural vegetation and green technologies that collectively provide society with a broad array of products and services for healthy living. Green infrastructure takes many forms including but not limited to the following: ... forests, natural areas,*

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\(^1\) Common definition of biophilia comes from Edward O. Wilson (1984) to mean “the rich, natural pleasure that comes from being surrounded by living organisms”. 

greenways, streams/water bodies and riparian zones, meadows and agricultural lands; green roofs and green walls; parks, gardens and landscaped areas, community gardens, and other green open spaces; rain gardens, bioswales, engineered wetlands and stormwater ponds (Green Infrastructure Ontario Coalition, 2012).

The description of GI elements is quite diverse from the literature. The greatest divergence goes away from nature-inspired uses and technologies and goes into matters of renewable energy or traditional infrastructure that has a small or soft environmental footprint (Federation of Canadian Municipalities, 2001).

To be illustrative of how GI has been thought of for use in this paper, work on GI elements from the European Union is illustrated in the following Figure.

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

Note: Some of the terms in this chart are vernacular words that are common in Europe.

Figure 2 - Defining Green Infrastructure as Elements within the Overall Community Landscape

The literature outlines a multitude of ways that a GI planning system can be placed on the land base. For example, publications are available illustrating the process of going from greenways to greenbelts (Amati & Taylor, 2010) and then greenbelts to green infrastructure (Thomas & Littlewood, 2011). The authors also discuss various approaches to green space governance – from the rigorous regulatory approach of a greenbelt protection area legal entity to the soft governance policy considerations within an open space greenway system.

The advent of powerful computer data processing facilities with relatively low expenses provides the necessary foundation upon which an ecologically based GI planning system can be structured. As explained by Benedict & McMahon (2006) and Isely et al. (2010), the use of GIS-based mapping systems are shown to greatly increase the knowledge capacity of examining possible development scenarios and planning trade-offs for incorporating green features into community master plans. In addition, the computer mapping software, built on increased sophistication of documenting ecological features and functions on the ground, has also greatly improved. This provides the opportunity to have enhanced decision-making respecting land resources that can have multiple land use applications applied to them.

This dissertation provides additional insight into various forms of GI use through a discussion of GI planning as found in many countries of the world today and including Canada. To avoid duplicating commentary, the detailed discussion of various uses of GI in various locations are outlined in sub-section 2.1.4.

2.1.2 Land Use Planning

There are many definitions of land use planning. What is highlighted here are ideas associated with the use of this subject matter in Canada.

This paper presents an overview of GI as a land use feature within communities and their associated landscapes within the Canadian context. Municipalities across the country are the principle agents of land use management, and all government levels are responsible
for the physical and economic wellbeing of these places through various pieces of legislation, most notably the British North America Act (Tindal, 2013). Within this federal Canadian Government Act, the provinces/territorial governments have the primary responsibilities for land use regulation, and municipalities are the creatures of the mid-level of government.

Land use planners are an important component in the allocation process of land uses within a community. They have responsibilities bestowed upon them as community leaders (Hodge and Gordon, 2014), and they are often entrusted with the role of being a “facilitating agent” of change (Douglas, 2010, p. 343.)

To examine how the general practice of land use planning is conducted, this paper uses a United Nations (UN) publication that describes how planning should be conducted in the world today. To begin the discussion, the following descriptors of planning have been adapted from a UN Human Settlements Programme publication (2009):

- planning has shifted from a governmental physical design approach “enforced through land-use control and centred in the state to a system comprised of governance with strategic implementation imperatives”;

- planning is viewed as a societal effort to imagine a place and “to translate the result into priorities for area investment, conservation measures, new and upgraded areas for settlement, strategic infrastructure investments, and principles of land-use regulation”;

- planning is concerned “with space, (i.e., ‘with the where of things’, whether in static or in movement; protection of ‘special places’ and sites; the interrelations between different activities and networks in an area; and significant intersections and nodes that are physically co-located in an area)”;

- planning is “now viewed as a strategic . . . activity” which “highlights a development movement from the past to the future. It implies that it is possible to decide between appropriate actions now in terms of their potential impact in shaping future socio-spatial relations. This future imagination is not merely a matter of short-term political expediency, but is expected to be able to project a transgenerational temporal scale, especially in terms of infrastructure investment, environmental management and quality of life”;

- planning is “an articulation of policies through some kind of deliberative process and the judgement of collective action in relation to these policies. Planning is not, therefore, a
neutral technical exercise: it is shaped by values that must be made explicit and planning itself is fundamentally concerned with making ethical judgements” (UN Human Settlements Programme, 2009, p. 19).

In the Canadian planning context, there are many definitions of planning but the one that is supported by the professional planning association of Canada, is the following succinct description:

*Planning means the scientific, aesthetic, and orderly disposition of land, resources, facilities and services with a view to securing the physical, economic and social efficiency, health and well-being of urban and rural communities* (Canadian Institute of Planners [CIP], 2014).

Planners are tasked in association with local community members (residents, business owners, elected representatives) to prepare and administer land use planning (Hodge and Gordon, 2014). The plans that are prepared give direction to how land is to be used – both developed and non-developed, and the overall consideration is to promote community sustainability along the lines of economic, social and environmental factors, and also promote inhabitant health/wellness. These notions are commonly ascribed the quality of life attributes of planning.

In addition to the effective and efficient disposition of land use and its arrangement, community planners must also consider the efficient provision of piped, transportation, communication and energy distributional infrastructural services for inhabitants. In looking at the early history of municipal planning there was a clear association made to the need for proper sanitation (sewers) and water systems associated with public health. Public health and planners worked together to ensure land uses were compatible to ward off environmental health impacts, and provide some protection for human activity (Lapping, 2006). This association is being reasserted now in Canada due to significant

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2 Although the UN publication highlights rapidly urban areas in the world today, the original reference material comes from general spatial planning work completed by noted planner theorist Patsy Healey (2004, 2006), and is therefore applicable to rural areas as well.
environmental and health concerns in the country (Public Health Agency of Canada, 2014).

Community planning in Ontario is guided by the Ontario Professional Planners Institute’s Code of Professional Conduct (OPPI, 2014) that has the following eight basic values:

1) Respect and integrate the needs of future generations;

2) Overcome or compensate for jurisdictional limitations;

3) Value the natural and cultural environment;

4) Recognize and react positively to uncertainty;

5) Respect diversity;

6) Balance the needs of individuals and communities;

7) Foster public participation; and

8) Articulate and communicate values.

Further elaboration on the requirements embedded within each of the above identified values is outlined in Appendix A, where mechanisms to achieve these values are explained.

The values of professional practice are instructive in the thinking that goes into community planning. Planners are often concerned with balancing the public interest with private aspirations, mostly associated with new development activity. This topic is quite expansive (Barton, Grant & Guise, 2010) but as a summary much of the public interest is manifested over time as a reflection of community values identified through planning issue public input, and decision-making as well as government laws enacted from time to time. In Canada, property rights - the right to use your land as you see fit, are not entrenched within the Canadian Constitution, and as a result there is quite a bit more leeway given to planners and communities as to what are considered reasonable encumbrances that can be placed on property. This is important for the Canadian planning profession, especially so for matters associated with protecting the
environment, i.e., *mother nature* does not have a voice in planning decision-making processes, and for matters concerning bigger picture, multi-generational timeframe issues such as climate change or biodiversity protection.

Another notion from the values of community planning is the construct of the incremental, continuous improvement planning process. This notion is important to consider as matters of land use planning are in continuous flux over time with new aspirations/challenges being presented through the democratic system we have in place (Hodge and Gordon, 2014).

The planning of communities is guided by Provincial legislation dealing with a myriad of matters that are associated with land. The principle document in Ontario is the Planning Act, but there is a host of other regulatory matters dealing with other provincial acts (the Municipal Act, Source Water Protection Act, Endangered Species Act, etc.), provincial strategic design statements (Provincial Policy Statement or commonly referred to as the PPS), provincial plans dealing with areas to grow and areas to be protected, and many other provincial regulations. The planner, hired as a civil servant, is required to have knowledge of the planning materials needed to conduct planning in the Province, and in a particular locale if working at a municipality. Further discussion on the details of planning in Ontario is elaborated on in Chapter 3.

As a concluding thought, in consideration of the CIP definition of planning, and the OPPI *Code of Professional Conduct*, the type of planning that is practiced in Ontario today can be described as a rational comprehensive form with adaptive, collaborative and communicative associations (Alexander, 1991; Healey, 2006; Hodge and Gordon, 2014). This descriptor of the planning system is important to note as it is this perspective of planning, at least in a basic philosophical sense which sets the foundational basis for considering GI as a rational approach to planning in rural locales of the Province.
2.1.2.1 Specific Challenging Topic Areas to Land Use Planners – Community Health and Wellness, Sustainability and Resilience

Planners think about a wide range of topics. In terms of associations to GI planning, an overview is necessary on the topics of health and wellness, at the individual as well as at the community levels as well as big picture notions of community sustainability and resilience. As these topics are quite broad and complex, only a cursory overview is presented here.

2.1.2.1.1 Health and Wellness

In terms of planning for health and wellness, land use planners need to consider this subject matter at both the individual as well as the overall community levels. A succinct description of the benefits of ecosystem services to individuals is laid out in the work by the Millennium Ecosystem Assessment. In this 2005 report entitled *Ecosystems and Human Well-Being Health Synthesis*, a clear depiction is provided as to how the G + S of nature provide the essential ingredients of clean air, water and land on which humans base their existence (Corvalán, Hales & McMichael, 2005).

Figure 3 provides an overview of the basic ecological system terms, and their interactions with human beings. Ecosystem services are described as the following: 1) *Supporting*: the all-encompassing term that establishes life on earth. It provides the services for the production of all other ecosystem services (nutrient cycling, soil formation, air production, water cleansing, etc.); 2) *Provisioning*: deals with food, wood, fibre, fuel production, water; 3) *Regulating*: deals with water purification, regulation of climate, disease, flooding; and 4) *Cultural*: deals with aesthetic, spiritual, educational, recreation activities. All of these effects lead to freedom of choice and action which, as another author has described (Maslow, 1943) results in self-actualization for the individual.
In terms of general community health issues, planners are guided by the Social Determinants of Health framework. This framework outlines a number of factors that are interrelated to form the health and wellbeing foundation for humans and their communities. This concept was formulated by the World Health Organization (WHO) in the 1940s around a holistic model of human health – and not simply the absence of illness. It was further refined in 1984 where an overall wellness approach to health was encouraged (Barton, Grant & Guise, 2010).

Figure 4 provides an overview of the relationship between the individual, to his/her community, and finally to the global ecosystem. The Natural Environment as depicted in
the figure provides natural habitats and clean air, water and land components that are essential elements in the health and well-being of our communities.

![Figure 4 - Community Health Overview](image)

Source: (Barton, Grant & Guise, 2010, p. 25)

In examining the above framework relative to Canadian society in general, there are significant challenges in created health and wellness conditions that are available to all. The Public Health Agency of Canada (2014) has documented that difficult conditions exist especially for low income households as well as aboriginal communities.

Work has been completed on the health of rural communities in DesMeules and Pong (2006). This publication took an in-depth statistical analysis of various health risks and mortality rates. As a general conclusion, rural areas are at a general health disadvantage
relative to urban areas. Factors noted here include higher rates of diabetes and obesity; poor lifestyle characteristics with increased rates of alcoholism and smoking as well as non-participation in physical exercise, and poor availability of fresh fruit and vegetables. Statistics Canada [n.d.] provides interesting data from their Canadian Health Profile to corroborate the findings of DesMeules and Pong. A recent publication by Caldwell (2015) identifies general health conditions in rural areas of Ontario with similar findings.

Research has been conducted in the United States (U.S.A.) examining the impact of the built form of communities relative to the health of their occupants. The extensive health statistical analysis work of the University of Wisconsin Population Health Institute (2014) has estimated that approximately half of the health characteristics of a community can be associated to the built environment of the particular place. The American Planning Association (Ricklin et al., 2012) completed extensive planning survey work across communities in the U.S.A. looking at strategic policy planning tools directed at creating healthy communities. From their work looking at over 900 plans, the most common public health planning topics were identified as: active living, active transportation, healthy aging, clean air and water, climate change impacts, emergency preparedness, environmental exposures, food access, physical activity, public safety and recreation.

Several planning associations in Canada, CIP (n.d.) and OPPI (2007) have outlined Healthy Communities Initiative guides that are available for health and wellness planning services for communities.

In reading through the various community health planning documents, there are many instances where positive associations with nature and natural elements are made.

2.1.2.1.2 Community Sustainability Considerations

The proposition of planning for sustainability is a core principle of land use planning. The topic has been discussed and debated it seems ad infinitum over the past several decades, but it still remains as a useful quest in planning. The following discussion associates the sustainability planning goal to the GI topic.
The generally accepted underlying principal for the sustainability concept came out of work of the Brundtland Commission’s *Our Common Future* report: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations World Commission on Environment and Development, 1987 p. 43).

Ever since the release of this seminal report there has been a focus on the methods and means to promote sustainability for the planet, and the communities within it. There is a plethora of literature that examines some of the significant challenges facing the planet today as well as suggestions on how to address the issues. Some of the general big picture ideas to address these challenges include the following: live within limits as suggested in United Nations Human Settlements Programme (2009) and Owens (2009); adopt the precautionary principle (Beder, 2006) whereby actions that may have unanticipated negative environmental consequences in the future should be avoided now. Other principles of sustainability as outlined by Venhaus (2012) include considerations of the following ideas: design with nature and culture in mind; provide regenerative systems that can serve as intergenerational equity elements; support a living, evolving framework within a systems design work approach; emphasize collaboration and ethical responsibility; promote continuous improvement; foster environmental stewardship; and connect people to nature. Venhaus stresses that sustainability requires consideration beyond short-term economic considerations, and there is a need to consider environmental benefits and costs in decision-making.

In terms of the linkage between sustainability and GI thinking, this paper’s author believes that a “strong sustainability” foundation perspective should be established. The notion of planning for sustainability using GI as a focus builds on the classic three circle sustainability definition of economic, social and environmental activities with one notable distinction. Instead of community sustainability being defined at the intersection of the economic, social and environment spheres as depicted in Figure 5, this writer argues that the sectors of economic and social spheres should rest on the base of the environment sector circle as displayed in Figure 6.
Figure 5 - Traditional Depiction of Sustainability Concept for Community Planning
Source: (Cato, 2009)

Figure 6 - Alternative Depiction of Sustainability as a Strong Notion for Community Planning
Source: (Cato, 2009)

A strong sustainability depiction as illustrated in Figure 6 resonates well with the concept of GI as a foundational element for community planning.
2.1.2.1.3 Community Resiliency Considerations

This area of special interest to planners deals with matters making communities adaptable to changing circumstances. The circumstances of change as being an ever constant, as attributed to Heraclitus, an ancient Greek philosopher, is something that drives the planning function. Conditions for resiliency in our communities is something that planners are to be ever vigilant to; this is identified as principle number 4 of the Professional Association of Canadian Planners Code of Professional Conduct (see Appendix A).

There is a plethora of publications dealing with the topic of resiliency and the condition of human settlement. Caldwell (2015) provides several definitions of resilience in circumstances dealing with rural communities. His publication highlights examples whereby ruralites are able to be adaptive to challenges that present themselves, clever to using available resources, and good stewards of scarce materials. These traits are illustrative of some of the hallmarks of living, working and playing within rural locations.

Several other publications point towards the utility of nature/natural systems that are associated with GI elements. In Nelson, Adger and Brown (2007), the notion of resiliency is discussed as it is associated with ecology - this is the level by which a system is able to withstand stress and to recover quickly from it. By inference, GI systems comprised of natural elements should embody some of the resilience attributes of ecology. Another source from Ahmed (2006), attaches the following characteristics of resilient systems that can quickly adapt to change:

- **Redundancy**—systems designed with multiple nodes to ensure that failure of one component does not cause the entire system to fail;
- **Diversity**—multiple components or nodes versus a central node, to protect against a site-specific threat;
- **Efficiency**—positive ratio of energy supplied to energy delivered by a dynamic system;
- **Autonomy**—capability to operate independent of outside control;
- **Strength**—power to resist a hazard force or attack;
- **Interdependence**—integrated system components to support each other;
- **Adaptability**—capacity to learn from experience and flexibility to change; and
Collaboration—multiple opportunities and incentives for broad stakeholder participation.

Many of the resiliency attributes discussed in the above comments have characteristics that are found in natural systems. The interest of the dissertation writer described herein is to attempt to devise a GI planning framework whereby a transfer of some of the resiliency elements embedded in natural systems can be leveraged over to human constructed settlements.

2.1.3 The Rural Land Use Planner

Rural planning is the practice of planning for rural areas, with a focus on rural issues and from a rural perspective (Caldwell, 2008). This succinct description clearly illustrates the need for the rural planner to be a community leader who is appreciative of and knowledgeable of a communities needs and aspirations.

Across Canada there are over 9,000 rural communities that represent approximately 20% of the country’s population. These communities come in all shapes and sizes and are reflective of a vast range of alternative situational circumstances - rural resource regions, the city’s countryside, rural recreation regions, northern peripheral/remote resource regions and aboriginal peoples rural regions (Hodge and Gordon, 2014). These communities deal with common issues that urban places have such as housing, transportation, public facilities, but they also deal with unique challenges that are found only in rural locales.

The unique circumstances of rural areas need to be acknowledged; these can include scale of development; range of types of development; intensity of development; pace of development. One particular rural area with significant planning challenges associated with it are agricultural working landscapes. The municipalities located within these areas have the usual planning issues as any human settlement area has, but in addition they have additional land use considerations associated with the following topics: farmland preservation, livestock facilities, provision for farmers markets/roadside stands, rules on
farm diversification, permitted rural land uses, farm sizes, rural lot severances, and environmental protection responsibilities (Hodge and Gordon, 2014).

Land use planning in a rural context is impacted by many differing conditions but all are associated with human forces driving change. A common characteristic of the rural planner is that he/she needs to be a generalist that can apply his/her talents to a potentially wide range of interests that the local municipality values. Caldwell (2010) lays out the many topics that a rural planner may be expected to deal with: land use, the local economy, labour and employment, demographics, community development, resource management, and environmental protection. As a result of the many expected responsibilities, planners often adapt to and capitalize on parallel processes, relying on community initiatives as much as on legislated processes in the implementation of their initiatives.

The specific interests of a particular rural community are driven by the values and circumstances of that particular community. Common issues include: built environment conditions (water and sanitary sewage; roads and transportation; environmental care with animal and/or human wastes); social conditions (aging population, social cleavages with older/new residents clashing values; population with stability, decline or immigration); economic development conditions affected by the resources/natural environment within which the community is situated (resource base, renewable or non-renewable resources such as mining, fishing, lumber products, agricultural production, recreational uses) (Hodge and Gordon, 2014).

Frank and Reiss (2014) relay information on the current importance of rural planning in the U.S.A. as well as Canada. From their research work, comprising KI interviews and a review of current literature comprising over 200 citation works, they advise that rural planning is alive and active. They indicate that rural planners are involved with the following primary activities: place-making, community building, sustainability, design of the built and natural environments, land use planning, local government regulation and administration, community engagement and consensus building, regional collaboration,
rural-urban linkages, rural economic and community development practices. This description of potential activities points quite clearly to the multi-functional roles that rural planners may take on.

The Frank and Reiss (2014) research also indicates that the planning for rural communities involves much more than simply thinking of these areas as resource extraction entities. Instead, they point out that the rural landscape provides multi-functional roles serving production, consumption and preservation endeavours. These areas are increasingly being seen in our urbanizing world as valuable and contested resource entities for meeting globalized needs including food, fresh water, climate change amelioration, but also local community aspirations in quality of life and social/economic innovations.

Planning in a local rural locale is often dictated by the politics of the local area, and the resources made available for planning. Financial resources are often limited, and priorities for economic development, rather than environmental or community social development endeavours, are often found to be most pressing at the municipal level. Added to this are the regulatory, financial and governance structures that are defined by senior government levels (federal and provincial). It is against this backdrop that rural planners can serve a useful function when they are able to articulate the values inherent in the local community and also serve as community leaders providing knowledge to address current challenges (Frank & Reiss, 2014). There is potential for the diverse and multifunctional attributes of nature/natural systems to be recognized and utilized within a connected local human/natural communities’ ecosystem.

2.1.4 The Use of GI in Planning Efforts Around the World

2.1.4.1 Introduction

The following sub-section gives a brief overview to how GI and GI planning is used in the world today. This discussion is intended to present further clarification to the meanings
associated with the concept that was outlined initially in section 2.1.1, and to elaborate further on the various motivators for action using the term.

To begin, an outline of the extensive use of the term in various European contexts is given. The application of GI is applied on a more or less consistent basis as set by the European Union (EU), but there will be some further elaboration on the use of the GI concept as used in specific countries of Europe, i.e., the UK and Sweden. The next discussion will also present some of the literature from the U.S.A. where there is a wider meaning of GI in place, with some understandings being associated with naturalized stormwater management systems to other applications regarding specific green use functions such as the use of greenways and active transportation networks. A brief overview of the term follows for Australia and Africa which provide interesting illustrations of the use of GI in these distinct regions of the world. The sub-section ends on the use of the GI term in Canada.

Generally, the literature illustrates the common interest in the use of nature/natural systems to provide services that benefit human activity while also maintaining and benefiting natural ecosystems. The intent of this section is to give examples of where GI is used in the world today, and some of the unique uses, meanings and functions that are applied to the concept.

2.1.4.2 GI Planning in the European Union (EU)

Significant interest in GI planning is currently underway in the EU with primary interests in biodiversity protection and climate change mitigation/adaptation. Since the beginning of the twenty-first century with respect to biodiversity concerns, various agreements have been reached by the member nations to complete GI works (European Union, 2012). These include: a) a habitat directive to include a minimum of twenty percent of the land base to be protected for unique Natura 2000 ecological sites; b) a water quality and protection framework directive; and c) a protection of endangered birds and animals’ habitats directive.
The EU has implemented various GI efforts that strategically address issues facing its constituent countries through its Environment and LIFE Programmes. Specifically, the EU is attempting to combat habitat loss, land fragmentation and degradation, and the negative effects of large scale agricultural and forestry production through specific GI mechanisms (European Union, 2010).

To date, the EU has been quite successful in identifying and protecting ecologically significant sites in much of Europe. These sites, referred to as Natura2000 protected sites, are a key component of their joint biodiversity protection efforts. The EU is now looking at ways to tie many of these isolated elements into a system network that is spatially and functionally coherent. The EU is looking at GI mechanisms to promote ecosystems restoration to increase their resilience and sustain the key services they provide while also achieving conservation objectives and providing adaptation mechanisms to climate change (European Union, 2012).

The EU provides seed funding to undertake research works in member countries. Some of their projects involve the topic of spatial planning for ecosystem enhancement. The following are examples of projects that have been completed: a) Landscape and management of natural suburban areas (France); b) A demonstration project on land use and environmental management of the physical planning in Gallecs as a biological and stable connector in the fringe space of the Barcelona metropolitan area (Spain); c) The use of a Green Belt as a form of sustainable territorial planning (Spain); d) The use of ecological networks as a model that integrates environmental considerations in sustainable land use planning and management (UK); e) Sustainable urban planning networks for green spaces (UK); and f) The use of GI as a foundational element for spatial land use planning (European Union, 2010; Llausàs & Roe, 2012).

The EU has produced numerous reports and directives that are associated with nature, the environment and GI – Building GI for Europe (European Union, 2008); Green Infrastructure (European Commission, 2010); Environment-Green Infrastructure (European Union, 2012); Green Infrastructure – Connectivity and Sustainability
(Sylwester, 2009). The EU is formulating a GI framework for the entire sub-continent area. This is a cornerstone piece to an interconnected green spatial system of space to protect biodiversity, to connect isolated natural hubs and to provide mitigation and adaptation mechanisms to the impacts of climate change. It is an ambitious undertaking associated with meeting their 2020 Biodiversity Protection Target with spatial planning implementation mechanisms across Europe being key pieces for the framework (European Commission, 2013).

The EU has also commissioned studies to evaluate the effectiveness of GI interventions in various EU countries. The Naumann et al., (2011) report entitled Design, Implementation and Cost Elements of Green Infrastructure Projects provides a detailed strengths, weaknesses, opportunities and threats (SWOT) analysis of various projects. In total, their study database consisted of over 125 GI projects, and by comparing/contrasting various approaches to GI provision they were able to distil recommendations for further work by the EU.

Another EU GI evaluation report was commissioned by the European Environment Agency (2011), and this extensive report looked at the opportunities of GI as a territorial cohesion mechanism across Europe. In this report, the authors define territorial cohesion as “the spatial representation of sustainability” (p.16). They go on to indicate that it represents a crucial centerpiece for implementing their Territorial Agenda 2020 agreement which “aims to provide a balanced and sustainable spatial development strategy for Europe” (p. 21). The document provides an in-depth analysis of the GI concept and its application in the EU. The document provides an overview of definitions from the literature, it associates the concept to big picture ideas such as sustainability and climate change mitigation and biodiversity protection. The document is also nuanced in its examination of alternative spatial cases to illustrate the applicability of GI to rural locales. This is something that is quite rare in the literature as the preponderance of the GI discussion is directed to urban centres. The document also examines the use of various GI assets that can be grouped together in geographic scalar considerations for regions, nations and even trans-national applications.
The European Environment Agency document goes on to provide an overview of how GI is associated with ecosystem services following the Millennium Ecosystem Assessment categorization and lays out principal GI literature documents that supports its observations. An interesting discussion is given regarding possible trade-offs in land use application between GI natural space provision and other state interests such as the growing of agriculture and agri-food crops. Several case studies of the use of GI are provided from the international Iron Curtain reuse as a greenbelt through Europe to smaller case studies for specific locales in differing countries, e.g., restoration of flood plains and wetlands in Babina and Cernovca, Romania; natural climate buffers in the Netherlands; neighbourhood regeneration in Malmo, Sweden; Kent and Thameside, UK. The publication provides a good overview of GI multifunctionality, and a detailed accounting of how ecological services benefit humankind as well as support healthy natural systems.

Finally, the European Environment Agency publication provides an account of sustainability aligned with GI planning or as they prefer to call it, spatial cohesion planning. The following points summarize the discussion:

*The use of GI can assist in making communities more sustainable. This is evident in the following: promotion of harmonious development, protection of lands from inherent dangerous natural conditions, avoiding over concentration of activity in any one activity (avoiding a non-resilient community environment), connecting areas (internal and external), and promoting co-operation/collaboration in efforts. In this way GI is supportive of community development that is resilient to future uncertainties, provide contingencies in cases of calamities, and promoting overall health and wellness (European Environment Agency, 2011, p. 109).*

Another EU sponsored evaluation piece (Giurgui County Council, 2011) examines the use of GI in three countries – Romania, Czech Republic and Italy. The purpose of this examination was to document the opportunities and barriers of several local GI case study applications to the overall protection of European natural resources and cultural landscapes.

In conclusion, from the case study examination work across the EU, GI planning is well entrenched in many locations. The EU is the sponsoring or organizing central governance
function that promotes the use of GI for numerous reasons – primarily for biodiversity protection and building resiliency to climate change impacts. Efforts to strengthen ecosystems for their functions and services are also central to their mission.

2.1.4.3 United Kingdom (UK) Land Use Planning Using GI

This sub-section is intended to give specific examples of the use of GI planning within the UK. Various levels of government within the Kingdom have embraced the use of GI in their land planning efforts. For example, at the national England level, Natural England, has produced several guidance documents on the merits of landscape-scale conservation planning and the provision of GI elements within various strategic land use plans at the local level. These documents include *Green Infrastructure Guidance* (2009a); *Spatial Planning in Natural England – Planning for the Natural Environment* (2009b); and *Think BIG - How and Why Landscape-Scale Conservation Benefits Wildlife, People and the Wider Economy* (2011). In 2013, Natural England released a document *GI – Valuation Tools Assessment* that examines the costs and benefits of implementing GI mechanisms, including the ecosystem services gained from such approaches.

The United Kingdom’s Secretary of State for Environment, Food and Rural Affairs, released a White Paper (2011) which described the value of planning with green infrastructure in mind; this paper was entitled *The Natural Choice: Securing the Value of Nature*. The United Kingdom *National Planning Policy Framework* (2012) was released by the nation’s central planning agency, and this document references the provision of GI as a mechanism in addressing climate change impacts in the UK (Policy 99). GI is described as an adaptation tool for areas exposed to flooding, costal changes, and as a means to address water management, biodiversity and landscape protection. The document goes on to encourage the establishment of GI networks within local plans (Policy 114) and describes GI as multi-functional green space.
As is seen from the above, the UK government has taken a very broad perspective on GI which recognizes the tremendous spectrum of G + S embedded in nature that can support healthy ecosystems and human settlements.

Respecting local municipal government consideration of GI, several references are indicative of how the concept is used in the spatial planning system (North West Green Infrastructure Think Tank, 2007; CABE, 2009; Leeds, 2010; Horwood, 2011). To give specific details as to how GI is being incorporated in a regional spatial plan, the East of England Government Office *Regional Spatial Strategy* (2008) has several policies that specifically discuss how local plans are to incorporate GI. The following points are summary statements illustrating the implementation of GI planning:

*Local development documents should:*

- define a multiple hierarchy of green infrastructure, in terms of location, function, size and use levels, based on analysis of natural, historic, cultural and landscape assets, and the identification of areas where additional green infrastructure is required;

- require the retention of substantial connected networks of green space in urban, urban fringe and adjacent countryside areas to serve the growing communities in key centres for development and change;

- ensure that policies have regard to the economic and social as well as environmental benefits of green infrastructure assets and protect sites of European or international importance for wildlife (p. 51).

The UK planning system has a well-established policy regime respecting GI. The concept permeates planning policy from the highest level of government down to local municipal plans with various implementation mechanisms. The UK GI planning use example is illustrative of how the EU strategic planning framework for GI is being implemented.

Significant GI discussion publications have been prepared by Ian Mell in the UK through his research work on the topic over the past decade. Dr. Mell completed his doctoral research on the topic at the School of Architecture, Planning and Landscape at Newcastle University in 2010. He has studied and written extensively on the history and evolution of the GI planning concept, primarily through literature review research (Mell, 2008, 2010, 2011, 2013; Roe and Mell, 2013). He comes at the GI concept trying to meld ecology,
human settlement and landscape architecture to form a new planning paradigm. In his various publications he advocates a strong position on the virtues of adopting GI as a new planning process. He emphasizes research and use of GI in Western Europe, the UK and the U.S.A.. He also writes with a significant urban interest in the topic.

In his 2008 publication Mell outlines the perspective that GI can be used as a new planning process for spatial land use planning in consideration of the form and function of landscapes. Through an extensive literature review, he argues that GI has attributes that provide the following: accessibility; use as both a concept and a resource; connectivity and networks; integration of differing cross-boundary people, places and policies; scales at differing geographic and political levels; a provider of multiple benefits and multi-functional attributes.

Mell (2008) outlines the use of GI as a means to provide for stormwater management using naturalized forms to mitigate the impacts of climate change storm events. His discussion focuses around SUDS (Sustainable Urban Drainage System) design that utilizes naturalized quality and quantity control ponds as well as biomimicry devices such as bioswales. As a side note here, in the North American context this form of stormwater management is referred to as Low Impact Development (LID). Mell’s article also highlights research that describes the use of nature to mitigate human illness in their physical and psychological health forms. The availability of trail networks is shown to encourage non-motorized travel, access to local parks, encourage increased physical exercise and social networking; the views/proximity of natural elements to people have also been shown to reduce illness caused by fatigue or stress.

In follow-up to his doctoral dissertation work, Mell (2011) outlines the virtues of using GI as an urban landscape management tool to further beneficial planning and development. He argues in his assessment of various case studies in the UK, Europe, and North America that the principles of GI have been well thought out; however, additional data to support the multifunctional attributes of the concept need to be researched further. He also
advocates on the prospects of using GI to address impacts of climate change and also the protection of biodiversity.

Mell in a 2013 publication argues about a troublesome aspect of the implementation of GI thinking in Europe and North America. He states that the ambiguity of using GI in its many forms and its wide variety of definitions may be impacting on its potential application. His paper looks at the continuum between grey and green technologies and how differing definitions may cause confusion by potential users. He examines the consideration of its use through different professions eyes, i.e., civil engineers, landscape architects, planners. He indicates that technologies that mimic nature may be confused/contradictory to green living landscape notions of GI.

In his joint publication with Roe (2013), Mell explores the topic of GI Negotiating Value and Priorities. This work outlines some of the difficulties of implementing a GI planning approach and project, and their paper involves an evaluation case study respecting the use of GI planning in Ely, Cambridgeshire, UK. In this specific study area, they illustrate there are mixed results with using a GI planning approach as the metrics for measuring planning success can vary tremendously for a community. In their case study they describe some of the difficulties: differing time scale considerations for immediate versus long term payoff schedules; priority of specific GI functions for human use such as trail development and tourism promotion versus unique natural area protection. However, they conclude in their paper on a positive note arguing that GI is a useful tool in promoting discussion and illustrating the land use trade-offs that are inherent in a multi-dimensional concept.

As part of their review of the case study, the following thirteen functions of GI are highlighted: Climate change adaptation; climatic control; water cleansing and control; economic development; sustainable movement; improved community cohesion; providing leisure and recreation opportunities; reconnecting people with nature; learning opportunities; local food production; improved health and well-being; protection of
cultural and historic features and associations; enhancing local identity and sense of place.

As a component of their extensive literature review, Roe and Mell (2013) outline the following key planning characteristics of a GI system: holistic, comprehensive, flexible and integrated approach; primary importance of GI; evidence-based benefits; importance of scale – from site to district; multifunctionality; connectivity and linkage; participatory and partnership approaches; spatial commitment with execution implementation and long-term commitment being equally important.

Another UK document that highlights the utility of a GI planning framework comes from the Landscape Institute (2013). This professional association released a position paper entitled *Green Infrastructure – An Integrated Approach to Land Use*. This paper provides an overview of the use of various GI elements in landscape and community design pursuits.

2.1.4.4 Using GI for Municipal Planning in Sweden

As another case study of the use of GI within the EU, the form of linked nature/natural system-based planning has been in place in Sweden during the past several decades. Although not necessarily referred to as GI, green planning in Swedish municipalities has been examined by Ulf Sandström in several publications.

Sandström’s (2002) paper summarizes work he completed assessing the extent by which GI planning had been instituted in a cross-section of various sized and planning-sophisticated communities across Sweden during the 1990s. He was particularly interested in how well green plans in Swedish cities take into consideration the multiple uses of green spaces in urban areas and can these green spaces in turn play a key role in obtaining sustainable urban development. His paper lays out 47 differing criteria around the following topics: recreation; maintenance of biodiversity; city structure; cultural identity; environmental quality; biological solutions to urban area technical problems.
The evaluation criteria he formulated from his research are quite comprehensive and are useful for researching the effectiveness of a GI planning framework.

Sandström with colleagues Angelstam and Khakee (2006) investigated the opportunities and barriers to promoting a biodiversity protection agenda in the largest communities in Sweden through a GI planning framework. Their research included examining planning documents and interviewing planners in seven Swedish municipalities concerning the topic of biodiversity acknowledgement. Their research indicated that the highest priority in the provision of GI space was given for recreation and park use, and that the enhancement of natural ecosystems was afforded a lower significance ranking.

2.1.4.5 GI Planning in Australia

The GI term is not a commonly used expression in Australia. The University of Melbourne is actively studying the concept in its Green Infrastructure Research Group, School of Land and Environment (University of Melbourne, 2012). The City of Melbourne, a well-regarded green city in the world today (Forman, 2008) has acknowledged the notion of the GI term in its most recent comprehensive plan for the municipality (Melbourne, 2012). The context of the city, with significant natural assets consisting of a major river and its location along the Australian ocean coast, are acknowledged for protection and enhancement within Green Wedges defined in the municipality’s planning document. The Green Wedges consist of open space lands that separate distinct urban entities of Melbourne, and they have been recognized as important elements of the community for over fifty years. These lands are recognized as a useful multifunctional greenbelt tool for the City as the GI lands provide functions of water retention and protection, protection of natural areas and biodiversity, provision of agricultural lands, recreation spaces, and areas for aggregate resource and water supply extractive uses (Ercoskun, 2012).
2.1.4.6 The Use of GI in Africa

Several publications are available giving an overview of the potential of using GI as a means to address various issues on the African continent. With fast rising populations within urban and semi-urban areas, Abbott’s (2012) book entitled *Green Infrastructure for Sustainable Urban Development in Africa* provides a useful overview of how cost-effective natural ecosystem resources can be used to address human needs. In addition to this, the author also presents the case that using GI is a closer reflection of the natural values held by Africans to living with the land than what is presented with the grey forms of infrastructure to support new urban development, i.e., impervious lands, concrete stormwater facilities. The book discusses GI as in the usual definition form of the term contained within this paper, but in addition Abbott presents the case that the freely offered sunlight, wind and water of nature can also be harnessed for renewable energy generation. This overview broadens the use of GI beyond the level contemplated in this paper but is useful to illustrate some of the definitional challenges of the GI term.

An interesting case study on the potential implementation of GI in Johannesburg, South Africa is also presented in Shäffler and Swilling (2013). This paper discusses the priority of integrating GI in a context where there is little appreciation for the notion of green in a rapidly urbanizing area. They argue that GI may be a useful construct to link socio-ecological systems-thinking in combination with the infrastructure human-serving scholarship in order to promote a sustainable future for the city. Interesting circumstances are highlighted where the former apartheid system has created great social-cultural-economic divides in the community, and it is envisaged that a GI system can assist in building a more equitable urban community with green access to as many persons as possible. Specific interest, as outlined by the case study research, is the ability of GI to serve as a carbon sequestration tool with urban forestry, and also the planting of trees being used as an employment source.
2.1.4.7 GI Planning in the United States (U.S.A.)

A comprehensive notion of GI came out of work by a think tank on sustainability for President Clinton in the late 1990s (President's Council on Sustainable Development, 1999). Several American authors discuss a holistic consideration of the GI term, and for the purposes of this paper a wholesome discussion for these authors is offered below. Suffice to state here, the GI planning notion is defined by its benefits both to human and natural communities, with the central premise points of greenness and connectivity being highlighted.

The holistic notion of the GI construct in the American context is often usurped by the U.S.A.'s Environmental Protection Agency (EPA) interest is using the term and providing grant funding in association with improving water quality through stormwater management mechanisms (United States Environmental Protection Agency, 2014). Several authors document this predisposition of the GI term meaning in the U.S.A. context (Mell, 2011; Rouse and Bunster-Ossa, 2013).

Ahern (2007)) has prepared a substantial guidebook on using biomimicry as natural function systems to assist in improving water quality and quantity controls that are often in association with implementation mechanisms for the American Clean Water Act. He identifies mechanisms whereby more naturalized approaches to the handling of stormwater surcharges may be dealt with in instances where there are combined sewer situations, i.e., when overflow surcharging occurs in storm events with sanitary sewer waste mixing with storm sewer water in older, large American cities, and instances where there are extensive urban land area imperviousness conditions. Ahern argues there are several key propositions where GI can be used for various multi-functional and multi-scalar effects. These include the use of a spatially-connected network, strategic thinking, the necessity for greening sterile grey infrastructure, and planning for multiple use in an adaptive experimental format. Several publications provide a good overview of the use of GI for specific benefits to various-sized communities and differing geographic contexts, including those comprising
rural to urban locales (Sarté, 2010; Center for Neighborhood Technology, 2010). These publications provide good overviews of the application of GI and discuss the merits of using GI for their generalized beneficial effects to land, water and air quality, and also improving general community liveability characteristics. In terms of defining the specific benefits that the GI construct provides, the following partial listing is offered: the protection of surface and groundwater quality, increased water supply, groundwater recharge, climate change mitigation, increased health opportunities through outdoor recreation, improved air quality, reduction in summer urban heat island effects, reduced flooding, local agriculture promotion (urban and adjacent rural), improved community cohesiveness, reduction in traditional grey infrastructure need, opportunities for community education, community amenity and attractiveness, reduced energy need, improved wildlife habitat, reduced urban noise pollution, provision of resources such as lumber and aggregates where they exist.

Across the U.S.A. there are many differing understandings and methods in implementing GI systems. One of the regional-wide areas with the most sophisticated understanding and implementation of GI relative to their planning work is in the State of Maryland. Several literature resources point to the long historical association of a natural carrying capacity perspective to planning within Maryland (Maryland Department of Natural Resources, 2003; Benedict and McMahon, 2006; Weber, Sloan and Wolf, 2006). This association of a GI approach to planning has evolved greatly over the past 20 years. Today, a GI plan is in place in the State to assist in prioritizing key conservation land areas that are to be protected as well as identifying areas where development should be prioritized. In reviewing the history of smart growth planning in the State, the 1997 Smart Growth and Neighbourhood Conservation Act had, at its core, several elements of GI planning that were not acknowledged as such at the time. These GI elements included the protection of the natural environment with primary consideration to water quality attributes of the Delaware estuary and Bay; direction of growth away from rural areas comprising important agricultural production resources and natural ecosystems; and land use measures to protect biodiversity.
In giving a critical assessment of the current Maryland Smart Growth Planning (2012) initiative, GI is represented in approximately one-half of the principles for the Growth Plan effort – namely to preserve open space, farmland, natural beauty and critical environmental areas; foster distinctive, attractive communities with a strong sense of place; promote the development of compact communities; and provide planning information/prioritization of state efforts to make development decisions predictable, fair and cost effective. In terms of specific wording related to GI, the terminology is included within the natural heritage feature protection policies of the Plan.

In the 1990s a state-wide network of protected spaces was created through the Green Infrastructure Assessment System (Weber, Sloan and Wolf, 2006; Benedict & McMahon, 2006). This system helped to identify and prioritize areas for conservation and restoration. The planning of a linked nodes and corridor natural system has resulted from the use of the tool and has served as a base foundational element to the State’s Growth Plan. Ecologically-significant areas requiring protection as well as areas of the network requiring restoration have been identified for further action. Strategic open space reserves such as greenways and agricultural preservation districts have been created within Maryland to implement the GI-based planning system.

To complete this sub-section on GI understanding and its use in the U.S.A., it is worthwhile to briefly review several substantive books that have been written on the GI planning topic over the past decade – there are four: Williamson, 2003; Benedict and McMahon, 2006; Rouse and Bunster-Ossa, 2013; and Austin, 2014. These publications highlight the utility of employing a GI approach to planning, and their publications are written on the script of defining GI first, then outlining why it is a useful planning entity next, and then adding substance to their thoughts using various case study examples.

The following discussion highlights specific unique perspectives on the GI topic from each author.

The Williamson (2003) publication is an early descriptive account of the use of GI in planning. The publication has an environmental protection orientation covering primarily
rural areas which is useful relative to the rural planning perspective given in this paper. Her discussion focuses on the utility of the GI planning system in defining areas that are to be conserved/protected, and other areas that can or should be changed. For example, conservation protection can be assigned to drinking water protection areas while areas for change may be a former industrial area (brownfield) that should be cleaned up. There is a useful discussion clearly articulating how grey and green infrastructure can be structured together to link the capitals of social/human, economic and nature together to form community sustainability. The focus of discussion is based on a common agreement to construct viable ecosystems in an area. The usefulness of watershed study areas involving many stakeholders concerned about planning for health and wellness is highlighted. Examples to the use of her suggested GI planning approach can be found in water-focused plans in the northeast U.S.A.; these plans are for the Middle Delaware watershed (Heritage Conservancy, 2004a); and Musconetcong River (Heritage Conservancy, 2004b).

The second substantive book on GI in the U.S.A. comes from Benedict and McMahon (2006). This publication entitled *Green Infrastructure: Linking Landscapes and Communities* is often cited in various GI literature pieces and is considered a foundational document on the topic. Their text covers early 2000s articles on the topic of GI prepared by the authors and offers numerous vignettes/case studies on how GI is used in planning across the U.S.A. – from site designs for individual properties to entire State or even international planning design processes. The earlier papers from Benedict and McMahon are covered within the text of the book (2002, 2004).

Table 1 provides an illustrative sampling of the variety of plans using GI as a foundational praxis in the U.S.A. The chart is also useful in illustrating the wide range of scale and setting applications of GI planning (rural, urban).
<table>
<thead>
<tr>
<th>GI Locational Reference</th>
<th>Primary Function &amp; Scale</th>
<th>Implementation Timeframe and Status</th>
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| Yellowstone to Yukon Conservation Initiative | - Greenway for the Rocky Mts. with a conservation biology emphasis  
- International scale U.S.A. and Canada | - Since 1993; emphasis on partnerships with over 340 agencies and individuals involved |
| Southeastern Ecological Framework | - Greenway in southeastern U.S.A. | - 1998-2003; research project with Univ. of Florida and EPA sponsorship |
| Florida Statewide Greenways Planning Project | - Greenway planning for ecological/cultural significant recognition & protection  
- Statewide | - 1990s – 2000s; Greenway Commission established for the State with primary management function |
| Twin Cities Greenway Plan for Minneapolis/ St Paul, Minnesota | - Greenway link connecting natural areas and parks  
- Municipal-regional scale | - Evolutionary from founding of communities in 19th century  
- Protection of core areas, and expansion into suburban fringes.  
- Government and Non-governmental collaboration |
| Portland, Oregon Greenspaces Program | - Greenway  
- Municipal scale | - Evolutionary from founding of community in 19th century  
- Greenbelt formulation – priority property acquisition and promotion of corridor/linkage partnerships |
| New York City Water Supply Protection Plan | - Ecological service protection for clean drinking municipal supply  
- Catskill/Delaware Watershed protection plan | - Since 1997, land acquisition and surface water/groundwater protection areas defined |
| Sonoran Desert Conservation Plan | - Ecosystem protection (including endangered species habitat protection)  
- Community teaching/learning in Pima County and including Tucson | - 1990s – 2000s; emphasizes a science-based planning system to protect multiple-species through conservation planning mechanisms |
| Topeka, Kansas Stormwater Management System | - Stormwater community-based system with impervious area payment structure | - Since 1997 with stormwater management funding provided for GI works |
| Kingston/Lenoir County GI Plan | - Strategic visioning process for a rural community in North Carolina | - 2001 plan to identify recreation lands and lands prone to flooding |
| Prairie Crossing, Illinois Rural Subdivision | - Public space provision with conservation marketing emphasis | - 1990s; rural subdivision planning with a conservation of special environmental features approach |

Table 1 - Illustrative U.S.A. GI Plan Case Study Examples from Benedict and McMahon

Source: (Benedict & McMahon, 2006)
The next American book that illustrates the utility of planning with a GI focus comes from Rouse and Bunster-Ossa (2013). Their publication entitled *GI: A Landscape Approach* highlights the use of ecosystem services to provide human health and wellbeing. Again, numerous case studies are outlined to document the benefits of a GI planning approach, with the greatest emphasis being placed on greenway-linked natural/open space area provision as well as the stormwater management biomimicry applications of natural and human-constructed handling and treatment facilities. A strong argument is made to using the provision of linked open space areas for their recreational and equitable public accessibility aspirations; these are discussed in reference to Richard Louv’s (2011) notion of a Natural Health Care System for the U.S.A.. Another strong advocacy position made in the text is the need to make performance measurement indicators for GI understandable in both quantifiable and qualitative metric formulations. It is through this means that buy-in to the use of GI can be made by the general public and the elected decision-makers. Case studies are highlighted to illustrate the many types of plans that can be formulated, i.e., strategic visioning, comprehensive policy, development and individual site plans which are illustrative of the multi-functional, connective, identity-forming and return-on-investment dimensions of GI.

The last major publication on GI in the U.S.A. is the publication by Austin (2014). This book entitled *GI for Landscape Planning - Integrating Human and Natural Systems* highlights the conceptual framework work of Tzoulas et al. (2007) concerning GI amongst other matters. The overarching theme in this book is the use of GI hubs and corridors that can be of use in networking ecosystem services within community land use structures. Discussions on various forms of GI are provided such as artificial wetlands for wastewater treatment as well as the provision of lands for local food production. As in the other publications noted above, numerous case study examples are provided to highlight the multiple functions and co-beneficial attributes provided by various GI elements. A notable case in point is a newly designed stormwater management facility in the Menomonee River valley of Milwaukee, Wisconsin. In this example, he outlines how a former grey, single purpose stormwater detention facility (sewer/pond) was replaced
with a new multifunctional GI asset, i.e., a naturalized treatment and storage facility that was constructed providing functionality for aspects of recreation, natural habitat, water quality enhancement technologies and landscape aesthetics as well as increased home property values in the area for economic benefit to the adjacent landowners.

The foregoing discussion has outlined substantive U.S.A. publications discussing GI. It should also be recognized there is a wealth of information on GI from other authors that write on specific elements of GI: parks (Dolesh, 2012); economic valuation of GI provision (Faucette, 2012); a climate adaptation approach (Lerner and Allen, 2011); GI plans for municipalities or regional geographic entities including watersheds and U.S.A. States (Firehock, 2014; The Conservation Fund, 2016).

2.1.4.8 GI Use in Canada

The consideration of GI and GI planning is not a generally accepted term around a common definition in Canada. For the purposes of the following discussion, GI is examined as a term at the national level, and then at the provincial level where some notions on the concept are available from British Columbia and also Ontario.

2.1.4.8.1 Canadian National Level Consideration of GI

In a review of the literature at the national level, there are two information sources that discuss the concept of GI (Infrastructure Canada, 2014; Federation of Canadian Municipalities, 2001).

Infrastructure Canada, through the Federal Government’s Economic Action Plan program (2014) defines GI in a very limited fashion; namely, it lists GI as traditional grey infrastructure development with a reduced environmental impact footprint. This funding grant program allocates funding for the provision of new infrastructure in the country in instances where the projects can assist in growing the economy but doing so in a manner with reduced impacts on air, water and/or land pollution through environmental-friendly
technology. For example in looking at some recently funded projects, the following are provided as examples of infrastructure that are ‘green’: sewage treatment plants, secondary treatment/tertiary treatment plant technologies; organic waste recovery projects from landfill for methane production in an energy from waste application; new hydro plant production with removal of existing diesel generated power sources; sewage treatment plant expansions to support new population/employment growth and not having sewerage flow exceedances during storm events into water bodies. These projects funded from 2009 – 2014 consist of improvements to traditional grey infrastructure that reduce impacts to the environment. Notions of natural systems, connectiveness or multifunctionality are not components of this GI definitional construct.

The Federation of Canadian Municipalities completed a study (2001) examining the use of GI for municipalities across the country. Their publication described GI as the following:

*Infrastructure systems are evolving into ‘ecological’ forms that are more effective at looping scarce resources, and at cascading energy flows through multiple end uses. Greater emphasis is placed upon achieving thermodynamic efficiency for the systems as a whole, and upon creating systems that are inherently more adaptable and resilient. The net result is an integrated infrastructure system with a reduced ecological footprint over its life cycle, and with significant benefits for the community economy and quality of life. This is referred to as ‘Green’ infrastructure.*

The above definition of GI refers to grey infrastructure systems that are redesigned in terms of ecological principals, i.e., small, distributive, etc. with standard traditional infrastructures dealing with water, wastewater, solid waste, energy, transportation and communication technologies being discussed. Again, this definitional construct does not have notions of natural systems, connectivity or multifunctionality associated with the definition.

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3 Multifunctionality as defined by several authors in this paper – see Mell, 2010; Rouse and Bunster-Ossa,2013; i.e., an element that provides a multitude of goods and services for either or both human and natural communities.
2.1.4.8.2 Provincial Level Consideration of GI

In a jurisdictional provincial scan across Canada, the literature provides some discussion of the use of GI in the contexts of British Columbia and Ontario.

In British Columbia, Rutherford (2007) outlines the *Green Infrastructure Guide* which provides a civil engineering design approach to lower the impact of stormwater peak storm events, and to provide for building water reuse through greywater recycling systems, and also renewable energy systems such as solar and geothermal power. Her wide perspective on what constitutes GI is interesting to note as she mixes natural based GI systems as defined within this paper with other environmentally-friendly notions such as reuse, recycling and renewable engineered facilities.

Within Ontario over the past several years, the consideration of GI has arisen from both government and non-government agencies. These considerations of GI are very much aligned with the principal definition of the term as outlined at the beginning of this paper. The government discussion of the term has been provided by the Environmental Commission of Ontario (ECO) and through the Ontario Ministry of Municipal Affairs and Housing (OMMAH). The Environmental Commissioner (2010) prepared his annual report to the legislature discussing the merits of a holistic notion of GI as outlined in the initial definition provided in this papers Introduction. In 2014, the OMMAH released a new version of the Provincial Policy Statement (PPS), the main tool used by planners in Ontario to guide their planning works in various municipalities, which included the term, GI, for the first time (OMMAH, 2014). This document stated:

*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, storm-water management systems, street trees, urban forests, natural channels, permeable surfaces and green roofs.* p 42

The term is used in the PPS to describe how GI can be used to complement traditional grey infrastructure which is defined in the traditional sense as the “physical structures
(facilities and corridors) that form the foundation of development” (OMAMAH, 2014, p. 43). Although a slightly natural notion of using the GI term is outlined in its PPS definition, the use of the term in Policy 1.6.2 has a significant stormwater management functional relationship and is also urban oriented, i.e., to be used in impervious settlement situations where a preference is given to the provision of urban forests and street trees.

Another source of interest in the use of GI for planning and development in Ontario comes from the Green Infrastructure Ontario Coalition which is an affiliation of representatives from a variety of environmental NGOs, professional associations and government agencies in the Province. In 2012 this group produced an interesting advocacy report entitled, Health, Prosperity and Sustainability – A Case Study of Green Infrastructure in Ontario. The contents of their report are very much aligned to the holistic notion of GI for planning as used in this paper; however, their report has a definitive urban bias with much of their written description directed to the high density, imperviousness urban condition (Green Infrastructure Ontario Coalition and Ecojustice, 2012). It is interesting to note that the Ontario planning profession was not represented in the coalition membership at the time of the reports preparation.

2.1.5 An Evolutionary History of GI Thinking for Land Use Planning

While the discussion of GI has only been in the literature for the past several decades, the antecedents to its development can be traced back to several planning circumstances that evolved in Europe, the U.S.A. and Canada over the past century and a half.

The notion of limiting human settlements in certain areas and planning for open space conservation in others came out of the Garden City movement at the turn of the 20th century (Lapping, 2006). Ebenezer Howard devised a notion of Garden Cities to accommodate new population growth migrating into the large cities of England for jobs. Howard realized that the physical outward expansion of the cities would quickly envelop the landscape, and he therefore envisaged the creation of green belts and satellite towns
that would comprise a regional planning framework. The larger central city would be connected by mass transportation to the nearby smaller satellite communities. By limiting the spread of the urban centre, the services and amenities of the centre could be made available on an equitable basis to those living in the nearby garden communities. People living in the city would benefit by proximity to the open green space of the greenbelts’ working farmlands and natural landscapes.

The notions of providing green space, its equitable accessibility to nearby residents, and the setting of boundaries to define various economic activity zones such as agricultural areas and urbanized lands, are concepts included in GI today (Lapping, 2006; Hodge and Gordon, 2014). Synergies between town and country could be realized looking at notions of local land carrying capacity, local food production and distribution, access to countryside beauty and community equity.

2.1.5.1 Landscape Architectural Expressions of Open Space Provision from the United States

In the U.S.A., large cities were being created along the eastern seaboard of the country towards the end of the 19th century. Frederick Law Olmsted postulated, as a landscape architect and early land use planner, that these large communities would require green spaces to serve as respites from the high-density urban conditions for the residents. Olmsted planned new parks for New York City, to become Central Park, and the Emerald Necklace for Boston. These park designs embodied GI characteristics of ecosystem services and human well-being, environmental rehabilitation and comprehensive planning (Eisenman, 2013).

The plans included the artificial development of nature-inspired open space areas rather than manicured parks in order to provide access to wild spaces for nearby urban residents. The park designs included the creation of natural-constructed spaces to provide various ecological functions; for example, Central Park had swamps dredged to create new lakes with treed-adjoining landscapes, and the Emerald Necklace included
artificial wetland areas to treat municipal sewage that found its way into the Boston harbour. The park designs were considered comprehensive, long term plans as they were placed in locations that were anticipated to have nearby substantial populations in the future. Today, dense urban population surrounds New York’s Central Park. The Emerald Necklace has created a greenway-linked network of natural and open spaces from downtown Boston into the rural hinterlands that existed in the 1800s but are now part of the overall metropolitan fabric of the city (Hodge and Gordon, 2014).

2.1.5.2 Early Efforts of Planning with Nature/Environmental Protection in Canada and the U.S.A.

Thomas Adams was commissioned by the Canadian government in 1909 to examine and make planning recommendations on many of the planning challenges that were facing rural areas at the time (Caldwell, 2011). Mr. Adams, amongst many other foundational premises concerning proper planning, made the association between the need for a healthy ecosystem in order to support healthy human settlement and economic activity. His final report to the Commission of Conservation addressed the significant environmental damage, primarily soil erosion that had been caused by settlement activities in various parts of the country over the previous 50 years. For southern Ontario the wholesale removal of the treed landscape after colonization, and poor agricultural production practices had significant impacts on the land and water. The green restoration plans that Adams recommended included tree planting which could now be referred to as GI.

In the U.S.A. during the first part of the 20th century, attention to degraded environmental conditions in Wisconsin was taking place through green conservation works. These efforts included the planting of riparian treed and naturalized buffers to waterways and new improved agricultural practices such as contour ploughing (Leopold, 1949).
In the early years of the 20th century within Ontario, a concerted effort of tree planting occurred in former treed areas that had been clear-cut following colonization and were then found not to be suitable for agricultural production. This effort was put in place by an early ecologist, the first provincial forester for the province, Edmund Zavitz (Bacher, 2011).

2.1.5.3 Early Regional Resource Management and Conservation Planning in Ontario

The importance of conservation planning became entrenched in the southern Ontario landscape during the 1940s with the creation of the Conservation Authorities Act (Shrubsole, 1996). This Act, formed out of work of the Guelph Conference in 1942, permitted municipalities within a given watershed to plan and work together in a collaborative governance and funding model on local water/land resource issues. The common focus here was primarily around water management issues: quality of surface/groundwater and flood control risks, assimilative capacity in waterways for sanitary sewage dilution, associated water recreational attributes. Conservation Authorities (CA) continue to exist today in areas of Ontario with significant development and land resource use activity, primarily in southern Ontario locations. CAs represent a valuable GI spatial management structure that approaches the landscape beyond municipal boundaries and extends to local ecological systems planning (Mitchell et al., 2014).

2.1.5.4 Late 20th Century Expressions of Nature/Natural Systems Design

Planning with a nature-human interaction focus was strengthened greatly with the pivotal publication of Design with Nature (McHarg, 1969). McHarg laid out a design process that emphasized the recognition of natural elements in the landscape, both as barriers to development as well as unique character landscapes. His planning methodology incorporated nature as a foundational design effort for communities. This
design approach with nature rather than over nature is a principle that is still used today with natural heritage system planning.

At the end of the 20th century, many other forms of planning with an environmental perspective became apparent. These planning forms were formulated as a reaction to some of the negative characteristics of planning that had enveloped many parts of North America - suburban sprawl and the homogenization of land use character across the landscape; natural area loss and ecosystem destruction. Other environmentally-focused planning forms that became well known at this time have various generic descriptors – they include conservation planning, landscape design, greenway planning, ecological systems planning, biophilic design, etc. (Arendt, 1994; Daniels, 2003; Forman, 2008; Newman, 2008; Beatley, 2011; Piedmont-Palladino, 2009; Randolph, 2012).

2.1.5.5 Planning with GI - Some Concluding Observations from the Literature

Over the past several decades, a greater appreciation of the impacts on the environment by human endeavour have become better known – these include the effects of ecosystem degradation, climate change impact, biodiversity loss. Greater understanding and acknowledgement of these circumstances has resulted in greater research efforts being directed to approaches in dealing with these challenges. The planner being the ultimate optimist - the idealist as suggested by Hodge and Gordon (2014) or the utopian thinker as Lapping (2006) suggests, can be a central player in teasing out commonalities between various discipline approaches to the topic of environmental protection, land conservation management, and new development/economic activity. As will be examined in future sections of this dissertation, the characteristics of GI planning that distinguish its use from the above-mentioned nature-inspired planning forms will be explained. GI planning moves beyond the simple identification of development constraint areas or areas for open space/recreation use, and instead moves into a recognition perspective regarding the untapped multiple function and co-beneficial attributes that ecological systems can provide.
2.1.6 A Conceptualization of GI Planning

2.1.6.1 Introduction

To assist in the conceptualization of a GI approach to strategic land use planning, a content analysis of generally accepted definitions of GI from the literature was conducted. These GI definitions have been included in Appendix B to be indicative of the range of thought respecting GI from the literature. This sampling is not exhaustive nor representative of the full gambit of thought regarding this subject; instead the definitions presented here are reflective of the general views that the dissertation author has accepted as being reasonable to the potential formulation of a GI planning framework useful to Ontario municipalities and planners.

The content analysis was useful to assist in the definition of basic characteristics of a GI planning framework. Generally, in considering the various meanings given, the second part of the GI phrase is well understood, i.e., Infrastructure is defined as the basic equipment, utilities and services that are essential for the development and operation of an organization (Zoning Trilogy, 2014). However, the first part of the GI phrase concerning Green has a wider application of defining words associated with it.

To assist in providing an understanding of the words associated with green in the GI concept, the definitions provided in Appendix B were subjected to an NVivo software discernment analysis. NVivo compiled the number of times words were used in all the definitions, and the following most used words resulted (top ten): natural, space, areas, support, lands, communities, conservation, benefits, network, provide.

To further understand the use of GI for planning purposes, common themes within a NVivo-generated word cloud and tree map framework were generated. From this exercise, the following general themes of GI were discerned:

1) Nature/natural spaces and areas are the primary common elements that carry across various definitions. These are the essential elements that comprise the concept.
2) The importance of benefits is identified – whether they are for human needs or natural system.

3) Interconnections and networking are important integral components of the term.

4) While some definitions emphasize functional elements such as conservation, ecological services, or people, other definitions emphasize land use components such as water, urban/rural areas, greenways, wetlands, parks or gardens.

5) Multifunctional considerations of elements are noted within land use categories such as floodway protection while also providing stormwater function, and biodiversity enhancement opportunities.

6) The potential of planning for conservation or for areas of development is noted.

This exercise is useful in acknowledging the substantive integral components of the GI term, and there is in fact, a good match to the common expressions and examples of GI use from the literature. The notions of nature/natural, interconnectiveness, multifunctionality of land activities and community benefits through planning are captured within the most commonly-used word definitional analysis.

The notion of infrastructure being applied to our ecosystems’ natural capital is a subliminal attempt to increase the profile of nature in an anthropocentrically-centred world. The commonly held notion of infrastructure from a government perspective usually rests with the pipes, wires, transport services, etc. that are required to meet the needs of new development or activity. To add the notion of the multiple G + S of nature to the required services of human community development is the point of positioning green with the word infrastructure.

The assessment of GI definitional meanings is intended to assist in the examination of the conceptual framework for GI planning. To continue with the examination of GI planning, this section contains three main topic areas. First a conceptual overview of the ecological services provided by nature, and the attributes it provides for human endeavour, health and wellness is provided. Second, various literature sources that provide support for the
notion of a GI planning framework are outlined. Finally, materials that formed the basis of the discussion for planning with GI elements in-the-field research phase of this dissertation are presented. This includes a graphic aerial photo illustration (see Figure 12) from a southern Ontario community perspective that clearly lays out what is meant by a GI planning system on the land.

2.1.6.2 Overview of GI Planning

This section examines the conceptualization of GI as a useful planning tool that can address human and natural system health and wellbeing needs together. For the purposes of this discussion, work by Tzoulas et al. (2007) is heavily relied upon. These authors provide a literature review which highlights aspects of the human dimensions of the GI conceptual framework. Their publication documents contributions of green spaces and nature to human health in accordance with various forms of study: interdisciplinary synthesis, epidemiological assessment, experimental survey analysis. The article also outlines models and theories of ecosystem and human health linkages from various research programs carried out from the 1990s through to 2005.

The Tzoulas et al. paper is a well-rounded overview of how the GI topic is integrated into the human condition, considering notions of human settlement development, individual and community health and wellness, and overall sustainability. Their article provides over 130 literature references that are tied to GI, human and ecological community health and wellbeing. Their paper lays the foundation for the importance of GI planning as a way to move forward; it begins with the premise that human communities are dependent upon a healthy natural system.

The Tzoulas et al. work investigates GI as a conceptual framework linking natural ecosystem elements to human needs, and it is outlined in Figure 7. This conceptual framework is aligned with elements contained within the Millennium Ecosystem Assessment (Corvalán et al., 2005). At its core, the conceptual framework outlines the natural ecosystem benefits of GI which includes mechanisms to provide for clean air,
water and land, and human benefits including employment and all aspects of health for psychological, physical and social wellbeing.

Figure 7 - Tzoulas et al.’s Conceptual Framework for GI Planning that Promotes Health and Wellness for Human and Natural Communities

Source: Tzoulas et al., 2007 (as adapted)

GI exists as a multifunctional constructed system within four principle components that are described in Figure 7 in Boxes labelled A to D. The first box as Box A includes the elements comprising GI. Box B outlines the ecosystem services and functions that are derived from the GI elements. Box C describes the health of the ecosystem, which in turn then provides for the health of human settlements as described in Box D on the right-hand side of the figure. It should be noted that the arrows in the Figure symbolise the interrelationships that exist between all of the components of the conceptual
framework. These multi-directional arrows are intended to emphasize the matrix functionality of the components included in the stylized diagram.

GI consists of a wide range of elements (see Figure 7, Box A), that in their most basic sense rest within nested systems of spaces and corridors that together comprise multi-functional systems within human settlement and natural community settings. The elements contained within the GI system, in an ideal circumstance, would all interact with one another, and through this process, system resiliency/sustainability would be encouraged. Natural and human-altered landscapes are contained within the open space, park and natural spaces (both water and land) that are contained within the GI elements. The elements can be adjusted by planning intervention to reinforce each other and to also provide land use efficiencies in the form of networks of corridors and spaces.

Ecosystem services and functions as outlined in Box B are provided by the GI system to humans. Another means to examine these is by way of the Millennium Ecosystem Assessment descriptors of ecosystem services in their provisioning, supporting, regulating, and cultural dimensions. This component comprising air, water and land are not independent but instead are embedded and interact within natural systems. The spatial and environmental settings within which GI exists provide outcomes that benefit humans as well as the natural environment. The generation of air, sequestration of gases (carbon, etc.), recycling of dead organic material are all contained within the ecosystem. The services provide both economic and non-economic value, and they need to provide beneficial ecosystem health on which all life is dependant (Corvalán et al., 2005).

Box C outlines indicators of ecosystem health, and resiliency of the system is dependent upon all components working in order to provide life. If any component falters, for example the provision of clean water or healthy soil structure, then impacts can occur to habitat/species diversity. Ecosystem resiliency is associated with how healthy the land, water and air are in the local setting. All of the ecosystem components are associated and dependent upon one another. Ecosystem functions create or maintain the
components contained within the Box unless they are negatively affected via human generated activities or natural catastrophes.

A greater understanding and valuation of ecosystem G + S is being made in recent times. Since the 1990s the transdisciplinary field of ecological economics has evolved to place a dollar and cents value on natural systems (Costanza R. et al., 1996). More recently, work in this area has spanned global to more local contexts. The UN has commissioned studies examining the global account of ecosystem service valuation and the human impact on planetary biodiversity loss (Kumar, 2010; United Nations Environment Program (UNEP), 2014). This work is now generally referenced as The Economics of Ecosystems and Biodiversity (TEEB). In the southern Ontario context, the Ontario MNR (2009) commissioned work to Estimating Ecosystem Services in Southern Ontario in the provision of clean air, water and soil.

The last Box – Box D, contains all the components that are associated with human life comprising the economic and social elements of sustainable human communities. Socio-economic health of human settlements is dependent upon a healthy GI system. It is in the planning of human activity that human health and wellness initiatives can be addressed. The provision of a healthy natural system on which human endeavour exists is a basic entity – for employment, housing, commercial, educational, institutional and recreation endeavour. Community capacity development occurs when people feel connected to a place, and then in turn they want to assist in making the community a better place in which to have a high quality of life. Attention to placement of GI is essential in order to maximize community benefit. A collaborative planning program with an engaged citizenry is a useful premise for community health and wellbeing.

The planning of the community will have lasting impacts on the physical health and mental health of the citizenry. Again, the placement of GI, as discovered through public health and medical health studies, is critical to promoting health and wellbeing. The Tzoulas et al. (2007) publication gives an extensive literature review on points that support these ideas.
Healthy ecosystems support human wellbeing via human socio-economic, community, individual physical and psychological dimensions. As well, human settlements need to support the ecosystems on which they are dependent in order to provide both short and long-term survival prospects. The proposition of GI planning comprising and supporting the health of human/natural communities is a basic strong sustainability notion as outlined by Cato (2009).

There is significant literature available on the health benefits of nature and its impact on the design of human communities. E. O. Wilson (1984) outlined that humans are inherently connected with nature rather than being apart from it. Wilson coined the word biophilia to be an expression that acknowledges this affinity humans have with other life forms, and this is now tied into biophilic community design. Several authors have studied the specific health effects of living with nature on mental and physical well-being (Ulrich, 1984; Kuo, 2010; Louv, 2011). The practice of forest bathing or known by the Japanese term shinrin-yoku is documented to have psychological health benefits (Park et al., 2010).

Several authors support the contention of Tzoulas et al. (2007) that GI can be used as a comprehensive land use planning approach. Kambites and Owen (2006) argue that a GI planning framework is useful to identify areas to be preserved or developed in accordance with the aspirations of the local community’s stakeholders. In addition, they identify various functions of GI and they tie these back to the human benefits derived. The following attributes are outlined:

- Exercise, sport, recreation and quiet contemplation;
- Educational and training resource;
- Community involvement in protection, creation, maintenance & use of green spaces;
- Green routes for people and wildlife (corridors);
- Provision of natural drainage and reduced risk of flooding;
- Improvements to water and air quality, local climate control & noise mitigation;
- Habitat provision;
- Landscape protection and enhancement for local residents and tourists;
- Protection of local natural heritage;
- Creation of a distinct community identity;
- Links between town and country;
- Encouragement of employers to locate in a pleasant area (Kambites and Owen, 2006; p. 487).
Davies et al. (2006) in their *Planning Guide for GI* lay out a detailed methodology to the comprehensive consideration of GI planning. They stress the fundamental importance of visioning alternative futures with the community’s stakeholders. These alternative scenarios with, using more or less, GI can set the basis for the preparation of development plans.

Lennon and Scott (2014) argue that a comprehensive GI planning approach should move beyond simple regulatory aspirations, and instead use GI planning as a strategic tool to promote area sustainability with wellness for both natural and human communities as the central focus. Their publication contains a literature review that lays out an extensive array of documents that support the various ecosystem services in accordance with the following categories: drainage management; habitat provision; ecological connectivity; landscape conservation; community sense of place; health, well-being and community development; recreational space, provision and access; sustainable transport, route provision and access; climate change mitigation and adaptation; and economic development. Finally, their paper presents various approaches to the use of GI that can be used to forge a better community. These mechanisms of GI include the following four considerations: 1) *a protective stance* – taking a proactive posture to identify and protect GI assets and functions; 2) *a defensive position* to implement measures such as establishing buffers to key natural assets, or requiring environmental impact assessments with development proposals; 3) *an offensive position* such as taking restorative measures to improve or restore negatively impacted GI assets and functions; and finally; 4) *an opportunistic stance*, whereby recognition can be given to the potential for comparatively non-contributing landscape elements to be managed or structured differently, e.g., enabling new drainage schemes, agricultural soil protection and greenways.

Allen (2012) and Chicago Wilderness (n.d.) advocate for the use of a comprehensive GI planning system to promote diverse area cohesion. These papers argue that GI systems can be provided in various urban, peri-urban or rural contexts. They argue that one of the best approaches to conduct research and look at bigger picture sustainability notions is
to look at a GI planning exercise that uses watershed boundaries rather than municipal boundaries. The linked nature of landscapes fits well within a rural planning area. It is well recognized in the planning literature that a healthy rural community has a strong territorial affiliation with place-based neighbours and collaborators at the local scene - Ebenezer Howard’s rural cultural landscapes (Lapping, 2006) and rural-to-urban transect planning as denoted by Frank and Reiss (2014). Rural planning around a GI-connected systems perspective may have great utility in furthering or establishing a linked and nested systems framework for a healthy, sustainable community.

Several evaluation reports and papers have been prepared that outline the effectiveness of natural and human community systems constructed around a comprehensive GI planning approach. Lennon and Scott’s paper (2014) has a section examining the use of GI planning in Ireland. They outline case studies where GI planning is used in national, regional and local municipal contexts. Their paper categorizes the use of GI planning in areas that move from ideas of theoretical possibilities, to thematic plans and practical implementation examples. Their paper thoroughly examines and explains the unique challenges of planning for GI in rural settings.

Young, Zanders, Lieberknecht, & Fassman-Beck (2014) provide a typology of GI as a means to organize and potentially streamline the implementation of a GI planning approach for urban areas. Their proposed methodology for assessing the implementation of GI plans incorporates several components directed at the social-environmental systems in which GI functions. Within the human community system, there are considerations associated with the setting, whether a region or local municipality context and governance structure; internal and external drivers for change; GI elements and their scale. On the ecosystem community side of things, the environmental setting is considered with drivers for action. Within a short-term context, a GI plan may be derived as a reaction to a catastrophic event; for a longer-term perspective, a GI plan may be formulated as a reaction to gradual changes in climate change impacts or biodiversity loss, and as a tool to prepare a preferred future vision for the community that can be shared with others external to the local area.
Hansen and Pauleit (2014) outline an evaluative conceptual framework to define GI for use in urban settings. Their paper categories GI with various principles of green structure: integration of grey/green infrastructure forms; multi-functionality of various sustainability elements in green spaces; multi-scale approaches with an emphasis on integrative working-together green elements; green governance functionality concerning a long term strategic emphasis but with short term flexibility to be adaptive/resilient to change, and with social inclusion to be inclusive and representative of an implementation agenda.

The foregoing publications outlining the virtues of a GI planning system are a sampling of the literature that is available on the subject. As a summary note here, much of the literature comes from the European context and has an urban orientation. There are opportunities in considering this material to apply notions of GI use to the Canadian context, and more particularly to the concept of a rural planning system for GI elements within rural Ontario communities.

2.1.6.3 A Systems Design Use of GI in Community Planning

From the literature, there is a strong argument to be made that GI can serve as a useful foundation for community planning. This foundation can be derived by recognizing and embedding GI into our human settlement and development endeavours. To accomplish this, GI must be thought of as a system that should be considered and implemented in our human communities in a seamless manner; however, it is also imperative to ensure that a GI planning structure is positioned to support the traditional grey infrastructural works that go into the pipes, wires and structures that make up our human settled areas.

To give substance to the proposition raised here, significant reliance is given to the writings by Donella Meadows (2008) and Rouse and Bunster-Ossa (2013) on this subject. GI, as described by the literature outlined here, has all of the ingredients of being a system as defined by Meadows. She has defined a system as “an interconnected set of elements that is coherently organized in a way that achieves something” and goes on to
indicate it “must consist of three kinds of things: elements, interconnections, and a function or purpose” (p. 3). This description is appropriately reflective of the ecological services of the Millennium Ecosystem Assessment (see Figure 3), the elements of GI (see Figure 2), and the interconnections of ecological services to human wellbeing (see Figure 7). The consideration of GI and its integration with grey infrastructure systems must acknowledge many of the other descriptors that Meadows outlines as being important - these include the following: subsystems, nested systems, interconnections, embedded material stocks, feedback loops and leverage points. For the purposes of the discussion here, Rouse and Bunster-Ossa (2013) provide a concise overview as to how “GI lends itself to an integrated, systems-thinking approach” (p. 14). They describe how GI with its various separate structures, functions, and processes intersect in the landscape to perform discrete but also combined multiple impacts:

. . . green infrastructure then is a system that comprises constituent parts, e.g., trees, soil, and constructed infrastructure; that is organized into a pattern, i.e., the landscape; and that performs functions, e.g., stormwater management and the removal of air and water pollutants that have a purpose, as in the benefits described above. Moreover, green infrastructure is part of a hierarchy: it incorporates multiple subsystems, e.g., hydrology, vegetation, and movement which work within differing geographic scale subsystems, i.e., site, neighbourhood, community, region, and which again interact with other systems such as transportation, economy, and governance (p. 15).

Rouse and Bunster-Ossa go on to provide a good overview in describing how green and grey infrastructure need to work together to be effective and efficient in laying out a foundational planning framework for communities. If grey and green infrastructure systems are functioning together, they may compete for resources or they can co-operate. Systems thinking can identify opportunities and barriers. Green and grey systems produce assets that produce feedback loops that can either have positive or negative impacts on higher sub-system levels. It is important again to consider that green and grey systems are planned together to meet at a leverage point that can assist in promoting overall community prosperity and durability. This in turn will then promote
the achievement of land use planning objectives associated with public health, community sustainability and resilience.

2.2 Summary

This chapter has focused on subjects associated with planning and GI. It began with a brief overview of what is meant by GI as used in this dissertation. The text then provided an overview of the role of the land use planner in guiding a community through change that is all around us — whether it is in fast growing urban areas, or in rural areas attempting to be resilient to changing circumstances.

The chapter went on to highlight the specific orientation and perspectives of a professional planner in Canada discussing the professional organization’s use of a ‘code of conduct’ as a central motivation to action. Attention was then given to specific overarching topics of interest to community planners involving public/individual health and wellness, community sustainability and resilience in responding to change circumstances. As this dissertation deals with rural community conditions, the unique multiple roles and tasks of the rural land use planner were also discussed.

The bulk of the chapter then explored the use of GI as it is used in various jurisdictions around the world. A specific topic interest was directed to planning frameworks that network the use of GI in communities, regions and countries. A general overview of the benefits of GI use was presented. The chapter concluded with some thoughts on how GI is or could be used in a planning framework to drive progressive circumstances for human and as well natural communities. The foregoing discussion lays the groundwork for the remaining portions of this paper. Chapter 3 describes the land use circumstances that are found in Ontario, and more particularly rural Ontario which is the case study area discussed in the research method that follows in Chapter 4.
Chapter 3 - Planning Context in Rural Ontario

3.1 Introduction

This chapter provides a background context to land use planning in Ontario. The primary focus is on the governance structure in the Province that permits land use planning to happen. The chapter builds on earlier material associated with the function of the land use planner, and the role more specifically of the rural planner.

The chapter’s main focus is associated with public interest matters that assist a municipality to be designed and then developed as a resilient, sustainable community. As the premise of GI planning is associated with giving greater insight and understanding of the value of nature for community development, a focus of the material in this chapter will be directed to environmental issues within the Province.

The first section in the following pages begins with an outline of the general planning system in the Province. It then goes into a discussion on some of the specific circumstances of the southern Ontario landscape that are germane to the discussion and examination of GI elements within this geographic context. Some of the significant interests associated with rural community leaders are presented. The chapter goes on in another section to describe some of the environmental changes that are taking place on the land, water and air use of the area. It concludes with some recent actions taken by the government to address environmental issues.

The material highlighted in this chapter has been chosen to reflect issues that the dissertation author believes important. The decision-making process involved in selecting materials for inclusion in this chapter has been a daunting task. The topic of land use planning is quite open with many aspects of community life covered under aspects of economic development, community social development, environmental protection effort and hazard area definition. A concerted effort has been made here to expose my personal biases upfront before this dissertation writeup moves into the final chapters concerning the topic of GI planning (Creswell, 2013). As can be expected from reading earlier sections of this paper, a directed focus on environmental matters is provided.
3.2 Planning Governance System in Ontario

The Province has the statutory right to set out legislation that directs the land use planning effort in Ontario; this has been discussed in brief within section 2.1.2 of the Literature Review, Chapter 2. There are 444 municipalities in the entire Province, with the majority of these local jurisdictions working in the southern Ontario landscape area which will be described below. Municipalities are the principal organization that directs land use planning within their areas through the use of land use policy guidance documents referred to as Official Plans. The planning work of municipalities is influenced by a whole host of influence stakeholders. These include the federal government through various pieces of legislation that touch on land use matters, e.g., fisheries, transportation, public works, climate change, environmental protection. Municipal politicians in deciding on an Official Plan for their community are guided in their actions by the stakeholders that hold influence in their area: land owners, businesses, civil associations and volunteer groups (Hodge and Gordon, 2014).

The Province’s governance system concerning planning is set out in the Planning Act, R.S.O. 1990 Chapter 13 (Ontario Government, 2017). This Act succinctly lays out the provincial interests in planning in Section 2 of the Act, and they are listed as follows:

(a) the protection of ecological systems, including natural areas, features and functions;
(b) the protection of the agricultural resources of the Province;
(c) the conservation and management of natural resources and the mineral resource base;
(d) the conservation of features of significant architectural, cultural, historical, archaeological or scientific interest;
(e) the supply, efficient use and conservation of energy and water;
(f) the adequate provision and efficient use of communication, transportation, sewage and water services and waste management systems;
(g) the minimization of waste;
(h) the orderly development of safe and healthy communities; . . .
(i) the adequate provision and distribution of educational, health, social, cultural and recreational facilities;

(j) the adequate provision of a full range of housing, including affordable housing;

(k) the adequate provision of employment opportunities;

(l) the protection of the financial and economic well-being of the Province and its municipalities;

(m) the co-ordination of planning activities of public bodies;

(n) the resolution of planning conflicts involving public and private interests;

(o) the protection of public health and safety;

(p) the appropriate location of growth and development;

(q) the promotion of development that is designed to be sustainable, to support public transit and to be oriented to pedestrians.

Another key planning tool provided to municipalities is the Provincial Policy Statement (Ontario MMAH, 2014). This document forms the overall policy basis on which municipal Official Plans are created across the Province. The Provincial Policy document lays out public interest direction associated with three key aspects: building strong communities; wise use of resources; and protection of public health and safety. Planners working in municipalities across the Province implement actions that are to be consistent with provincial direction, and also in consideration of their code of professional practice obligations as noted in Appendix A.
3.3 The Southern Ontario Geographic Area

The general area that is the topic of discussion and research in this dissertation is illustrated in Figure 8.

![Southern Ontario Case Study Area](image)

**Figure 8 - Southern Ontario Case Study Area**

*Source: Google Maps*

The southern Ontario land base is an intensively used part of the world due to its rich resource base for economic activity and within a moderate climatic zone for human endeavour. With these favourable human settlement circumstances, the area has been extensively used since colonialization days (late 1700s), and now is reflective of a conflicted, contested land use base with many activities. Activities that are found here include: urban development, agricultural production, waterfront recreational uses, and servicing systems that criss-cross the land base and enable human community development to happen, i.e., piped water, electrical and communication services, transport modes provision.

To step back a bit on these current land use circumstances, some of the pertinent foundational structures for the region should be outlined. The area is characterised by
physiographic features that have been created by actions of glaciers that traversed the area millions of years ago (Chapman and Putnam, 1972). There are three characteristic regions that remain as surface glacio-fluvial features within an overall low relief landscape profile. The first is the bedrock-scraped areas of the Canadian Shield which are found to the north of a line that would be drawn roughly between the Barrie area eastward to Ottawa (see Figure 8 for locations of these cities). The second physiographic region are the land areas associated with the major river and lake systems within southern Ontario. These areas are relatively flat, and the lands have been conducive for agricultural/lumbering production activity initially after colonization and then more recently for urban development. The last significant physiographic area found in the region are the drumlin and esker remnant glacial features that comprise areas away from the Great Lakes in the south and south-central portions of the province.

The land base south of the Canadian Shield is prized for its agricultural production capability. The rich soil base and long growing season capability attracted colonial agricultural settlers to the area beginning in the 1700s (Neptis, 2003). When compared to the rest of Canada, this area provides a scarce, high productivity land base for agricultural products. The soils for agricultural production have few limitations for field crop production as noted by the Canadian Soil Classification (Agriculture and Agri-food Canada, 1998); lands within the south west, south central and south east areas of the region are used extensively for this agricultural use activity. The Canadian Shield geological formation comprised of rock and situated in the north central area of southern Ontario is not conducive for agricultural production or large human settlement.

In terms of ecological land classification, southern Ontario is comprised of two ecozone areas as illustrated in Figure 9 (Ontario MNR, 2009). The north central area falls within the Ontario Shield Ecozone, more particularly described as Ecoregion 5E Georgian Bay. Further to the south is the Mixedwood Plains Ecozone; this area is comprised of Ecoregions Lake Simcoe-Rideau (6E) and Lake Erie-Lake Ontario (7E). The ecoregions are important components of the land use planning system in Ontario, being described
within the PPS and having prescriptive policies associated with protecting natural features with differing land use restrictions for the different Ecozone regions.

Note: Numbering nomenclature in figure is associated to classification of eco-district sub-areas with unique ecosystem characteristics.

Figure 9 - Ecoregions of Southern Ontario

Source: Ontario MNR, 2009

In terms of weather classifications for this part of the world, two designations are applicable from the Köppen World Classification: Dfb - Warm Summer Humid Continental Climate for the majority of southern Ontario; and Dfc - Hot Summer Humid Continental in the extreme southwest part of the province in the Windsor area (Kottek et al., 2006). The weather is the area is influenced by its mid-continent general location, as well as the proximity of the large water bodies in the Great Lakes. These weather classifications are quite tolerable for the human condition.

Against this backdrop of favourable conditions of physiography, soils, weather, and water availability, the area has been subject to significant development pressure over the past
several centuries. With this development has come the loss of significant natural areas through measures such as the clear-cutting of forest cover and draining of wetland areas. Only remnant natural areas from pre-colonialization times are present, especially in the south west and south-central portions of the region.

3.4 General Issues of Interest to Rural Ontario Municipal Leaders

Dr. Wayne Caldwell, University of Guelph Rural Planning professor recently led a workshop session in conjunction with the Queen’s University Business School to define research topic areas that were of pressing interest to rural municipal leaders. The results (2010) were published by the Ontario Rural Council (now the Ontario Rural Institute) and entitled Research Priorities. The range of key planning issues that were outlined were classified into two category types, pressing today, and emerging tomorrow. The pressing today issues in alphabetical order are the following: Agriculture/farm revitalization; Broadband; Economic diversification; Efficient, cooperative government; Employment opportunities; Environmental sustainability; Financial sustainability at a community level; Healthcare; Infrastructure; Regional strategies and collaboration; Skills training/education/literacy; Sustainable economic development; Transportation improvement; and Youth retention. In terms of emerging tomorrow issues the following were identified: Aboriginal issues; Access to capital for small business; Adequate services in rural areas with declining populations; Aging populations; Climate change; Immigration - attracting new immigrants and labour migration; Poverty; Rising energy price and the impact on rural communities; Safe drinking water (a specific priority in the North); and Women’s issues.

The Rural Ontario Institute (2015) has documented many socio-economic challenges of rural places through their Focus on Rural census data profiles. The challenges noted include static or declining populations in many rural places coupled with out-migration of younger populations but the retention of older residents.
3.5 Environmental Challenges to the Southern Ontario Land Base

The following selection of environmental challenges is intended to illustrate areas of interest that a GI planning system could address. The listing here is not intended to be comprehensive in extent but is intended more to be illustrative of the issues present.

The UN has taken note of the development challenges and competing land use interests in the southern Ontario landscape. In a recent report it noted that the Toronto centred region is one of the top ten areas of the world with the highest urban sprawl attributed to “permissive land use planning and the growth of affluent households” (United Nations Human Settlements Programme, 2009; p. 28).

The Biodiversity Council of Ontario has examined the ecological footprint of the Province to better assess the pressures that development may have on the Province’s need for biodiversity protection. The assessment was completed by the Global Footprint Network and compared Ontario’s footprint comprising its use of land and water resources for settlement, forestry, cropland, grazing, and fishing to other places in the world (Stechbart, 2011). The report gives the Province a poor rating relative to many other areas - Ontario has a footprint of just over eight global hectares per person in comparison to a Canadian average of 7.1, and a global average of 2.1. The report also indicates the Province generates a large carbon footprint in comparison to other locations. Much of the negative environmental impacts are associated with the lands of southern Ontario.

Environment Canada has reported that many watersheds within the Great Lake Mixedwood Plains ecozone of southern Ontario do not have sufficient habitat areas to maintain biodiversity thresholds (Environment Canada & Canadian Wildlife Service, 2013). Conservation Ontario (2014) publishes water quality reports and natural resource feature report cards for many Conservation Authority watersheds/subwatersheds in southern Ontario, and many of these areas have significant environmental challenges,
i.e., surface water quality issues, issues with minimum levels of forest cover and other natural areas.

Filson (2011) has reported on the environmental impacts of intensive agricultural operations within southern Ontario. His research indicates that biodiversity loss is a significant land use issue in the area. According to Agriculture and Agri-Food Canada over the past quarter century of monitoring, some aspects of the land base in agricultural southern Ontario have improved such as the reduction in soil erosion, but other environmental aspects have gotten worse; these impacts include pesticide residuals, loss of wildlife habitat and biodiversity richness (Eilers, 2011).

In his annual report to the Ontario legislature (1999), the Environmental Commissioner (ECO) has reported that the southern Ontario landscape is ecologically damaged by its fragmented natural areas landscape characterization, primarily due to discontinuous natural heritage feature nodes and linkages. This circumstance greatly diminishes the ecological integrity and resiliency of the general ecosystem structure. The need for a connected natural heritage system is an accepted landscape ecological practice (Forman, 1995; Collinge, 2009; Allen, 2012).

In a subsequent year (2012), the ECO has documented the significant environmental challenges that are in play for assisting in planning for biodiversity protection, climate change adaptation and mitigation as well as improving natural heritage systems planning in the heavily fragmented landscape of southern Ontario. In addition, he also identified the need to clean-up former industrially-used sites – referred to as brownfields as something that should be prioritized in the province. These contaminated lands, some with significant land and water issues, and some others with only minor problems can be cleaned-up and potentially used for new development or for public open space purposes. These sites are found in both urban and rural locations of the Province.
3.6 Indicators at the Provincial Level Whereby GI Planning May be Considered in Ontario

There are several indicators at play in Ontario that point towards conditions that may enable a GI planning structure to be considered. The following discussion addresses these factors.

The land use planning system in the Province has gradually moved into a more environmentally-conscious perspective over the past half century (ECO, 1999). This gradual movement has been in line with heightened environmental concerns from the public and has manifested itself in terms of the creation of new legislation in Ontario. The following pieces of legislation are indicative of matters associated with the environment and also with GI elements: Niagara Escarpment Planning and Protection Act 1973, and subsequently amended from time to time (most recently 2012); Oak Ridges Moraine Conservation Plan 2002; Clean Water Act and associated Source Water Protection Planning program 2006; Species at Risk Act 2007; Lake Simcoe Protection Act 2008; Water Opportunities and Water Conservation Act 2010; Great Lakes Protection Act 2015; Climate Change Mitigation and Low Carbon Economy Act 2016 (Ontario Government, 2016).

In addition to pieces of legislation that are available, there are also a host of other initiatives that deal with various protections and initiatives dealing with specific elements of the environment – these include measures for biodiversity protection by the Ontario Biodiversity Council (2011) and the 50 million tree planting initiative for the province. The government has also made available several planning guideline documents that assist in defining areas where development should not happen – natural hazard areas, (OMNRF, 2013), and also areas to be conserved for use as natural heritage ecological systems protection (OMNRF, 2010).

The current planning framework for infrastructure provision in Ontario is provided for by the PPS (OMMAH, 2014). In the most recent update to the Policy Statement,
consideration for GI has been made in relation principally with stormwater management systems.  

A provincial initiative that is closely aligned with GI principles is the Greenbelt for the Greater Golden Horseshoe, the area that encircles the Toronto-Hamilton urban region (OMMAH, 2005). The primary intent of this Greenbelt is to preserve the ecological system attributes of the landscape, and to permit agricultural production to continue in close proximity to the metropolitan area. The notions of inter-connectivity, multi-functionalism and open landscapes are attributes of the Greenbelt that are reflective of a GI planning approach.

Another large-scale GI element proposition that has been advocated in the southern Ontario landscape comes from a civil society organization, the Carolinian Canada Coalition (Carolinian Canada, 2013). This environmental non-governmental organization (NGO), has a primary goal of furthering the biodiversity protection of the Carolinian Life zone in southwest Ontario. One mechanism to do this is an interconnected natural heritage system devised and entitled the Big Picture. This project formulated in 2002 sets out an aspirational objective to give guidance to organizations working in southwest Ontario to create an interconnected system of natural areas that can improve the prospects of biodiversity in this severely impacted land use area.

The southern Ontario landscape also has some planning history in the presence of Conservation Authorities that look at water and natural resource conservation activities at a watershed level. These organizations, many of which have been around since the 1940s, have many attributes of a GI planning construct; namely they look at water as an environmental resource as well as a natural resource (Shrubsole, 1996); their jurisdictional frame of reference are ecological watershed units rather than political units only; they are positioned to reflect local interests via a legislated provincial-municipal

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4 The 2014 Ontario PPS encourages the use of GI with the provision of traditional grey infrastructure. GI is defined as: natural and human-made elements that provide ecological and hydrological functions and processes. GI 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.
partnership basis; they reflect comprehensive and collaborative interests to local communities.

Caldwell, in conjunction with various colleagues has examined and reported on the environmental conditions of the southern Ontario landscape during the past several decades (Caldwell, 1994; Caldwell, Black & Ball, 2008; Caldwell & Landman, 2013). These publications taken together point towards an increasing awareness and understanding of the pressing need for stewardship of the land, air and water resources in this region.

Up until the 1980s, provincial ministries did not articulate their long-term aspirations (Mitchell et al., 2014) or stated differently, provincial ministers and ministries have now begun to articulate their long-term planning objectives in many environmental and resource management spheres. An example of expressing the governments intent with respect to environmental and resource management actions are in the form of mandate letters. A mandate letter for the Ontario Minister of Agriculture, Food and Rural Affairs in 2016 directed the Minister to consider a variety of matters dealing with the environment; these included the development of an agricultural soil conservation strategy, and the implementation of a Great Lakes Agricultural Stewardship Initiative to reduce nutrients loading into receiving waterbodies.

Civil society organizations involved with environmental initiatives in Ontario have banded together under the banner of the Green Infrastructure Ontario Coalition (2012). This organization has been actively engaged in promoting the environmental, social, economic and health benefits of GI for Ontario.

3.7 Summary

The forgoing chapter has laid out the general conditions concerning land use planning matters that are relevant today in the province of Ontario, and more particularly, the research case study area which lies within the southern portion of the Province. The chapter has focused on the formal governance functions that occur with planning and
municipalities in the area. It is acknowledged that while the land use planner is an important cog in the wheel for community development and enhancement, there are many planner leaders that operate in a community. As we will see in the research findings from survey respondents and interview KI in Chapter 5, many different forms of plans can exist within a community. These plans can be formulated by non-profit organizations and interested citizens that have concerns about the future well-being of their communities. Plans can deal with specific subject matters – sustainability plans, food plans, active transportation plans, climate change adaptation/mitigation plans, Transition Town Plans (Hopkins, 2008), etc. All of these types of non-official plans are important as they can have significant impact and relevancy at a community level. Plans of this type should also be considered under the ambient notion of GI planning.

The next chapter will lay out the GI planning research framework that was applied to the southern Ontario case study area.
Chapter 4 – Research Methods

4.1 Introduction

This chapter describes the mixed methods used to address the goal and objectives of testing the application and potential utility of a GI planning system framework for use in rural Ontario communities. The chapter begins with a general discussion on the interpretative framework for conducting the qualitative research. A detailed overview is provided to ensure the research findings have been adequately tested. Mechanisms to reduce subjective bias and provide objective analysis and conclusions are outlined.

4.2 Research Conceptualization

In considering various interpretive frameworks to conduct the research, a pragmatism perspective, as outlined in Qualitative Research and Research Design (Creswell, 2013), has been selected. This approach is most aligned with a general philosophical approach to transformation; this contains the following attributes:

- Ontological Belief – Reality is what is useful, practical, and what works.
- Epistemological Belief – Reality is known through using many research tools that reflect objective as well as subjective evidence.
- Axiological Belief – Values are discussed because of the way that knowledge reflects both the researcher’s and participants’ views.
- Methodological Belief – The research process involves both quantitative and qualitative approaches to data collection and analysis.\(^5\)

The researcher’s ontological perspective involves a critical assessment of the existing land use planning system in a particular geography with research leading to advocacy in planning to work with – not against nature. There are challenges in the existing system that need to be addressed to enhance the liveability/resilience of rural places. The

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research environs consist of work with planners working in municipalities who complete their tasks within a regulatory system formulated by the Province of Ontario. A language embedded within a professional code of conduct for practicing planners is included within the research framework.

Cato’s (2009) strong sustainability perspective on community design sets the research lens for the work in this dissertation. With this perspective, there is an acknowledgement that the environment sets the basis for everything else in our existence – life, health, and human progress. A GI planning framework can serve as a strong foundational design tool for rural communities; this notion will be tested via the research conducted here in Ontario.

Gunderson and Holling’s (2002) Panarchy: Understanding Transformation in Human and Natural Systems provide a foundation in thought for the research. It is my perspective, grounded in long-term exposure to the planning system in Ontario that a new GI planning framework would need to evolve within the sophisticated planning system that is in place for the Province. The GI planning framework as described in the literature is quite messy and complicated; GI can involve many elemental components; these provide many synergistic functions and services and are inter-related with various feedback loops.

The epistemological foundation of thought concerning GI planning is tested through the research methods. The mixed methods approach to research is intended to draw out commentary from land use planning practitioners on a variety of aspects concerning the GI topic. The topics include specific illustrations of GI use as employed in the field, and consideration of alternative formations of thought concerning a systems planning paradigm. A critical analysis of information is completed at all stages of the investigation – in pre-and post testing phases of qualitative data assemblage. Information is compiled in an iterative step process whereby assumptions or beliefs can be tested in subsequent steps.
In terms of *axiological beliefs*, a basic organizing premise for the research is that individuals involved in the research need to understand how land use planning is conducted within Ontario. In terms of considering the values of research participants, this is done a number of ways as outlined in the following points.

For participants in the land use planning field, their membership within the professional association of planning in Ontario – the Ontario Professional Planners Institute (OPPI) – was set as a determining piece for involvement. The researcher could rely on the Institute’s *Code of Professional Practice* as a baseline of values for the individual planner and their interest in bettering the lives of people.

In terms of contacting and involving individuals who work within land use government and non-government organizations in the Province, the values of the individuals were by surrogate association to the mandates and principles of each of their respective administrations. The identification of organizations that were well regarded within the planning spheres of influence were often provided through the Survey or KI. The ‘snowballing technique’ of assembling credible sources was carried out in a sequential pattern starting with community leaders in the Province and then working through the various research steps, i.e., derive contact, do background check on legitimacy of organization, do background verification of potential individual potential interest and involvement, conduct interview.

In terms of positioning myself as the researcher, I have trained and then worked within a Western World planning tradition over the past 40 years of my life. My working life has involved planning at both the municipal and provincial levels of government. I am a Registered Professional Planner and currently continue to practice planning in a semi-retired classification with the main planning associations in the country - the CIP, and province - the OPPI.

The *methodological belief* for compiling accurate and usable research is outlined in the next section. The research is a mixed method case study approach to inquiry, largely
based on Yin (2012). The overall intent of the research is to derive new knowledge on the topic of GI and its use in a planning framework for use in southern Ontario. Triangulation was employed to test the applicability, relevance and utility of a GI planning system in the Ontario context.

4.2.1 Research Methods

A mixed method, primary qualitative process has been used to examine the use of GI, and its potential utilization within planning for rural communities in southern Ontario (Yin, 2012). The case study method of inquiry was used to examine the use of the term, GI, and how it can be used to inform the land use planning system. A variety of qualitative assessment methods were used – these include document review, surveys, KI interviews, focus group and research review meeting discussions with various data analyses conducted along the way. Some quantitative documentation was provided in the initial GI Use Survey work as well as metrics defining specific socio-economic characteristics and circumstances of various test communities within rural Ontario. Quantified data is provided for organizations working in land use matters of the Province.

Yin provides a useful protocol for case study work to provide explanatory, exploratory and descriptive dimensions while maintaining reliability and validity. The quality of the case study work was measured through a methodical process involving several stages of research and also using various research instruments. The goal was to devise a research process that had accurate and complete study construction, good data assembly methods, external validity checks by examining multiple situations, proper data collection, and research protocols for data reliability. The research was conducted in several stages with external reviewers providing comment and validation along the way. The various tests used for accuracy, reliability and validity will be described further in sub-sections 4.2.1.1 to 4.2.1.9.

In applying Yin’s case study method to the research, the mechanics of individual research instruments moved from a broad to narrowing perspective. The broad first step in the
research was to examine the current use of GI and planning systems in Ontario today. The applicability of the general theories of GI planning research as outlined in the literature and comparing/contrastng these to the specific land use planning conditions found in Ontario were tested. Figure 10 provides a research methods flow chart.

Figure 10 - Research Method
4.2.1.1. Step One – GI Literature Review

The first step was the literature review. As noted in Chapter 2, this chapter covers the use of individual GI elements and the use of the GI planning systems approach in various countries of the world. The literature review also included a jurisdictional scan of its use in Ontario, and other parts of Canada. The review of the literature laid the groundwork for the next step in the study process involving a brief GI Use Survey that was distributed to rural community leaders across Ontario.

4.2.1.2 Step Two – GI Use Survey in Ontario Communities

The survey for this step and described below was a component of another study entitled Green Infrastructure for Ontario's Rural Communities: Using Nature for Community Economic Development and Resilience (Caldwell, Kraehling, Dubyna and Pauk, 2016). This work was completed under a funding program provided by the University of Guelph-Ontario Ministry of Food, Agriculture and Rural Affairs (OMAFRA) Research Partnership. The GI Use Survey reported in this research paper (see Appendix C) was prepared by me in conjunction with other colleagues working on the project at the University of Guelph. The primary intent of the Survey was to identify GI mechanisms that are being used in Ontario today to assist rural communities in their planning endeavours. The Survey included eight themes that were derived by encapsulating the over-50 possible GI elements (see Figure 2 on page 13) that the literature had identified, and that survey respondents in Ontario might outline.

The GI Use Survey was sent to over 700 rural community leaders in the planning, economic development, public health, natural resource conservation and first nation community settings. The Survey, distributed via an on-line internet SurveyMonkey™ tool,

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6 Funds from this research program were of assistance to the researcher in partially funding his degree program and providing substantive background information that was valuable in the preparation of this dissertation.
was sent to officials whose names and contact information were readily available from various public information sources.

The Survey, entitled *Gi for Ontario’s Rural Communities*, consisted of a semi-structured questionnaire with seven questions. The Survey preamble outlined a general definition of GI and provided the potential respondent with an opportunity to consider ways that GI can benefit rural areas of the Province, i.e., identify “how the G + S of nature can be used in a sustainable fashion to create economic and employment opportunities, provide cost savings to rural municipalities, and thereby enhance community resilience and health” (see Survey instrument in Appendix C). To assist Survey respondents in directing responses to interesting programs, policies, or uses of GI, a question was outlined that provided a non-scripted word entry option under the following general headings: Community Liveability (including environmental aesthetics, health and well-being, community cohesion, sense of place); Culture, Education, Recreation, and Tourism; Local Food Production, Soil Quality Enhancement; Biodiversity, Habitat and Species Protection; Climate Change Adaptation and Mitigation; Water and Stormwater Management; Woodlands, Woodlots, and Street Trees; Other (including vacant lands and/or recycled lands, landfills, brownfields).

Another key question in the GI Use Survey requested the respondent to self-identify any innovative GI examples they felt should be shared with others in the Province. The other remaining questions in the Survey dealt with classification, possible continuing research interest, and administrative contact detail information.

The Survey was distributed through a mass email blast directed to municipalities (441 contacted, predominantly rural), public health authorities (35), conservation authorities (36), community future development corporations (60) and first nation communities (128). The Survey was distributed in May 2015 after being pre-tested with several research colleagues who did not participate in the final Survey.
The focus of the GI Use Survey was on the economic gain potentialities of using GI in rural places – these could be by way of cost savings in operation, or as a basis for new economic activity in the community. In addition, as the Survey was formatted as a semi-structured questionnaire format, other attributes of GI involving environmental enhancements and community social capacity building techniques could be offered by respondents in text. The Survey results can be reviewed in the final report (Caldwell et al., 2016).

The researcher analyzed the Survey responses that were associated with municipality operations. Over 100 Survey responses were analyzed using NVivo software to discern interesting uses of GI, and to look for evidence of a systematic use of GI within a local municipal planning structure. The results of the GI Use Survey analysis are discussed further in Chapter 5, Results, Analysis and Synthesis. There was sufficient evidence of interest in GI mechanisms in Ontario that this researcher had confidence that this subject matter could be explored further.

4.2.1.3 Step Three – GI Systems Planning Framework (Draft)

The next step in the research was the development of a conceptual framework of GI planning that could be tested in-the-field. The draft framework was developed using a number of techniques: the researcher’s reflections on the literature contained in Chapter 2 and the general planning conditions present in Ontario as described in Chapter 3; a NVivo software generated common traits categorization of words used in various literature definitions describing GI (see Appendix B for listed definitions); and an analysis of the GI Use Survey results of rural leaders commenting on GI in Ontario. In utilizing these methods, the framework was developed through several iterations; the final depiction is provided in Figure 11.
The Systems Planning Framework (Draft) integrates grey infrastructure with GI into a network for use in comprehensive planning in rural areas. In formulating the Framework, it was necessary to have several components that would be useful for rural community planning:

1) It needed to be simple enough in its extent and illustration of components to be understood by most individuals in charge of planning or leading proposed change in a community. To accomplish this, the inclusion of common grey infrastructure elements that are the ‘bricks and mortar’ components to a community’s structure were outlined prominently in the left half of the figure. GI components were added to illustrate the importance to a community’s structure of nature/natural systems on the right hand of the diagram;

2) The grey and green arrows on the diagram were intended to provide the context of potential integration of the various grey and green infrastructure components. This
portrays the synergies these infrastructures can have together; these infrastructure forms need to work in tandem to form a strong overall community infrastructure base;

3) The selection of particular GI components on Figure 11 illustrates both some of the land use elements of GI, (i.e., land, water, trees) but also some key GI functions as well, (i.e., climate change impact amelioration, biodiversity protection). The selection of the wording and number of components here was completed with a strategic intent – the GI words were chosen to think of the here and now aspects of life, but also some long-term community sustainability aspirations. The GI components in the diagram numbered slightly more than the grey infrastructure components to be illustrative of the importance of green aspects to life in a community.

The GI Systems Planning Framework (Draft) was formulated considering the basic traits of GI definitions. The NVivo software system\(^7\) was used to examine key aspects of GI as contained within a sampling of general GI definitions as identified from the literature and outlined in Appendix B. The software word count revealed the key common ideas amongst various definitions: *natural, space, areas, support, lands, communities, conservation, benefits, network, provide*. The software further revealed through a word tree idea branching process the following general themes of using GI as components of planning: 1) Nature/natural spaces and areas are the primary common elements that carry across various definitions. These are the essential elements that comprise the concept; 2) The importance of benefits are identified – whether they are for human needs or natural systems; 3) Interconnections and networking are important integral components; 4) Some definitions emphasize functional elements such as conservation, ecological services, or people; other definitions emphasize land use components such as water, urban/rural areas, greenways, wetlands, parks and gardens; 5) Multifunctional considerations of elements are noted within land use categories such as floodway protection while also providing stormwater function, and biodiversity enhancement.

\(^7\) NVivo Pro 11™ software version from QSR Inc. was employed here; word selection was derived using a ‘stemmed’ wording selection method.
opportunities; and, finally; 6) The potential of planning for conservation or for areas of development was noted.

This exercise was useful in acknowledging the substantive integral components of GI; nature/natural systems, interconnectiveness, multifunctionality of land activities and community benefits through planning are captured within the most commonly-used words. These components were captured within the formulation of the GI Systems Design Framework as depicted in Figure 11.

This diagram was used prominently in the KI interviews and Focus Group discussions. The intent of using the diagram was to provide a quick and consistent overview of what constitutes planning with GI. Through the interviews and discussions, the researcher wanted to outline how GI could be used in an overall community strategic planning system and to test the operability/utility of the GI planning model with participant comments.

To add in promoting a further understanding of what is meant by GI elements on the land, an aerial photo (see Figure 12) of a hypothetical rural community and its land base was distributed with the Systems Planning Framework diagram. The intent here again was to provide a research participant with a quick overview of ideas within the GI planning system, and to solicit understanding and potential comment.

The aerial was used as a representation of what a GI system could look like with features that were included within a networked, connected nature/natural system. The aerial photo of Rockwood, a small southern Ontario town is illustrative of a rural community that is richly endowed with GI elements.
4.2.1.4 Step Four - Prepare Questionnaire Guide for Use with Key Informants and Focus Group

To prepare for KI interviews, two different instruments were prepared. One questionnaire was designed for planners, and the other was prepared for general organizations in Ontario that have an interest in land use matters. The questionnaires (see Appendix D) were used in the KI interview sessions as well as in a Focus Group discussion. Both questionnaires provided a semi-structured interview format to get a better understanding on the opportunities/challenges of GI planning for southern Ontario. The questionnaire for the land use planners had a focus on specific GI elements...
that they currently use in their GI planning work. The questionnaire for the organizations had an opening section that questioned their interest in GI efforts, and what the relationship of their organization was to further the specific interests of rural Ontario. Both questionnaires included the draft Systems Planning Framework diagram depicted in Figure 11. Questions on the diagram were asked during all sessions concerning its completeness, accuracy and usefulness for planning in Ontario.

4.2.1.5 Step Five – Key Informant Interviews with Planners/Organizations

The KI land use planners were selected for interviews from one of two ways. The first way for selection came through information provided by the GI Use Survey respondents from Step 2 of the research process. Several municipal planners indicated in the Survey on GI use that they had innovative GI practices in their local communities and they would be willing to participate in further interviews on these examples. Several other qualifying factors were considered: Was the prospective informant from the southern Ontario general geographic area; Was the person a member of the Ontario Professional Planners Institute. As well, KIs from a variety of circumstances dealing with innovative GI uses and also from differing geographic contexts within southern Ontario were selected. The selection characteristics served to ensure quality prospective interviewees.

The second way that planners were selected for interviewing was through their volunteering. These planners volunteered as they were generally familiar with the notion of GI planning, and they wanted to discuss the idea further with the researcher. These volunteers attended a session provided at the Ontario Professional Planners Institute annual conference in October 2016, where an overview of the GI topic was presented. As these volunteers were professional land use planners and well experienced in the field, their offer to participate was accepted.

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8 Ontario Professional Planners Institute Conference, 2016. GI session entitled Using Green Infrastructure in the Planning of Healthy Rural Communities, October 5, 2016
It was hoped that ten planning KI could be selected for this stage of the research; in the end, seven interviews were conducted. The small number variance was deemed not to be a major barrier to obtaining good qualitative information on GI, as these participants came from a variety of rural contexts of southern Ontario, and they offered insights on GI element usage from a variety of perspectives.

Prospective KI organization interviewees with interests in land use planning matters in rural Ontario were sought out. Organizations comprising various agency, institution and association perspectives were identified through a ‘snowball selection process’, i.e., information provided in GI Use Survey respondent sheets as well as through discussions with KIs and Focus Group planners. It was hoped that a minimum of ten organizations would be selected representing diverse interests within the general themes of sustainability, i.e., organizations representing economic, social and environmental interests. In the end fourteen representatives were interviewed. Organizations large and small were sought out and from different geographic areas throughout rural southern Ontario. The slightly larger pool of participants was deemed acceptable as an increased variety of perspectives on GI planning was derived.

KI were given questions in one of two formats (see Appendix D). One format was presented to KI who had previously been exposed to the GI topic via the general GI Use Survey (Step 2) from across Ontario, and the respondents had provided specific GI use options concerning projects, plans or programs. The second format questionnaire was distributed to individuals/organizations that it was believed only had a general knowledge on the GI topic; this included planners involved in Step 6, the Planners Focus Group, and most of the organizational representatives. The intent of having two different questionnaires was to involve the KI on a platform with which they would be most comfortable. This was designed to solicit ease in getting into the topic area, and to encourage participation.

For all KI, the questionnaires were administered within a 1-hour time horizon. The discussions were recorded in all instances, and summary notes were compiled
immediately thereafter (see Appendices E and G for summary notes). All KIs agreed to have their comments made available to others. One KI requested that his comments be ascribed to himself directly and not to the organization that he belonged to. The notes taken during the interviews were vetted by all the KIs individually to ensure accuracy and completeness. A further re-review of the material in an aggregate presentation format was made available at the end of the research phase of the dissertation (Step 9).

4.2.1.6 Step Six – Focus Group Discussion (Planners)

The next step of the research was a Focus Group discussion with Ontario Professional Planners Institute (OPPI) planners on their perspectives of GI planning in Ontario. It was originally planned to have the Working Group on Agriculture and Rural Affairs of OPPI, a subset of the 4,000 professional planners registered in the Province, provide input on the potential of GI planning in Ontario. This Working Group comprises approximately fifteen professional planners working in rural Ontario and was thought to be an ideal mechanism to solicit input on GI planning. Efforts to organize this Focus Group went on for a considerable length of time, considering differing formats (in person or webinar sessions), and at differing times. Ultimately, this initiative was abandoned on the advice of OPPI’s Director of Public Affairs (Ryan, 2016). The main constraint to having the Working Group consult on the GI research initiative was due to conflicting priorities with available resources. The Provincial Government at the time had many pieces of pending legislation and the OPPI organization was deeply involved in the review of provincial planning instruments under discussion. The OPPI administrative staff were interested in responding to the Provincial Government requests for input; there was concern that the OPPI Working Group planners would suffer from volunteer burn out by taking on this researcher’s GI planning initiative outside the direct OPPI mandate.

To be reflective of another type of Focus Group discussion, the chair of the OPPI Agricultural and Rural Affairs Working Group offered the services of planning members from the County of Huron (Weber, S. 2016). The format of the Focus Group discussion
would be contained within one of the monthly staff meetings held at the County, and this format of discussion would capture GI viewpoints of professional planners who work at the County. In this manner, GI perspectives would be captured from planners who work with an upper tier, strategic planning perspective as well as from those planners who serve at the lower tier of local municipalities (nine in total) that exist within the County governance setting. The Focus Group session was arranged to consist of a presentation on GI planning and then a group discussion of the questions contained within the Organizations KI Questionnaire (see Appendix D).

As a summary to the preceding Steps 4 to 6, the following figure illustrates the locations of the participants involved in the dissertation research.

Figure 13 - Location Map for KI and Focus Group Participants

Source: Google Maps
4.2.1.7 Step Seven – Research Participant Information Analysis/Synthesis

After completing the KI interviews and the Focus Group discussion, the research results to date were analyzed and synthesized. The step entailed the preparation of summary observations from the information contained within the interview notes taken from the KI sessions as well as from the Focus Group discussion. Summary information was compiled for each research participant in a format addressing the goal/objectives of this research, and this information is provided in Chapter 5, Results, Analysis and Synthesis. The summary information from the twenty-two separate KI interviews and the Focus Group discussion were then analyzed. Synthesis entailed a content review of the perspectives provided by the various research participants.

The detailed notes from the KI interviews and Focus Group discussion are provided in Appendices E to G.

4.2.1.8 Step Eight – GI Systems Planning Framework (Final)

Synthesis of the data allowed for the reformulation of the GI Systems Planning Framework. A reconsideration of the Framework’s components was derived from the comments provided by research participants. The reconsidered Framework was based on GI diagram work completed by Rouse and Bunster-Ossa; however, their material was adapted from an urban setting to one applicable to most rural settings.

The Framework as reformulated became a much more intricate illustration of the interactions of grey and green infrastructures working together to build a resilient land and community base from the one originally prepared by the researcher (Figure 11). The various system components – the stocks, feedback loops, etc. provided a much richer expression of the GI planning system. The Framework provides a graphic representation of the services and functions of the green/grey infrastructures working together to form the basis for sustainable economic, social and environmental conditions that in-turn
provide the resilient community outcome being sought. The re-formatted GI Systems Planning Framework (Final) is discussed in section 5.4.2 and displayed in Figure 18.

For the completion of research step eight, the planning framework and other summary information derived from the research work was put together in a slide presentation format for use in a research review meeting held at the University of Guelph.

4.2.1.9 Step Nine – Research Review Meeting

A Research Review Meeting was held at the University of Guelph at the conclusion of all the research steps listed above. The intent of this session was to be a validation check of the reliability and results of the research work that had been conducted. All the KI and Focus Group participants who had indicated they wanted to hear the final results of the research were invited to this session. The session was held in conjunction with a research committee meeting organized by my research advisor, Dr. Wayne Caldwell. The meeting held annually is an opportunity for planners, researchers, and senior government officials at the Province (Ontario MMAH, OMAFRA) to get together to review and comment on research that is underway at the University. As the original GI Use Survey for my research was funded partially through the OMAFRA – University of Guelph Research Partnership, there were individuals present that had an interest in my final GI planning system research findings.

4.3. Research Integrity Methods

This section outlines methods used to ensure the information compiled through the research framework was completed in a rigorous and accurate manner.
4.3.1 Research Ethics

The research plan for the KI interviews and Focus Group discussion session was approved for use by the University of Guelph: Research Ethics Board (REB# 15JN014). Consent forms to participate in the research were prepared, and all KIs indicated their acceptance of having personal information regarding their name position and comments revealed in the dissertation. It should be noted here that one of the organization KIs stated that his comments are reflective of his own views, and not of the organization. This remark is noted in his KI summary information sheet.

4.3.2 Research Accuracy

The KI interviews and Focus Group discussion were audio recorded, and these recordings were used to compile accurate summary notes based on the interviews and discussion. The majority of the KI interviews as well as the Focus Group discussion were completed in person; some of the KI interviews were completed using telephone or on-line technologies where logistics precluded an in-person interview.

The remarks from the interviews and discussion were summarized. The summaries were presented back to the participants to ensure the material accurately reflected the content of the participants remarks.

Summary materials from all interview and discussion events have been presented for use in this dissertation. The researcher personally conducted all parts of the research and completed a manual content analysis of the results. Through this process, there is a high assurance that the resulting findings are as accurate and complete as possible. Supplemental computer word patterning and theme analysis was also completed using NVivo.
4.3.3 Completeness of Research

Corroboration effort was expended at all stages of the research through triangulation. For example, during the GI Use Survey portion of the research, special note was made of plans, programs or initiatives in an area that were mentioned several times by different community leaders. An example here was the Maitland Valley Conservation Authority’s networking environmental stewardship efforts directed at agricultural lands, i.e., stormwater management, agricultural soil protection, natural area provision. This work was identified as being innovative from multiple sources – from the Authority survey respondent as well as from survey responses from the local municipal planner and also an area economic development officer.

Triangulation of information gathered during the KI interviews and Focus Group discussion was completed by the researcher. This involved a background review of remarks made during the sessions to other available sources of information from on-line or printed sources. This process provided the researcher with a more informed and thorough understanding of particular information gathered during the in-the-field work phase. Corroboration effort was also evident in the Research Review Meeting; many ideas on GI were being shared by KIs, and this information received general acknowledgement from other general researchers at the meeting.

Throughout the research, background content review of applicable literature and information sources was carried out for the specific circumstances of various KI and Focus Group participants. This research is not necessarily reported in the bibliographic references of this dissertation, but this information provided valuable context, validation and further clarification of research documentation. Content review consisted of website information, strategic planning documents, financial statements, municipal Official Plans, information brochures and pamphlets. Background information review occurred pre- and post meeting at each research step stage.

This chapter has provided an overview of the research methods used for this research. The next chapter presents findings, analysis and synthesis of the compiled research data.
Chapter 5 – Results, Analysis and Synthesis

This chapter presents the outcomes from the various research instruments, presented in sequential order as outlined from the research steps in Figure 10. Analysis is provided after each set of outcomes. The methods are: the general GI Use Survey of rural community leaders gauging interest and knowledge concerning GI; KI interviews involving planners, and also including the planner Focus Group discussion; KI interviews involving organizations; and findings from the Research Review Meeting. Two frameworks concerning GI planning are also presented – one, prepared at the beginning of the research by the author (see Figure 11), and another adapted from Rouse and Bunster-Ossa (2013) at the end of the research (see Figure 18). The chapter ends with a summary analysis and synthesis.

5.1 Findings from GI Use Survey of Rural Community Leaders

The GI Use Survey in rural Ontario was completed as a component of a research project with OMAFRA and the University of Guelph in 2015-2016. As outlined in Chapter 4, the predominant focus of the Survey distribution was on potential economic development activities or cost savings in the use of GI in rural places. The Survey findings are included in a report entitled Green Infrastructure for Ontario’s Rural Communities: Nature and its Contributions to Community Economic Development and Resilience (Caldwell et al., 2016). The dissertation writer will highlight some of the interesting results from this work that have direct applicability here.

One hundred and ten Surveys were returned from across Ontario. The majority of the responses came from municipal representatives and most often planners (80 responses), but there were also surveys received from the other groupings that were contacted – from Conservation Authorities, Health Units, Community Future Development Corporations (CFDC) and First Nation communities.
The map in Figure 14 illustrates the location and type of organizations that responded to the GI Use Survey from places across southern Ontario and parts of the mid-north of Ontario as well.

Note: Survey respondents in northern Ontario, as indicated on this map were not contacted in subsequent research work steps as these areas were beyond the geographic scope of this dissertation.

Figure 14 - Location of GI Use Survey Respondents, by Organization Type in Ontario
Source: Caldwell et al., 2016; p. 9.

The Survey responses provided a wide variety of perspectives associated with planning, programming and use of GI elements. The following general matters in planning and community development matters were provided: Official Plan policies, sustainability planning goals and actions, stewardship incentives, eco-cultural tourism efforts, permaculture projects, local food, active transportation trail corridors, parks, soil erosion controls and soil quality enhancements, woodlots, tree planting, rain gardens, natural habitat restoration, green linkages, prairie habitat, windbreaks, buffers, pollinator
plantings, streetscape greening, species at risk habitats, watershed protection, source water drinking water protection, wetland protection and provision, shoreline protection, climate change adaptation planning, sense of place and cultural landscapes.

In terms of categorizing responses, the Caldwell et al., 2016 report noted that GI initiatives could be associated with the following themes, listed from most frequent to least responses: Community building that includes measures of using GI to enhance environmental aesthetics, health and well-being, community cohesion or sense of place special identity measures; Culture, education, recreation and tourism development opportunities; Local food production and soil quality enhancement mechanisms; Water and soil conservation measures; Woodlands, forests and street trees; Biodiversity enhancements including habitat and species at risk protection; Rehabilitation of former used lands, e.g., brownfield previously used industrial properties, landfill area naturalization; and Climate change mitigation and adaptation measures.

In comparing the present use of GI measures to the literature, the prospect for a GI planning framework for rural places has some utility. In particular, the co-ordinated use of GI elements in communities may represent an untapped resource in dealing with the particularly difficult challenges of climate change impact amelioration, rehabilitation of brownfield lands and assisting in biodiversity protection.

The Survey responses were further analyzed with the objective of discovering innovative programs, uses and practices of GI that would be useful for further examination in municipal land use planning efforts. A sifting exercise through a number of steps was conducted to ascertain a potential listing of potential KIs. This process included the following: 1) out of the 110 original Survey responses, 90 came from agencies tasked specifically with the administration of land use planning, i.e., municipalities and Conservation Authorities; 2) only responses from individuals who self-described their GI examples to be innovative and useful for sharing with others were considered; 3) only responses from agencies within southern Ontario were of further potential interest as this southern geographic location was the selected focus of the research; 4) only
respondents who indicated a willingness to be contacted for follow-up interviews were considered; 5) only responses from jurisdictions that were rural in nature could be considered, i.e., not Regional Municipalities in the Greater Toronto Area; and 6) instances were noted where responses from multiple agency/municipal respondents in a local context identified a common ‘best practice’. In addition to the above preliminary qualification considerations, the researcher also considered prospective interviewees who were situated within a diversity of geographic contexts across southern Ontario as noted in the Research Framework, subsection 4.2.1.2.

Through this vetting process, a potential nine municipalities or Conservation Authorities were identified for KI GI interviews. At the end of the research phase, seven KI interviews were completed due to logistical considerations.

It is appropriate to highlight some of the innovative plans, programs and policies that were identified in the Survey responses and that have direct correlations to a GI planning framework. The following descriptors cover a variety of topics associated with GI planning:

1) Private-public partnerships with treed windbreaks – landowner benefits with improved agricultural soil conditions/higher production crop yields; public benefits from living snow fences for municipal operation cost savings, and other local benefits (climate change, biodiversity enhancement), i.e., Wellington County Green Legacy Programme;

2) Valuation and payment of G + S of nature to individual landowners - funding from foundations and senior governments for local agricultural pilot projects, i.e., Norfolk County ALUS program;

3) Watershed-wide agricultural soil and water conservation - nature/naturalized environmental systems working with newly constructed rural non-point source stormwater management facilities (artificial wetlands, biodiversity enhancement and pollinator landscapes), i.e., Garvie Creek-Glenn Drain Subwatershed in Huron County;
4) Community capacity development through a shared community environmental-focused strategic vision – private entrepreneurs buying into community vision and creative jobs; senior government/foundation research grants; understanding and promotion of interconnected natural heritage systems, i.e., Huron County’s Sustainable Huron plan;

5) Interconnected treed landscapes that are attractive for tourism as well as local citizen health and wellness benefits in the form of active transportation trail corridors, i.e., Essex County’s County-Wide Active Transportation System (CWATS) initiative; and

6) An Official Plan that incorporated many aspects of a GI planning system, e.g., an environmental focus for the community, landscapes both cultural and natural that are to be protected for their sacred and sense of place characteristics; linked natural landscapes with trail networks; areas to develop and areas to conserve; riparian zone requirements adjacent to water features; climate change adaptation/mitigation initiatives; biodiversity protection goal statements; tourism development opportunities in strategic locales, i.e., Georgian Bay Township Official Plan.

Through the GI Use Survey responses, there were demonstrated GI initiatives that were associated with rural community resilience efforts. These efforts were useful in creating new employment opportunities; enhancing the quality of local land, water and air resources; and having measures that often assisted in building local community social capacity. As this research is principally focused on mechanisms that could be construed to be strategic in nature and also networked across many natural system activities, several of these survey responses were of interest. The Surveys provided a basis by which KIs could be selected for the next step in the research.
5.2 Findings from Key Informant Interviews and Focus Group Discussion Session – Planners

As outlined in Chapter 4, Research Method, KIs from the professional planning organization in Ontario were sought to provide understanding perspectives on the potential utility of a GI planning system for use in rural Ontario communities.

Planning officials from various regions of Ontario were selected to reflect varying conditions and location contexts. Input on the GI planning concept was derived from the following areas of southern Ontario: South-central Ontario (Niagara Region, Wellington County); South-eastern Ontario (Lanark County); South-western Ontario (Windsor-Essex Region and Huron County); Near-north Ontario (Muskoka District, Greater Sudbury).

From background work in the preparation of the dissertation, the researcher was interested in exploring the GI planning framework from a variety of rural area defined areas. As mentioned in Chapter 3, the southern Ontario rural landscape is comprised of a number of differing conditions based on primary land use activity, density of development, and proximity to urban areas. For the purposes of classification and based on rural land use general descriptors (Hodge and Gordon, 2014), the researcher wanted KI to represent four differing types of geography as depicted in Figure 15.

![Figure 15 - General Rural Community Planning Classification Descriptors](image_url)

Source: Adapted from Hodge and Gordon, 2014; p. 237.
In terms of definitions for the general rural areas outlined in Figure 15, the following is offered:

1) *near-urban rural*. These can be defined as rural areas that are intricately intertwined within urban commuter-sheds of nearby urban places. In Statistics Canada terms, they comprise areas within the metropolitan influence zones (MIZ) of nearby urban centres.

2) *tourism amenity rural*. These areas are often associated with water features. In the southern Ontario rural context, they are often associated with water bodies found in the Canadian Shield as well as along the narrow band of shorelines next to the Great Lakes.

3) *working landscape rural*. These comprise rural areas that have richly endowed lands for resource extraction purposes, such as agricultural areas as well as forested landscapes.

4) *remote rural*. These comprise areas that are found in locales that are distant from urban centres. In reviewing Statistics Canada definitions for MIZ areas, no areas within southern Ontario qualified for this type of rural area. For this reason, the research did not consider this type of rurality within the southern Ontario case study area.

In applying these geographic descriptions to the location circumstances of various KIs, often a community/place could be described as having multiple rural definitions. Based on the discussions with the KI, a best fit application of rural circumstances was applied for each KI geographic context, and in consideration of the above described classification.

5.2.1 KI Interviews with Planners in Ontario

This section provides an overview of the findings of the research associated with the perspectives of professional planners concerning the topic of GI planning. The notes that follow are organized by individual KI and represent summaries of each interview. The notes provided here cover matters of significant thought associated with the goal and
objectives of this research, i.e., the utility and applicability of a GI planning framework to assist the planning function in rural Ontario communities.

Interviews were conducted with planners working in a diversity of settings in southern Ontario. Table 2 provides an overview of the selected participants for this stage of the research. The KIs were selected to participate in the research due to their responses provided on the initial GI Use Survey sent out to rural community leaders in Ontario, or they requested participation at an OPPI conference event held in 2016.

Table 2 - Key Informant Planners

<table>
<thead>
<tr>
<th>Name &amp; Title</th>
<th>Jurisdiction</th>
<th>General Location Southern Ontario</th>
<th>Type of Rural Geographic Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jeff Watson, Planner</td>
<td>Town of Essex</td>
<td>West</td>
<td>Resource (Ag); Near Urban</td>
</tr>
<tr>
<td>George McGibbon, Planning Consultant</td>
<td>McGibbon &amp; Wakefield Inc.; City of Pt Colborne</td>
<td>Central</td>
<td>Near Urban</td>
</tr>
<tr>
<td>Nicholas Popovich, Planner</td>
<td>Township of Georgian Bay</td>
<td>North</td>
<td>Tourism</td>
</tr>
<tr>
<td>Phil Beard, General Manager</td>
<td>Maitland Valley Conservation Authority</td>
<td>West</td>
<td>Resource (Ag); Tourism</td>
</tr>
<tr>
<td>Stephen Monet, Planner</td>
<td>City of Greater Sudbury</td>
<td>North</td>
<td>Resource (Minerals); Tourism</td>
</tr>
<tr>
<td>Noelle Reeve, Planner</td>
<td>Township of Tay Valley</td>
<td>East</td>
<td>Tourism; Resource (Ag)</td>
</tr>
<tr>
<td>Mark Van Patter, Planner</td>
<td>County of Wellington</td>
<td>Central</td>
<td>Near Urban</td>
</tr>
</tbody>
</table>
The selection of KI planners was also made reflective of differing basic planning responsibilities for rural Ontario places – working with a municipality, lower or upper tier setting; Conservation Authority representative; and consultant experience.

In reading through the KI results, the reader should be reminded of some background information details. The responses are reflective of the interviews based on the semi-structured questionnaire in Appendix D. In Appendix E, a general overview of some of the significant characteristics of the KI and the particular jurisdiction/type of planning that the planner is engaged in is provided. This is intended to provide a context for the individual.

5.2.1.1 Essex (Town of Essex), Jeff Watson, Planner

Mr. Watson is a senior experienced planner currently working on an Official Plan update for the Town of Essex; the Town is located in the extreme southwestern portion of the Province near Windsor, Ontario. The Town comprises both smaller urban settlements and rural agricultural areas, and the entire municipality has a population of 20,000 persons.

Jeff Watson makes a strong point that GI policy needs to be placed in Official Plans. In the Essex area there are significant challenges associated with stormwater quality and quantity issues brought on by unique features in the area, i.e., heavy clay soils that limit drainage; industrial-scale agricultural operations that impact rural stormwater quality. There is increasing concern that climate change impacts may create intensified storm events that will generate floods and greater rural land episodic runoff events. To address these issues, a GI plan should be devised to emphasize production systems that encourage sustainable agriculture. He suggested that policy could be formulated based on sustainable cropland farm practices as outlined by the United States National Research Council (2010).
Mr. Watson argues that new provincial regulations are required that will mandate the use of GI stormwater management systems. Additional research is required in the Ontario context to demonstrate the cost-effective benefits of GI technologies, both in settlement areas as well as on agricultural lands.

Mr. Watson provided the following quotes that help to illustrate the significant points he made regarding GI planning:

“Official Plan policy needs to anticipate challenges that an area may face. In the Essex area major challenges are associated with stormwater management, and stormwater quality and quantity issues associated with large industrial scaled agricultural operations are very significant.”

“We are moving beyond sustainable which means keeping things the same and moving into a resilience mindset whereby we need to plan to be adaptive to changing circumstances.”

“Tools are required to translate GI technologies into everyday land use planning approaches. Information is required to define cost effective use of GI which is required to ‘market’ these new ideas to elected officials. Education is also required. Additional research to document the benefits of GI techniques to address challenges found within the rural landscape (water and land use) is required.”

5.2.1.2 Environmental Planning Consultant George McGibbon, Principal Planner at McGibbon Wakefield Inc.

Mr. McGibbon is an experienced environmental planner who owns a consulting company and lives in Pt. Colborne. In consideration of the GI questionnaire, he examined it in terms of its potential use in his home city and in general across rural Ontario. His remarks concerning GI planning tend to be philosophical in nature. In general, he was uncertain of the overall utility of this tool for community planning as it is too new and abstract for the needs of a practicing planner in the field, i.e., it needs research and further assessment. He discussed the importance of a planning system that can provide value relative to an individual’s needs, the needs of his/her family and also to the general community. It is only in this way that there will be "buy-in" to doing things in a new way.
Mr. McGibbon described a green initiative in his hometown of Port Colborne that could be labelled a GI project. A community effort was made to retain natural vegetation along road corridor ditches to serve as important habitat for migrating monarch butterflies. The effort required support of private landowners to acknowledge the importance of retaining messy natural landscapes, and that government could alter their roadside maintenance plans at the regional operational maintenance level to reduce vegetation removal along road corridors. He went on to describe this project as potentially being one element of an overall GI plan.

Mr. McGibbon provided several insightful quotes on the topic:

“GI initiatives should ideally be directed at the community /municipality level, involving the participant in his/her vocation, and having meaning at both the individual and family structure levels.”

“Elements of a strategic GI plan can be laid out in conceptual terms: 1) need a questioning mind – consider impacts/opportunities to water, land, species. GI can comprise natural areas or be introduced into built up areas including green roof/wall applications; 2) need discipline to look/question things differently. This requires an appropriate setting and resources involving time and research capabilities to examine alternative approaches to addressing challenges; 3) use models where they exist to structure and document conditions. This will expose ‘surprises’ to existing circumstances; 4) good data drives good analyses and can address current doubt conditions; for example, climate change refugees and their impact on local communities.”

“GI strategic planning is currently not at work in Ontario municipalities as the concept is too new and abstract. . . . However, it may be useful as a tool to open up discussion looking at the practical opportunities of GI to assist human and natural communities such as the use of carbon sequestration credits in prairielands, forests, agricultural areas... It may be a useful planning tool if it is associated with good science and data to back up notions. A process is needed where a variety of options can be explored and priorities set.”

5.2.1.3 Georgian Bay Township, Nicholas Popovich, Planning Director

The Township is part of the Muskoka District and is considered part of cottage country for the Greater Toronto Area. The permanent population of the rural community is 10,000 but this triples in size with summer tourists. Mr. Popovich talked quite
passionately about the diverse, place-based geographies found within the Township. He referenced the rich diversity of natural features, and the many private and public land use governance agents at work within the Township. He referenced the Township’s Official Plan as being a “green plan” due to its emphasis on the protection of the natural environment and its reference to the economy (tourism primarily) being dependent on a healthy environment. He noted that this symbiotic relationship was a major foundational perspective in the preparation of a new Official Plan in 2014, and the Plan was well supported by participating stakeholders in the Township.

Mr. Popovich believes a GI planning framework would be of greater value within a community where there are limited remaining natural areas after settlement, i.e., southern Ontario agricultural areas. In this diminished natural landscape context, GI efforts would need to be made to link “disjointed natural attributes”. In examining the general GI themes that were identified in the KI questionnaire, he went on to indicate that all themes were addressed in their Official Plan except for efforts to promote local food production. He indicated there is a close fit in wording of their Official Plan to “being consistent with” provincial policy as outlined in the 2005 Provincial Policy Statement.

In reflection of the Popovich interview, an observation can be made that those areas of special natural (or cultural) character for that matter may be identified for protection within a municipality as a component of a GI plan. In the case of Georgian Bay Township, waterfront land areas are contained within the Eastern Georgian Bay World Biosphere Reserve, and existing natural character land/water locational context adjacent to First Nations reserve areas are also important.

Some key quotes from Mr. Popovich are the following:

“In a rural context, politicians need to acknowledge provincial policy in the PPS which is strong; starting in the 2005 PPS version and continuing into the 2014 update, municipality planning shall be consistent with provincial policy to promote development in urban areas, limit scattered rural area development and protect environmental areas.”
“GI planning involves putting in place mechanisms to acknowledge and protect the natural environment.”

“The municipality has placed an intrinsic value on nature – not a numeric one.”

“The economy is the environment, and the environment is the economy.”

5.2.1.4 Maitland Valley Conservation Authority, Phil Beard, General Manager

Mr. Beard, while being the general manager of this Conservation Authority (MVCA), is also a member of the Canadian Institute of Planners. The MVCA agency provides water and land management regulation to a large watershed area that is located within rural parts of north and central Huron County. Mr. Beard provided detailed commentary on many matters that need to be changed with respect to building greater rural community resiliency. In association with GI planning, many of the points he raised were associated with using nature as a soft-path to designing adaptability and functionality into the land use system for health and wellness for humans and natural communities.

Mr. Beard asserted that a GI planning system can work but not solely through a municipal planning system. Instead, this planning system needs to work with and through the local community with multiple, motivated stakeholders being involved and with expected changes taking some time to evolve. Stakeholders include, for example, local champions such as local planners, technical researchers, economic incentive agents, private landowners and funding agencies.

In the MVCA, it is Mr. Beard’s view that the elements of a GI plan can be found in a multitude of individual initiatives: rural stormwater management plans; rural watershed partnerships (terrestrial and water action teams); and restorative agricultural practices. Mr. Beard highlighted the tangible benefits that have been displayed in rural stormwater management enhancements in the Garvie-Glenn subwatershed area. He also highlighted the creation of an ecological park in Wingham as an environmental enhancement and education facility in a former mill pond area.
In order to build resilient rural places, Mr. Beard indicated that significant challenges exist with existing systems; he indicated there need to be changes made relative to agricultural production and drainage works, general economic incentive mechanisms and funding, the design for non-point source rural drainage systems and actions to address climate change impacts. In consideration of recent stormwater management design initiatives for the Garvie-Glenn subwatershed, he indicated that hard infrastructure design features that include artificial berms and reformulated tile drainage systems can be quite expensive on their own. A substantial amount of money has been spent to modify the agricultural landscape to be more resilient within this relatively small sub-watershed area, with average costs of $750/acre. If this figure was applied to create a more resilient land base across the entire MVCA watershed, an expenditure of over $340 million would be required.

The following quotes were provided by Mr. Beard:

“The value of nature is everywhere in rural areas; this resource needs to be tapped into.”

“Need to devise a system that rewards people that are doing the right things for both private and public benefit.”

“GI planning can work with local champions, local groups to support leaders, technical supports, economic incentives to support change, in a long-term effort spanning many decades.”

“What are the principles and practices to make GI planning work? – is it a program, or a planning system? From a watershed management perspective, GI involves working with nature to build resilient community systems – both human and natural.”

“There is significant interest in building a resilient watershed in the Maitland Valley CA area. The land base is comprised of a significant agricultural land base (80%) and only 18% forest cover. Watershed report cards discuss building more natural infrastructure to build watershed resilience.”

5.2.1.5 Sudbury (Greater Municipality of Sudbury), Stephen Monet, Manager of Environmental Planning Initiatives

Stephen Monet works within a municipality that comprises an urban core with a large rural area. While the overall population for the City is 160,000, the municipality comprises one of the largest geographic area communities found within Canada.
Dr. Monet provided several insights into the utility of GI as being applied to a setting that combines both rural and urban areas within one municipality. He used the experience of "Regreening Sudbury" to illustrate the importance of uniting various stakeholders together – businesses, propertyowners, government, NGOs – for a common purpose. The "Regreening" effort for Sudbury has involved the planting of over 10 million trees during the past 40 years to assist in improving the local environmental conditions in a landscape heavily impacted by smelter operations for over a century. While the initial effort of the tree planting program was to improve the aesthetics of a barren blackened rock in highly visible landscapes of the region, the program has now moved into strategic drinking water protection and improving stormwater runoff conditions for various subwatersheds within the area.

Dr. Monet felt a strategic GI planning system would be useful for rural areas if it was focused on the specific needs of a local municipality, e.g., Sudbury’s unique need to re-green its rural landscape. He felt it could be useful to bring various stakeholders together in a specific locale, such as propertyowners, businesses, NGOs, government agencies (a Conservation Authority), to address common concerns with concerted, directed efforts. He went on to indicate that the economic/social/natural area enhancement priorities for a community using GI works are very much tied to the unique geographies of a community. In a community such as Sudbury it can tie the rural area to the urban area in terms of common needs for environmental protection that can increase understanding and greater appreciation for players to generate appropriate action. In order for a GI planning system to be of relevance in a community, it needs to distinguish itself from other planning systems that are currently in place; these could include, for example, natural heritage system plans and subwatershed water protection plans.

Dr. Monet provided the following quotes to illustrate his perspectives on the topic:

“GI planning is a valuable concept in systems thinking to look at the benefits of nature beyond the specific intrinsic value of a natural heritage element. GI systems planning may provide another perspective whereby communities can look at bigger picture values to a
society of nature. For example, in a wetland other beneficial attributes of the area can extend beyond its important biodiversity habitat protection and groundwater/surface water protection values. These may include key habitat linkage corridors, tourism development benefits, etc."

“The use of the word infrastructure is useful to denote societal benefit. The term needs to be considered in relation to the specific planning context. In Sudbury, the landscape is comprised largely of trees with pockets of agricultural lands and small communities. In contrast, the southern Ontario landscape is comprised of large communities and agricultural land areas with small pockets of natural areas (trees and water feature areas). The GI planning context is set by the general conditions found within an area’s landscape matrix.”

5.2.1.6 Tay Valley Township, Noelle Reeve, Planner

Noel Reeve is the Planning Director for this rural municipality located in the southern portion of Lanark County in eastern Ontario. The community comprises 5,000 people with this population base doubling in the summer with tourists. The Township has scattered settlement areas set amongst some agricultural areas as well as significant forested regions.

Ms. Reeve talked about GI planning and the need to think of bigger picture planning initiatives such as mechanisms to build community resiliency relative to new climate change impacts. She discussed the GI topic from a strong municipality leadership role for rural planners. Even though the community’s population base is quite small, it has a substantial tourism base due to the natural beauty and the rural community’s tranquility and ambiance. She noted in her background comments that the area has experienced several droughts in the past few years, and that there is a strong community desire to build up resiliency measures due to climate change impacts. This has manifested itself in enhanced measures to protect water quality in small rural recreational lakes through the creation of new riparian buffer requirements, and enhanced landscaping requirements in the site plan development regulations for new development. Ms. Reeve also discussed the importance of growing local food to deal with food insecurity issues. She indicated all of the above-mentioned aspects of GI could combine within an overall GI planning
framework. It should be noted that Ms. Reeve had been exposed to GI planning from previous working experience with a public policy NGO in New Jersey, PlansmartNJ.

Ms. Reeve provided the following quotes respecting GI planning:

“**It is important for rural planners to think of bigger picture items as GI resources are available within rural settings.**”

“**GI planning from a strategic perspective has a place in rural settings. Negative cascading effects may occur without a strategic review of the significant GI resources found within a rural setting. . . . Critical components of GI need to be delineated as if significant areas are not protected then cascading negative effects may result in the local context.**”

“**Why is there a push for protection of green infrastructure within a rural context when there is so much of it. . . The key is to highlight priorities within a local area.**”

“**GI planning consists of something more than simple elements on the ground; outcomes remind persons of the multifunctional benefits derived from specific actions. A planner needs to be conversant and lead on the notions of GI - biodiversity protection, prevention of soil loss, climate change impact protection, etc.**”

5.2.1.7 Wellington (County of Wellington), Mark Van Patter, Planning Manager

Mr. Van Patter worked in the County of Wellington for many years (retired in 2017) and was responsible for many environmental initiatives within this upper tier municipality. The County comprises 120,000 people and is constituted of smaller rural towns and villages and substantial agricultural areas. The County is located in central Ontario, to the southwest of Toronto.

Mr. Van Patter outlined that the initiatives being instituted by the County of Wellington concerning tree planting could be construed to reflect a GI planning framework. Although the GI planning term is not used in the process, initiatives and programs in place concerning the Green Legacy Programme tree planting initiative would constitute a GI plan.

He described various components of the Green Legacy Programme as being reflective of elements contained within a GI planning system. The following attributes from a community sustainability and resiliency perspective were noted: community capacity
development is derived by having all sectors of society participate in the programme; young school children plant seedlings in classrooms; older children work in the County tree nurseries; and high school students plant young trees on public and private lands in their communities. Additional tree plantings are also made available by government agencies for community ceremonial and commemorative planting projects. The strategic directions for the Programme are noted in Wellington County (2008).

From an economic perspective, trees are planted in strategic locations to derive cost saving benefits to the County road operation division, i.e., strategic placement of windrows of trees adjacent to County roads serve as snow fences to reduce winter snow clearance expenses. Additional opportunities were identified by government agencies to plant trees for passive energy savings for winter wind protective barriers and summer shade protection in park areas. On private lands, treed windbreaks have been shown to increase crop yields due to greater water retention on the land and the prevention of wind erosion of topsoil.

Finally, from an environmental perspective, tree plantings are identified as measures to enhance natural cover on the landscape and provide carbon sequestration and water retention and cleansing benefits. In this way the community’s land and water base is better protected against harmful future climate change impacts.

Mr. Van Patter provided several remarks that are quoted here:

“The use of green infrastructure within rural areas should be encouraged; it comprises a valuable resource that can assist rural land stewardship initiatives. Stormwater management in agricultural non-point source situations can be aided by green infrastructure elements.”

“GI planning needs to have a strong communication component. You need to build trust between stakeholders. . . It is important that the community accepts GI initiatives – not something pushed by elitist environmentalists, or by the government. It is important not to talk down to private propertyowners.”
5.2.2 Focus Group Discussion with Huron County Planners

Huron County comprises 60,000 people and is predominately an agricultural rural landscape with towns and villages scattered throughout. In addition to its significant working landscape base, it also has water-based tourism interests along the central shore of Lake Huron.

The details on the Focus Group discussion session and its general format are found in Appendix F. Planners provided comment that were reflective of their various planning responsibilities, i.e., both at the upper-tier County level, as well as at the lower-tier municipality. Sandra Weber, the County Planning Manager participated in the discussion by focusing on meeting time management and leaving planner question/answer responses with the researcher. The researcher provided a presentation overview following the script of the organization KI questionnaire format, as outlined in Appendix D, and the overall group discussion lasted approximately one hour.

The planners who responded to the prompted questions consisted of both more experienced as well as younger planners. It was observed that the planners provided both strategic policy perspectives for the County as well as implementation mechanics at the local municipality level.

In terms of overall discussion, a variety of perspectives were provided by the Focus Group participants. There was a general acceptance that GI planning may be a useful strategic planning approach to discovering new opportunities in using nature/land/water assets of a rural community. Much of the discussion was focused on current planning efforts associated with natural heritage feature delineation; stormwater management initiatives in town/village settings as well as for agricultural field areas. Comments were made in terms of potential GI enhancement opportunities with environmental stewardship water/land protection initiatives.

Some interesting points of view were expressed, as summarized here:
- agricultural lands can provide green infrastructure G + S natural attributes around matters such as soil development, carbon capture, water storage/cleansing capabilities;

- to promote good environmental stewardship, research efforts should be directed at best management pilot projects with associated education and local marketing efforts for surrounding landowners; a variety of tools are necessary to help steward private land; this can include the use of payment systems for ecological G + S;

- some were uncertain as to how a GI planning system would be of use respecting stormwater management measures within a rural landscape that comprises significant pervious areas. Existing sub-watershed planning efforts by Conservation Authorities are directed at enhancing water and land quality capabilities within urban landscapes primarily.

Significant quotes from the Huron planners include the following:

“GI planning may represent the next generation of thinking around the use of landscapes. GI thinking provides strategic thinking to further both human and natural communities conditions - it may provide a new-thinking lens.”

“We can’t fight nature – lets work with nature. A nature-based system should be favoured over time . . things that are designed in harmony with nature are more resilient over time, such as the shorelines of Lake Huron.”

5.2.3 KI/Focus Group Planners Perspectives on GI Planning

This section includes general overall observations on the perspectives of planners on the topic of GI planning, as well as synthesizing ideas based on the various general geographic characteristics of rural areas in southern Ontario, i.e., near urban rural, working landscape rural, cottage-country or tourism water based rural. For purposes of organization, both the information from the planner KIs (Section 5.2.1) as well as the Focus Group planners session (Section 5.2.2) are placed together in the following subsection.
5.2.3.1 General Observations on GI Planning

The planners uniformly believed there are aspects of GI planning that are relevant to planning in Ontario today. Some offered greater endorsement for the concept, while others less so.

In terms of the endorsement for the planning systems framework as outlined in Figure 11, there was the belief that GI should be allowed to adapt to the unique circumstances that are found in various parts of Ontario. Some planners believed that GI planning can be aligned with the stormwater management efforts that the Provincial government has been promoting through policy in the 2014 PPS. Others believed that GI planning should be tailored to the unique perspectives or challenges that a particular area may be experiencing, e.g., efforts to combat climate change impacts of flooding events or increased drought conditions; a community-wide tree planting initiative. Overall, however, there was the general belief that measures associated with GI planning can assist in making communities/landscapes more resilient to future challenges.

In terms of comments on the draft GI planning framework, some planners offered only minor suggested individual element changes to the GI themes, e.g., water emphasis, while the majority suggested that a more in-depth planning framework illustrating elements and outcomes of GI use should be developed. Overall, there was a general expression that a more in-depth framework model would be more conducive to adapting to the unique challenges and opportunities that are present in various rural areas of Ontario.

In terms of the question or option of mandating the adoption of GI planning in Ontario, only one KI offered this as a desirable approach. Several KIs liked the notion of adapting this strategic-thinking approach to the use of nature in communities and on the landscape as one of its strengths and stated that governance institutionalization mechanisms should not be made to standardize its use.

The following table summarizes position opinions of planners as derived from the KI interviews and the Focus Group discussion.
In examining the responses, it is interesting to note that several tangential functions of nature/natural systems use for community planning and development as noted from the literature were not main points in the discussion. As potential outliers in the use of GI, these extra benefits such as easy accessibility to nature areas for psychological or physical health benefits are not the main purview of land use planners, and therefore were not main points in the discussions. Even thoughts of sense of place or significant cultural landscapes recognition within rural settings did not make it to the top priority listing for the KI respondents.
5.2.3.2 Specific Comments on GI Planning as Applied to Various Rural-Defined Areas in Southern Ontario

The following discussion looks at the various rural area geography descriptions as outlined at the beginning of this section 5.2. The point of the review is to discern any findings by rural place that may have meaning to defining the utility and function of GI planning. Geographies are the following:

1) *Near-urban*. In terms of the research, near-urban places were near the Toronto-Hamilton urban corridor, and within the geographic limits of the City of Greater Sudbury. KI here included planners from Sudbury, Port Colborne and Wellington County.

All of these viewed the use of GI planning from slightly different perspectives, and they generally believed that GI planning should be left as an adaptive, creative process for strategic thinking. The use of the specific key resources that are found in rural areas can be leveraged to the greatest possibility where there is understanding and acceptance as to why some action dealing with nature/natural systems is being completed for a specific locale. A refined GI planning framework definition may be required to give utility to the concept as a foundation for community planning.

2) *Tourism amenity rural*, often associated with lands bordering waterways. In terms of the research, KIs in this geography type came from two areas - one from the Canadian Shield dominated Georgian Bay Township (part of the Muskoka District, located approximately one hour north of Toronto), and the other, in the small lake-dominated Tay Valley Township located midway between Kingston and Ottawa. The KIs discussed GI from a strong potential utilization potential. Some of the key ideas raised centred around the importance of a clean environment to assist in marketing and developing the economic potentials of their townships. Also, bigger picture planning concerns such as impacts of climate change or biodiversity loss/change were of high importance. One KI believed their existing Official Plan could be considered a GI plan because of the prominent green environmental protection components within it. The notion of adopting a GI plan that could exploit or utilize the unique natural resources of a municipality, using
local stakeholder involvement, understanding and interest, were key in moving ahead with progressive community planning.

3) Working lands rural. The KI interviews from Maitland Valley CA and the Town of Essex and the Focus Group discussion participants were reviewed here. The perspectives of participants within this rural area grouping were mixed. Some planners believed that existing planning efforts around existing systems planning, for example of natural heritage systems or water management systems can be utilized to get the equivalent benefits of a strategic GI plan. Others believed additional combined environmental/economic/social strategic planning use of natural assets are needed to combat the wicked challenges that some rural communities are facing, i.e., loss of agricultural soils resiliency, rural water quality impacts, biodiversity loss issues.

From an overall perspective, there was general acceptance on the utility of enhanced GI stormwater management on the land to assist in better environmental conditions for agricultural field run-off, i.e., slow stormwater flows, hold them in place, spread them out, and let them soak in. This could occur with GI stormwater management techniques utilizing major interventions such as landscape drainage works, and minor adjustments, including grassed greenways or riparian buffers to ditches/streams.

As a summary to this sub-section, there was not a consistent pattern in GI thinking by the planners in differing rural-defined category areas. In some instances, the use of GI was considered in a very specific application, such as a tree planting program, or very broad, such as the work by those using nature/natural systems to deal with the impacts of climate change. One general observation can be made that the consideration of GI use is more prevalent in rural amenity area locations due to the priority placed on clean environmental conditions as a basis for economic activity. As one KI stated, "the environment is the economy, and the economy is the environment."

5.3 Findings from Key Informant Interviews – Organizations
As outlined in Chapter 4, organization representatives were selected to go through a KI interview regarding their views and understanding of a GI planning methodology for use in strategic land use decision-making in rural Ontario municipalities. To accomplish this task, a selection method was adopted that would capture viewpoints from organizations that have an interest in land use planning matters of southern Ontario. The various lenses of sustainability were considered as a beginning sorting mechanism to capture potential viewpoints on the subject. The lenses as depicted in Figure 16 were used for this purpose.

![Figure 16 - Philosophical Lenses Categories for Ontario Organizations with Potential Interest in GI Planning](image)

Organizations were selected for some key reasons: interested in land use matters; a substantive entity that is generally well-known in Ontario; and the potential for views from organizations operating in a wide variety of areas across rural southern Ontario.

Most of the organizations were identified through the GI Use Survey respondent comments in the first part of this research. Survey respondents referenced several of the organizations that were doing innovative works with various aspects of GI elements in different rural Ontario municipal settings; it was expected these organizations would have some knowledge of GI issues.
Several KI organization representatives had also provided comments in the initial Survey work, and so these individuals had good understanding on what was being investigating concerning GI. These individuals, as rural community leaders, were interested in sharing their innovative use of GI elements in this phase of the research.

5.3.1 Key Informant Interviews with Organizations - Overview

The following subsections provide a summary of information that were relevant to the research goal of exploring GI planning in rural Ontario. The summaries presented here are based on materials outlined in the Appendices of this document. Appendix D contains the questionnaire used for the exploration of the GI topic with KI organizational representatives. Appendix G contains the detailed interview questionnaire notes taken by the researcher for each individual KI organization. Appendix G is structured with a consistent format for each individual KI. First of all, a general overview of some of the significant characteristics of the KI organization and the particular KI representative are presented. Information is outlined concerning the general mandate and size of the organization, and associations are made as to how the organization could be involved in GI planning. Following the general overview context description, the verbatim text of the KI interview transcript is provided.

Fourteen KI organizations participated in the research as outlined in Table 4. The listing order is by way of organizations alphabetical names. This listing order is retained in the transcript ordering of information in Appendix G and the KI summaries that follow in this section.
Table 4 - Key Informant Organization Representatives (Alphabetical Order Listing)

<table>
<thead>
<tr>
<th>Organization</th>
<th>Name &amp; Title</th>
<th>Location in Southern ON</th>
<th>Type of Sustainability Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALUS (Alternative Land Use Services) Canada</td>
<td>Bryan Gilvesy, Executive Director</td>
<td>West, Central, East</td>
<td>Environment</td>
</tr>
<tr>
<td>Carolinian Canada</td>
<td>Michele Kanter, Executive Director</td>
<td>West, Central</td>
<td></td>
</tr>
<tr>
<td>Community Futures Huron</td>
<td>Paul Nichol, General Manager</td>
<td>West</td>
<td>Economic</td>
</tr>
<tr>
<td>Conservation Ontario</td>
<td>Kim Gaven, GM; Jo-Anne Rzadki, Manager</td>
<td>West, Central East, North</td>
<td>Environment</td>
</tr>
<tr>
<td>Ducks Unlimited Canada</td>
<td>Kevin Rich, Provincial Policy Specialist</td>
<td>West, Central, East, North</td>
<td>Environment</td>
</tr>
<tr>
<td>EcoHealth Ontario</td>
<td>Suzanne Barrett, Co-ordinator</td>
<td>West, Central, East, North</td>
<td>Social</td>
</tr>
<tr>
<td>Essex Region Conservation Authority</td>
<td>Kevin Money, Director Conservation</td>
<td>West</td>
<td>Environment</td>
</tr>
<tr>
<td>Friends of the Greenbelt Foundation</td>
<td>Kathy McPherson, Vice President; Tom Bowers, Manager</td>
<td>Central</td>
<td>Environment</td>
</tr>
<tr>
<td>GI Ontario Coalition</td>
<td>Debra Martin-Downs, Chair</td>
<td>West, Central, East, North</td>
<td>Social</td>
</tr>
<tr>
<td>Ontario Federation of Agriculture</td>
<td>Peter Jeffery, Senior Policy Researcher</td>
<td>West, Central, East</td>
<td>Economic</td>
</tr>
<tr>
<td>Ontario Nature</td>
<td>Joshua Wise, Greenways Program</td>
<td>West, Central, East, North</td>
<td>Environment</td>
</tr>
<tr>
<td>Ontario Soil and Crop Improvement Association</td>
<td>Harold Rudy, Executive Officer</td>
<td>West, Central, East</td>
<td>Economic</td>
</tr>
<tr>
<td>Rural Ontario Institute</td>
<td>Norman Ragetlie, Director of Policy</td>
<td>West, Central, East, North</td>
<td>Social</td>
</tr>
<tr>
<td>Trout Unlimited Canada</td>
<td>Jack Imhoff, Director</td>
<td>Central, East, North</td>
<td>Environment</td>
</tr>
</tbody>
</table>

The following fourteen sub-sections provide a summary of the comments made by organizational KIs on GI planning. Notes from the interviews are available in Appendix G.
5.3.1.1 ALUS (Alternative Land Use Services) Canada - Bryan Gilvesy, Executive Director

Mr. Gilvesy heads a new national charity that is associated with the provision of funding to assist in re-naturalization or ecological enhancement to farm and ranch lands across the country. The organization works with individual landowners to establish beneficial environmental works on the land (see Appendix G for further background information on the organization).

For the purposes of the interview, Mr. Gilvesy focused his attention on the circumstances found in Ontario and his long history of the ALUS program within Norfolk County. He provided a spirited interview on his home farm property, YU Ranch in Norfolk County. A large portion of the interview was on challenges of implementing environmental initiatives on farmland in southwestern Ontario. He sees many opportunities in using the ALUS program to assist in beneficial environmental stewardship efforts.

In reviewing the conceptual elements of the GI model, he believes his organization’s mission is “aligned with GI thinking”. He made this assertion in relation to the draft conceptual framework that was presented to him, and he compared it to the ALUS "Bible", a document entitled: *ALUS: The Farmers’ Conservation Plan*. Mr. Gilvesy provided several examples where traditional grey infrastructure works for water provision in rural areas, as well as urban areas, can be cost-effectively enhanced through GI works. He referenced here the creation of artificial wetlands that can be used to store water (quantity supplies for irrigation or drinking water) and also to treat it for quality control issues (nutrient management, close to source provision).

In discussing the opportunities of a GI planning system, he was not sure how a GI planning system would be of great benefit as it appears to be a top-down, government-programming mechanism. He believes most effort should be directed to education and working with willing private landowners to enact beneficial environmental improvements on the land. Strategic planning exercises, he felt, can cause obstacles to action, with their
use of time and resources. In addition, “Planning exercises can cause people grief . . . Winners and losers within an area”.

He believes a form of GI "plan" has already been enacted in Norfolk County based on the landscape resources in the area, and on how many of its rural residents think. He provided the following description of the area:

“A green infrastructure environment is found in Norfolk County – smaller acreages with many hedgerows, streams, forests. GI thinking can tie the entire landscape together – ‘infrastructure for all.’ This can build on the strong ‘sense of place’ that exists in Norfolk.”

Mr. Gilvesy emphasized that a bottom-up system of planning, education and understanding are essential to build community capacity.

He indicated that a GI planning system may be of use in a community where, at the end of the day, it provides additional environmental benefit on the ground. He indicated, it is “important to provide additionality onto the landscape. ALUS spends their monies on adding ecological services. We are so bereft of ecological services; we should take anything we can get.”

He concluded the interview by indicating that things were changing in the Ontario/Canadian societal context with respect to acknowledging the importance of ecology. He believed that new government regulations will be coming into effect soon that will promote/require the use of GI technologies. In addition, he stated that economic levers will be instituted by government to deal with climate change mitigation/adaptation measures and this again will assist in enhancing the prospect of GI use in our communities.

5.3.1.2 Carolinian Canada - Michele Kanter, Executive Director

Carolinian Canada is a non-profit environmental charity whose mission is to advance a conservation strategy for the Carolinian Life zone that is found along the north shore of
Lake Erie. This ecoregion is a unique environmental area in Canada that has been significantly degraded over time by human settlement activity and faces many unique environmental challenges. Michele Kanter has been in her role as Executive Director at the Coalition for over 10 years. She is interested in the topic of GI as it relates to her work with the NGO concerning "natural" infrastructure. She presented an overall perspective that healthy communities, whether they are a natural ecosystem or human, “are dependent upon healthy natural heritage systems” and that planning for this is very important.

She stated that “GI planning is reflective of the planning process for Conservation Action Plans” (CAP) that the Coalition uses. These plans are strategic in nature and involve ecologically-important hot spots on the landscape that include critical habitat areas for endangered species. The CAP process involves presentation of background information collected by experts on a particular issue and then sharing this with stakeholders who have direct/indirect interest in the subject lands. All interested parties work together in devising alternative action plans with differing costs and benefits. A best approach is ultimately devised with mechanisms for implementation in protecting and stewarding the environmental asset(s) under threat.

Ms. Kanter, in reviewing the GI planning framework, thought there could be merit in applying this concept to rural areas.

“If GI planning looks at nature first, there is great potential for multiple benefits for rural landscapes. If done well, it can be the intersection of community planning with natural heritage systems and greenways planning. . . GI planning is at the nexus of conservation and cultural planning . . . GI planning looks at how things connect together and add other benefits to the landscape; for example, connected trails within greenways provide enhanced value.”

Ms. Kanter went on to elaborate how she felt GI planning could be useful in a southwestern Ontario context.

“A GI planning framework can address an awareness gap on the ground. Natural system improvements don’t need to cost a lot and they can make big changes on the landscape
for people and nature. . . Agricultural lands can support GI (natural infrastructure) but it needs to be done carefully. “

Within this context, Ms. Kanter outlined one of the strengths of GI planning as taken from the literature. She expressed the view that the multi-functional attributes embedded in all living things should be acknowledged and used for community development. Ms. Kanter’s perspective is that, to get the greatest benefit from natural infrastructure, there needs to be built-in resilience for the overall landscape – both urban and rural, with the provision of diverse landscapes that in turn can provide a variety of redundancies amenable to changing future circumstances.

Ms. Kanter went on to state that a GI planning framework could be useful in clarifying how differing landscapes within southwest Ontario should be developed or not developed at all. This would align with their overall Big Picture (Carolinian Canada, 2013) workplan that is based on the ‘3 Ss’ best practices for healthy landscapes: “Save existing nature / biodiversity; Steward the whole landscape using best practices; Seed and grow native plants to restore lost habitats by starting with priority restoration areas for highest efficiency.” In addition, she posited that greater understanding on the value of nature to human communities through GI planning may assist in defining areas where there should be no new urban development areas – a nature led planning system.

“There is a need to clarify urban development limits; greenbelts are needed everywhere in the southern Ontario landscape context. Most natural areas are significant in the Carolinian Zone due to their limited extent.”

5.3.1.3 Community Futures Huron (formerly Huron Business Development Corporation) - Paul Nichol, General Manager

Mr. Nichol works with a CFDC (Community Futures Development Corporation) which is a federal non-profit agency. Its primary mandate is to help new entrepreneurs to thrive in a particular area. The work of this Ki, in assisting to build resilient and sustainable rural communities, was identified through the initial GI Use Survey work to rural community leaders. Mr. Nichol, the General Manager at Community Futures Huron, highlighted the work of Sustainable Huron as a community capacity development initiative that, in
addition to building strong local economic and social actions, also highlighted the
importance of being supportive in building a healthy local environment (Huron County, 2011). Although Mr. Nichol works in an economic development capacity at the County
level, it is evident in his responses that he recognizes a healthy and resilient
environmental base is one component that is essential for overall community
development.

“As an economic community planner, you need to start with an asset-based approach –
these are categorized as financial, social, human and natural capitals embedded in the
community. All assets are important for a viable community – the farmland, the
lakeshore, the communities are all important assets for community economic
development.”

In considering the GI planning notion being put forward, Mr. Nichol pointed out that
within the Sustainable Huron community development planning process a question was
raised: “What are the natural resources here that are going untapped within Huron?” He
went on to point out “One cannot be talking about rural Ontario unless you are
considering green infrastructure and natural resources. Natural assets are present
everywhere.”

Mr. Nichol highlighted how GI resources were being used within the area to build
economic activity. He indicated many different aspects of green initiatives such as natural
assets as tourism attractions; local food, permaculture and new food crops on the land;
rural stormwater management retention and cleansing mechanisms; and land use
changes such as tree plantings to deal with climate change impacts.

In examining the GI planning framework, he felt it did not do an adequate job of
explaining the idiosyncrasies of working with grey and green infrastructure elements on
the land. He felt the GI planning framework schematic over-emphasized stormwater
management issues. In addition, the conceptual framework did not adequately illustrate
the potential working together of green and grey infrastructure assets within the overall
system, i.e., the arrows pointing from grey to green and vice versa did not adequately
illustrate how the systems can synergistically work together. He thought a more elaborate diagram was required to illustrate the multitude of benefits – economic, social, environmental enhancements that could be derived from using GI assets. Mr. Nichol also highlighted some of the fundamental challenges of considering what type of viewing lens to use to organize the planning efforts in your community. On the one hand, and using Huron County as an example, there is the field crop production interests of a farmer owning/operating a 10,000-acre farm, and, on the other hand you have the interests, for example, of an environmental NGO possibly wanting to return a portion of these lands back to wetlands to achieve a healthy 20% overall wetland coverage rate for the area as found in pre-settlement days (according to Mr. Nichol, Huron currently has a 2% wetland cover). From a local political perspective, interests in current and future economic activity tend to have the greatest sway with local politicians and government administrators.

Mr. Nichol believed that a GI planning mechanism should consider the economic development opportunities of using the natural capital of your area to its optimum advantage. This could even include the rural countryside tourism development mystic, i.e., as was once illustrated in the rural valleyland scene on the back of the now non-circulating $2 Canadian bill. It is also important to acknowledge impacts of climate change and the cost savings that could result for the community through implementation of new GI, such as the protection of soils via green cover crops.

5.3.1.4 Conservation Ontario - Kim Gavin, CO Executive Director; Jo-Anne Rzadki, CO Business Development & Partnerships Manager.

The individuals who participated in this KI interview session are with the umbrella Conservation Ontario organization in Newmarket, Ontario. This organization co-ordinates and speaks on behalf of the 36 Conservation Authorities that work in major developed watershed areas of the Province. The interview consisted of commentary being provided primarily by Ms. Rzadki who had some significant knowledge concerning the use of Low
Impact Development technologies for stormwater management. Ms. Gavin, as ED for the organization, presented more strategic organizational comments throughout the interview. Both of them had a primary focus on water and natural resource management issues and within a planning framework referred to as integrated watershed management (IWM). Within this planning framework, impacts of land use and water on and under the ground are given consideration. Outcomes from this planning approach relate to water balance considerations for an area regarding sufficient water supplies for human use as well as for nature. Considerations on measures to control water pollution and water conservation efforts are also outlined (Conservation Ontario, 2010).

It was pointed out in the interview that we should be moving towards a "one water" approach to planning, where all aspects of water use by humans and its impacts on the natural world are considered, i.e., drinking water, stormwater management and sanitary waste water management should all be considered together. In commenting on the GI planning strategy framework in the interview questionnaire, these two KIs indicated that water protection (quality and quantity) should be a central consideration for municipal action. This is the mandate that CAs are charged with in Ontario. In terms of considering the use of GI planning in municipal strategic planning, the following quote was offered:

“GI planning strategies are not the same as IWM planning. Rural Ontario municipalities are piecemealing things together for working landscapes, natural heritage planning, etc. All municipalities should do IWM planning everywhere.”

This is a strong statement that argues for an IWM planning regime that could be used to co-ordinate actions on the land respecting the use/misuse of water. From the KIs' perspective, it was somewhat unclear how GI planning would inform/be informed from the IWM process.

In summary, the two KI representatives appeared to consider GI as an implementation tool for IWM plans. The integration aspects of grey and green infrastructure themes within the proposed GI planning framework were not given consideration. However, they
suggested that the value quantification of ecological services from GI is a worthy pursuit. They acknowledged the efforts of Gibsons, British Columbia, as a community that is considering the value of natural capital and adding it to their municipal corporate books. In addition, comments were offered at the end of the interview to indicate that GI should be a useful tool in climate change adaptation efforts.

“Adaptation planning is required to adapt to challenges – adapt to threats such as climate change. The need for GI is relative to future air impacts, carbon sinks, vegetative technologies, etc. There is a need to see multiple benefits of green spaces.”

As the umbrella organization for CAs in the Province, the two KIs focused their comments to how water should be managed on the landscape. Their strategic focus on land use planning efforts was directed to IWM plans that have been completed in CAs that are subject to high development growth pressures. In terms of rural areas, they acknowledged the rural stormwater management efforts that are being led by some of the CAs bordering Lake Huron, such as in the Ausable-Bayfield and Maitland watershed areas. Within these CAs there are many initiatives associated with rural clean water programs that address the reduction of excess nutrient/sediment loadings from water runoff from agricultural lands.

5.3.1.5 Ducks Unlimited Canada - Kevin Rich, Ontario Office - Industry and Government Relations, Provincial Policy Specialist

Mr. Rich works in the Ontario provincial office of this national environmental NGO whose mandate is to restore lands to natural habitat, principally in the form of new or restored wetlands. Mr. Rich expressed an interest in the GI planning concept in relation to how Ducks Unlimited works with landowners to conserve, restore and manage wetland areas. He prefers to refer to GI in a rural/semi-urban context as "natural" infrastructure as this distinguishes it from the form of GI used in more urban settings which is most often associated to matters such as porous paving or bioswale provision.

Mr. Rich supports the notion of GI planning as it adds a broader perspective to the values of natural assets to local community development and resilience, e.g., local food, quality
of life. However, he is unsure of the specific mechanisms to distinguish it as a valuable community planning exercise tool. He is unsure of the added value it provides in an Ontario context where the provincial government is mandating natural heritage system plans for areas south of the Canadian Shield, and Conservation Authorities are using Integrated Watershed Management (IWM) planning systems to examine how water is used/managed on the landscape. He felt GI planning could be akin to sustainability planning systems that have been used in various communities such as the watershed-oriented plan prepared by the Severn Sound Community Association, i.e., an Integrated Community Sustainability Plan (ICSP).

In consideration of the appropriate features contained within a GI planning framework, Mr. Rich suggested that wetlands should be another important component of the GI system. Wetlands are important in the cleansing and storage functions they provide in source water protection efforts. The development of artificial wetlands and control of rural stormwater runoff are important considerations to reduce nutrient/sediment loadings to receiving waterbodies.

He outlined many funding mechanisms that are in place or currently are in the works to assist in the creation and retention of wetlands. New funding initiatives could include climate change mitigation strategies such as carbon capture and storage within wetlands. In addition, he identified the federal government’s interest in providing infrastructure dollars for the development of GI in rural Canada. Mr. Rich was supportive of payments to private landowners for the G + S that nature provides on those lands if retained in a natural state. Appropriate agreements are required to ensure natural areas are retained in a natural state.

5.3.1.6 EcoHealth Ontario - Suzanne Barrett, EcoHealth Co-ordinator

Ms. Barrett provided insights into GI planning from perspectives associated with Ecohealth Ontario, as well as from her role as chair with the Stewardship Network of
Ontario (SNO). Details on the EcoHealth Ontario organization are provided in Appendix G. Details on the SNO organization are provided below.

SNO has a similar function as the Ecohealth collaborative but has been in existence for a longer timeframe since 2004. SNO provides information-sharing mechanisms through a website and meeting opportunities with representatives of several Ontario provincial ministries, agencies and NGOs interested in environmental stewardship matters. This networking organization has an overall mission to enhance Ontario’s biodiversity conservation efforts and environmental priorities: “Our Vision is a future where Ontarians care for air, land, water and biodiversity and work together to sustain the natural processes on which all life depends.” Funding for the organization comes primarily from in-kind support by its members as well as Ontario government grants such as the Trillium Foundation for special projects from time to time.

The subject of GI planning is directly relevant to the interests of Ms. Barrett. She has been working in the environmental communications field for over three decades. While being supportive of the overall concept of GI planning, Ms. Barrett provided specific comments on how she felt the concept could be given greater substance and understanding to the general public. She suggested that the aspect of "living" should be associated with GI to distinguish it from other green aspects such as renewable energy. In addition, she wondered why, in the existing Ontario planning system as noted in the PPS, that GI is given a narrow focus: “Stormwater management is only a small component of the overall GI tent.”

In reviewing the GI planning framework, Ms. Barrett did not think it was appropriate to mix tangible things – grey’s bricks and mortar, pavement, pipes and wires with the intangible aspects of green such as climate change amelioration effects or biodiversity protection and enhancements. She suggested that, with a land use planning orientation, green should comprise categories that have tangible manifestations on the land such as greenway networks, waterways and treed landscapes.
Ms. Barrett acknowledged that a “general ecosystem support” mechanism in community planning is a worthwhile enterprise “GI planning is a principle motivator for various stewardship initiatives, and associations with natural health.” She went on to indicate that the GI planning concept can assist in the development of “the complete community; a healthy, robust natural system is a necessary component of complete communities”.

She indicated that:

“Various options are available to further the notion of GI planning within the current planning system of Ontario: 1) create a new strategic planning system incorporating GI thinking; 2) build on existing tools/techniques to make GI planning happen.

In whatever form the planning system takes, it is important to take care of existing land, air and water resources."

5.3.1.7 Essex Region Conservation Authority (CA) – Kevin Money, Director
Conservation Services

Mr. Money works for the Essex Region CA which is located in the southwest corner of the Province encapsulating the Windsor area. Mr. Money was identified as a potential KI for this research based on his responses in the initial GI Use Survey for this research program. The interview with Mr. Money was a wide-ranging exploration of the environmental stewardship challenges for the Authority. In summary, the following background environmental conditions are what he felt were most important in the area:

- a rich agricultural clay base provides a significant run-off challenge with soil sediment and agricultural input nutrient issues described vernacularly as "land soup";
- limited natural areas due to forest clearing and wetland drainage efforts to make land available for agricultural production;
- increased flooding in recent times including 500-year storm events due to climate change conditions;
- Great Lakes algae bloom conditions;
- significant plant/animal invasive species conditions with changing climate conditions;
- loss of an estimated 20% land area tree cover due to recent ash tree destruction by the Emerald Ash Borer.

Against this backdrop, Mr. Money is working with landowners to use GI technologies to provide environmental stewardship initiatives to plant trees and lessen land erosion and nutrient loadings into receiving waterways. Drought concerns are not a
significant issue in the area due to the proximity of the land base to surface water resources in adjacent waterways, i.e., irrigation water can be pumped from Lake St Clair, the Detroit River, Lake Erie, and into the extensive drainage ditch matrix that covers the rural region.

Mr. Money believed a GI planning framework can be useful for strategic planning purposes. Within this process the natural features of an area can be identified and used as strong community sense-of-place elements.

"Essex should be defined with a variety of natural features including prairielands, wetlands, and the multiple-function types of aquatic natural systems, especially using the Great Lakes as a means to define the region."

In consideration of the specific GI planning framework, Mr. Money had some difficulty discerning the interplay of GI as elements on the ground and GI as services, e.g. climate change mitigation. From his perspective, the green components on the conceptual diagram did not correspond well with the grey features that all are representative of features on the land.

In considering the functionality of a GI planning template for the Essex Region, Mr. Money believed there was a good fit with the work the CA is doing:

"The CA mandate is to build GI in the region. . . the goal is to build natural habitat - improve natural capital. They are the leader in the region in putting this as a priority. Many of their initiatives fall under the umbrella of GI."

In addressing the question of what needs to happen to support GI planning, Mr. Money provided the following suggestions: provision of funding to support new GI elements; supportive land use policies to provide connected greenways through the landscape, such as the provision of riparian buffers along drainage ditches; build upon integrated watershed management plans such as the South-East Leamington Erosion and Land Protection Study (Essex Region CA, 2007); and give GI support to implement projects for source water protection plans.
“To formulate a useful GI plan, key individuals in the community are required to get buy-in and acceptance right from the formulation of the GI planning proposal. Natural heritage system plans with features on the land within a systems context are important considerations in the preparation of a GI plan. Habitat, both aquatic and terrestrial are of primary importance.”

Mr. Money finished the interview with a strong endorsement of the potential for GI planning.

“GI plans can go further than other plans by a conservation authority such as source water protection plans; these plans are concerned primarily about drinking water quality and quantity issues. Integrated watershed management plans look at water issues from a broader perspective ensuring water quality/quantity in the community. GI planning can make the existing system better as currently the Essex region is not in balance . . .”

5.3.1.8 Friends of the Greenbelt Foundation - Tom Bowers, Research Manager; Kathy Macpherson, Vice President, Research and Policy

The interview was completed with two senior staff members of the Greenbelt Foundation. This Foundation is a non-profit entity whose mandate is to support the continued integrity of the natural, agricultural and rural characteristics of the Greenbelt policy area that surrounds the Toronto-centred Golden Horseshoe.

In reviewing KI organization questionnaire, the respondents were unsure of the utility of a holistic GI planning notion. They believed GI should be focused on urban Low Impact Development stormwater management design mechanisms. They referenced the provisions of the Ontario Government’s 2014 PPS respecting this matter.

Tom Bowers indicated that:

“Everything that is green/natural can be construed to be GI; what have you gained with this notion within a rural context? A broad definition could muddy the policy formulation conversation currently underway in Ontario. GI is more valuable with a more refined definition and application.”

Mr. Bowers went on to describe his preference for discussing GI:
“... something that includes an engineered/managed natural system that provides ecological support for both human and natural communities such as water management and linked natural systems. GI should support the natural system – it is a tier down from nature.”

Kathy Macpherson likewise was unsure of the purpose of a GI planning framework: “... unsure of the utility of planning with a GI strategic focus, as the concept encompasses many facets of nature and is unfocussed.”

The respondents did not offer much comment on the planning systems framework looking at the interrelationships/interactions of green and grey infrastructures. Tom Bowers indicated that only a limited number of G + S of nature were included, and it was incomplete. Also, there was questioning on the meaning behind the arrows in the blocks of grey and green infrastructures within the conceptual diagram.

In reviewing the utility of GI in a strategic planning framework, Kathy Macpherson acknowledged that the discussion of the G + S of nature within the planning model may be of use in explaining this difficult concept. She also was interested in what others may think about this planning concept. Mr. Bowers supported the notion of GI planning as it is associated with an “engineered/managed approach of nature/natural systems that connect to urban areas”. This could be reflected in plans for stormwater management mechanisms and support for natural heritage system planning.

5.3.1.9 GI Ontario Coalition - Deborah Martin-Downs, Coalition Chair

Ms. Martin-Downs is the Coalition Chair and also the General Manager of the Credit Valley CA. The Coalition comprises government and non-government umbrella organizations centred in the Toronto area that are interested in promoting the use of natural infrastructure to address development issues.

The interview provided a rich overview on the GI topic. Ms. Martin-Downs provided insights into the formation of the GI Ontario Coalition, and the work of the organization since 2009. She indicated that when organization representatives first came together
there was interest in advocating for a GI Act for Ontario that would mandate consideration and implementation of measures for the Province. Since the early days, however, Ms. Martin-Downs indicated that the Coalition has moved away from this legislative action approach to a more nuanced effort whereby GI should be slowly introduced into Ontario by various supportive initiatives. She gave illustrations of their efforts such as lobbying for the inclusion of GI as a concept in the Province’s 2014 PPS, and encouraging modifications to the Provinces’ guidelines for stormwater management to include urban Low Impact Development provisions.

Ms. Martin-Downs provided several comments on the GI planning framework. Overall, she felt it important that additional elaboration be made on how GI can work with grey infrastructure to return greater economic benefit to a community. She presented the following ideas to support this idea: outline how cost-effective green spaces can aid municipalities’ park/recreational assets; and quantify passive energy savings that result from strategically-placed trees that can provide summer shading or winter sheltering services. She expressed interest in the biodiversity protection service of GI for municipalities but suggested this needs to be made real as an important community priority by outlining tangible long-term human benefits for this protection. Again, to illustrate this point, she provided some supporting ideas: provide diverse natural systems that can create potential future adaptation/adjustment alternatives to changing circumstances; create interesting diverse natural settings for development whereby lands can be marketed for increased value and higher municipal tax assessments.

In consideration of the appropriate settings for GI provision, she felt all areas could benefit from their provision in community settings. She acknowledged that the existing consideration of GI from the Coalition’s perspective has an urban-centred emphasis due to the make-up of the Coalition members, and also several of the pressing issues facing highly impervious, dense grey infrastructure centres, i.e., stormwater management quantity and quality conditions and increasing urban heat island effects due to climate change impacts. She expressed interest in further exploration of GI provision in rural settings.
In terms of a GI planning strategy focus, Ms. Martin-Downs believed that,

“there is utility of a GI planning framework that is distinct from other planning systems such as watershed management planning. GI planning goes beyond water considerations; it is important to link street trees, for example that have tremendous water storage capabilities in the tree canopies, with energy saving opportunities.”

She went on to indicate other opportunities of GI planning:

“Anchor pieces and linkages are important components of GI planning. Provide connecting links that can include permeable - penetrable, porous spaces; these include agricultural fields, institutional grounds, active park spaces, golf course lands, etc. to connect natural areas together.”

Ms. Martin-Downs offered many ideas as to how the application of GI planning could be furthered, and in rural areas particularly. The following points summarize some of the ideas that she provided: learn from other areas that have implemented rural-based GI mechanisms; learn from and create alliances that are doing on-the-ground GI in rural parts of Ontario (ALUS, Ducks Unlimited); research and recognize the strong GI beneficial opportunities of stormwater management in rural locales; recognize challenges of various meanings of green as it can be applied to land use planning and provide educational resources.

5.3.1.10 Ontario Federation of Agriculture (OFA) – Peter Jeffery, Senior Policy Researcher

The following interview remarks are Mr. Jeffery’s viewpoints only, and do not necessarily reflect the opinions of the OFA organization. Mr. Jeffery commented as a KI being knowledgeable of land use planning matters in the Province, and particularly on matters pertaining to farming operations. The OFA is a non-profit corporation that has a mandate to promote and assist in viable farming operations in the Province.

Mr. Jeffery believed the draft GI planning framework diagram made sense, but it did not accurately reflect the many green aspects that can be encapsulated within grey infrastructure systems, e.g., utility corridors that can be used for parkways, trail systems. He went on to indicate the topic area may be academically interesting, but it most likely
would not generate much interest to an average person. GI planning as a “high level conceptual notion may be difficult to excite interest – an academic interest with limited appeal to average folks.” In addition, Mr. Jeffery indicated that government land use regulation is very complex with many differing pieces of legislation and requirements, and “GI planning may add to the confusion.” He acknowledged that there are a multitude of public and private interests captured within agricultural land:

“It is important to acknowledge the added environmental and ecological service values that food lands provide; these include the provision of biodiversity and wildlife; climate control; erosion control, recreation and tourism and other aspects outlined in the GI graphic.”

In terms of specific applications of GI, Mr. Jeffery noted the important services that agricultural lands provide with respect to stormwater management functions such as its pervious cover. It is important that a systems design approach be used with various drainage systems in place (overland flow on private lands, private drains and ditches, municipal drains). Mr. Jeffery discussed the many challenges that are captured within an environmental policy/regulatory structure when applied to private lands. Good environmental efforts are applied to farmland areas but there are not compensatory measures put in place for loss of agricultural production, i.e., public payment for G + S of nature when applied to natural heritage systems, waterway riparian buffers, or set aside lands.

As a summary comment, Mr. Jeffrey noted that GI planning may be of use in looking at agricultural lands as part of a “one landscape” approach to considering the multitude of environmental public benefits that are provided from privately-owned farmland. Using this systems approach may generate greater understanding by various stakeholders of the multiple capital values included within the land.

“The system needs to recognize that ecological services are also available in agricultural lands; these include climate change mitigation, biodiversity, attenuating storm events, groundwater recharge, etc.”
Mr. Wise works with Ontario Nature, a non-profit environmental NGO whose mandate is to protect and enhance natural areas in the Province. Mr. Wise provided a strong endorsement for connected thinking regarding the GI planning strategy. He reflected on the Greenway Program that Ontario Nature has delivered to encourage systems thinking for natural spaces. Their organization funded the *Best Practices Guide to Natural Heritage Systems Planning* (2014). In reviewing the schematic GI systems planning diagram, he felt it was too simplistic and did not adequately reflect the multitude of services that nature provides for human health and wellbeing. In addition, implementation mechanics for a GI planning system were not offered.

In terms of considering mechanisms that encompass GI thinking, Mr. Wise provided several examples of tools that can be used. The biggest opportunity is the use of natural heritage systems to link landscapes together.

“*Many opportunities are available to enhance natural heritage systems using green infrastructure to create open space linkages in the community-built fabric.*”

He also outlined the increasing use of the ALUS program to provide more GI within rural agricultural areas.

“*The working landscape can directly benefit the farmer as well as nature. Marginal lands can be used to assist the natural heritage system.* . . .

*The GI planning system represents another tool to assist in furthering the natural wild species and wild spaces agenda*”.

Mr. Wise also pointed out that ecological economics is furthering the human valuation of natural systems in a monetary sense which points towards greater understanding and appreciation of GI. This is moving us “into new elements of nature’s services that includes carbon sequestration beneficial attributes.”

Mr. Wise expressed some discomfort with the lack of details in the KI questionnaire on the implementation of GI planning. He noted the planning framework is positioned as only a concept when it should be implemented, especially in the settled southern
portions of the Province. He felt GI planning may assist in achieving the desirable minimum 30% natural lands objective in areas dominated by working landscapes. The GI planning process allows public objectives to be meshed with private landowner aspirations.

“GI planning can provide more tools, and redundancies to protect natural systems. Additional layers of understanding and support can provide better layers of protection.”

Mr. Wise indicated that:

“The landscape doesn't create the constraints to development in southern Ontario; it is the buy-in for the acceptance of the need to protect nature. The land is ripe for development and the public interest goes beyond local interests only; it is important that work with municipal planners and community leaders takes place.”

He thinks additional effort needs to be directed at protecting natural areas in the settled south of the Province.

“It is important to acknowledge that as southern Ontario continues to develop that limits to progress must be set including matters such as new greenbelts and new land use policy. The environmental impact of development has not properly been assessed on the southern Ontario landscape over the past century – mitigating impacts to ecological communities have largely not been considered.”

In summation, Mr. Wise felt that GI planning may be able to build a business case around the importance on linking healthy natural systems to healthy working landscapes.

“A green infrastructure strategic planning approach can identify what are the problems and then create a discussion forum to address identifiable opportunities.”

5.3.1.12 Ontario Soil and Crop Improvement Association (OSCIA) - Harold Rudy, Executive Officer, Research and Business Development

Mr. Rudy is a senior executive with this agricultural support organization. The Association has been in existence from the 1930s and has a mandate to “facilitate responsible economic management of soil, water, air and crops through development and communication of innovative farming practices”.

Mr. Rudy indicated the high-level overview of the GI planning framework was alright; he thought that agricultural lands could also provide biofuels/bio-products in addition to
food production activities, i.e., reflective of the many diverse products that can be grown on agricultural lands. He went on to state that in terms of the practical use of GI planning in a community, the prioritization of activities and robustness of the overall environmental consciousness will be related to how “green” the community is. To measure greenness, metrics can include inventories such as the extent of natural areas in an area or tree coverage. The planning process can then examine various overall community design options, e.g., planning scenarios reflective of an optimum versus a realistic green space provision option.

Mr. Rudy believes the OSCIA is an example of a GI provision organization, as it provides merit-based incentives to farmers for environmental initiatives on the ground using provincial funds. Examples of funding projects include: Species at Risk Farm Incentive Program; Great Lakes Agricultural Stewardship Initiative (GLASI) program to remove phosphorous from the Great Lakes; Species at Risk Partnerships on Agricultural Lands-Grassland Stewardship Program; Environmental Farm Plan with mechanisms to provide environmental enhancements such as riparian buffers, windbreaks, riverine fencing, nutrient management, and conservation cropping programs.

As time goes along, Mr. Rudy believes, we are “getting better in identifying priorities by topics, farmers’ needs, generic landscape needs.” With this knowledge base, it is hoped that a GI planning system can derive the best approach to land use allocation considering both public and private interests. In order to move forward with a GI planning strategy, Mr. Rudy states that ‘best practice research’ needs to be applied to deal with the issues we are facing today and anticipated in the future. For example, rural landscape stormwater management systems on agricultural lands are only now being studied such as the priority sub-watershed study areas along Lake Huron. In addition, comprehensive information on overland flows of stormwater are not available, and this should be a priority study area in anticipation of more extreme weather events with climate change.

In terms of mechanisms to promote a GI planning approach, Mr. Rudy provided many ideas.
“It is important to set suitable levels of natural area land aside that are reflective of a realistic balance in achieving public interests such as employment with food/fibre production as well as provide protection of the environment.”

This allocation of effort needs to be set on the best science that is available as there are extreme pressures being placed on the limited land supply in southern Ontario. Effort must be made via the measurement of outcomes through using government expenditure of funds for various environmental initiatives such as the protection of species of risk bobolink nesting habitat. GI planning may be useful in examining the various trade-offs that need to be made in a specific geographic location, between interests of the public versus individual property owners.

“Individual property owner objectives will not necessarily align with bigger picture community ideals; community leaders need to show priorities for local contexts.”

5.3.1.13 Rural Ontario Institute (ROI) - Norman Ragetlie, ROI Director of Policy and Stakeholder Engagement

Mr. Ragetlie is a senior staff member of the ROI. This organization’s mandate is to increase the community capacity of rural communities and is interested in building rural leaders for tomorrow.

In reviewing the GI planning framework, Mr. Ragetlie noted that there was a mixing of ecological services with land use elements that he found confusing. He thought this could be simplified through the basic needs of life in clean water, land and air. Following this would be the various elements, G + S of nature that are essential for health and wellbeing. He noted there is increasing interest in environmental matters – whether it consists of ecological economics or interest in permaculture agricultural systems.

“Humans see ourselves separate from the environment - but we are all part of one system. A re-awakening of the potential for environmental systems planning may be occurring, but there are numerous barriers in the way.

Mr. Ragetlie indicated that a GI planning system makes sense, but elements need to be separated from functions and services of nature. Inspiration for this type of system can come from existing plans such as the Niagara Escarpment Plan. There is a need to
acknowledge there are many natural resources, including aggregate from which our communities are constructed.

Mr. Ragetlie believed a strategic planning focus in GI planning can be useful in bringing diverse community stakeholders together to collaborate on issues in their community. This format of strategic plan making is something that ROI takes on quite often for "wicked problems" in rural situations, e.g., rural transit services, school facility provision, regionalization of services such as government, recreation, or hospital facilities. GI planning in its formation can “take advantage of the systems that we are living with”. He endorsed GI planning but outlined many challenges. For example, ecological services have value at different scales – for local situations all the way up to global environmental effect. To derive consensus on what is a priority in a local area is difficult. Another issue is the degree of understanding that can be derived for individuals in discussing a very complex topic.

“Numerous barriers to using a GI planning system needs acknowledgement: pressures to complete strategic plan are absent, unless there is a crisis or there is strong local interest; short term thinking and economic interests hold sway; lack of funding to undertake a comprehensive study; unless an external threat to an existing situation is felt such as a new development, then impetus to conduct strategic thinking in an environment with limited resources is problematic; long term thinking is often absent at a local area; multiple governance structures and power debates often get in the way.”

Implementation of a GI plan is extremely difficult, but Mr. Ragetlie believes:

“the effort is worth pursuing. . . Part of our obligation is to protect and preserve our ecosystems. It is important to put some rigour and importance in the protection of our ecosystems. Watch and steward the landscape.”

5.3.1.14 Trout Unlimited Canada (TUC) - Jack Imhof, Director of Conservation Ecology

Jack Imhof has had a long career as an ecologist and is a senior staff member with TUC. The organization is an environmental NGO whose mission is “to conserve, protect and restore Canada’s freshwater ecosystems and their coldwater resources for current and future generations."
Mr. Imhof commented that, as an ecologist, he has a good understanding of how the G + S of nature work. In terms of specific comments on the elements included in GI, he suggested that clean water should be noted as being essential for life, whether in a human or a natural community. He also thought that hazard areas should be denoted as some of these natural areas are not good for human health and wellbeing. Sustainable soils that are rich in organic content and water retention capabilities are also important GI features.

Mr. Imhof had the following remarks to make on the GI planning framework:

“The outline diagram with some modifications holds promise to assist in planning resilient rural places. The inclusion of GI planning with grey infrastructure can be useful. GI is particularly useful for providing water storage on the landscape.”

In terms of GI planning implementation, Mr. Imhoff felt it had relevance in areas with industrial farming activity, in that soil quality is generally in a poor state and water quality issues are also quite significant. GI planning has an inclusivity agenda as “everyone lives downstream from somewhere else.” He argued for the need to repair agricultural soils through water and soil conservation efforts.

In considering methods to assist in implementing GI planning, Mr. Imhoff offered the following ideas: Organizations like TUC can educate people on the importance of GI on the landscape. The farming community needs to understand that while they tend to think they are farming commodities, they should also think they are farming water, i.e., “if water is managed more effectively and sustainably, then downstream landowners benefit.” Education is important for explaining how GI planning works. We “need to convince those who are in authority that we need to change to improve our circumstances – a challenge and opportunity for the GI planning system.”

Mr. Imhof completed the interview by making comments on how water is central to a healthy system – both human and natural. Integrated watershed management planning developed in the 1990s by the Ontario Ministries of Natural Resources and Environment has a key role to play in identifying water protection and enhancement opportunities on the land. This information can be tied into GI planning and the overall land use system.
“We need to plan for healthy ecosystems - unhealthy ecosystems will lead to unhealthy settlements. . . Healthy waterways are the capillaries of water supply for healthy landscapes. . . Additional opportunities to store water on agricultural lands needs to happen.”

5.3.2 Summary Analysis – Key Informant Organizations Perspective on GI Planning

This section provides observations on the fourteen KI organization representative perspectives concerning GI planning. Remarks will centre on commonalities and differences in observations and opinions. Reflections back to the goal and objectives of the research will be highlighted - namely, does the notion of a GI planning system have resonance with entities doing planning and/or development work in rural Ontario?; Can the elements of GI be used to build resilience in rural communities?; Are there particular mechanisms to build GI system capacity if it appears there is acknowledgement and acceptance of the worth of GI planning?

5.3.2.1 General Observations on GI Planning - Organizations

The organizations provided a variety of perspectives on the GI planning topic. Their viewpoints tended to be more varied than the opinions offered by the respondent planners that participated in the research. Some of the organization representatives wanted to discuss GI use from a very narrow perspective – using it primarily as a stormwater management tool, which is the primary policy direction of the provincial government today. Other organizations defined GI from a very broad perspective and that it could be used as a strategic planning tool. There were also several examples given on individual uses of GI elements to promote environmental or human community health and wellness; these include instances where new naturalized areas were provided or where community tree planting occurred.

Five of the fourteen organizations gave a whole-hearted endorsement of the use of GI for strategic planning purposes, with examples provided where alignments could be made with specific GI uses in-the-field, i.e., park provision, new natural area
establishment. Overall, four organizations gave a general positive review, on the belief that the new system could work with existing planning instruments that are in play for communities; these KIs referenced possible synergies with the development of Natural Heritage System plans, Integrated Water Management plans or Community Strategic plans. Four of the KI organizations gave the concept a bit more ambivalence to its potential utility. A variety of reasons for this neutral position were given; for example, the notion is hard to define and therefore difficult to implement, or there are already other available means to implement nature protection and green provision schemes. One organization felt emphasis should be placed on implementation of the current understanding of GI as it is a relatively new term dealing with stormwater management in Ontario.

Overall, in assessing all KI organization perspectives, there was general support for a GI planning initiative; it was in the area of implementation and extent of use where there were mixed opinions on its function.

Table 5 offers general categorizations of thought on the use of GI, as provided by the organization KIs. A check-mark in a cell illustrates that the KI thought a particular GI theme would be relevant to their particular organization. In addition, some additional outliers of interests were also noted.

**Table 5 - KI Organization Summary Perspectives on GI Planning**

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<th>Themes</th>
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<th>GI as a community development tool</th>
<th>GI addressing climate change and/or biodiversity enhancements</th>
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<td>13) Rural Ontario Institute (ROI)</td>
<td>Themes</td>
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<tr>
<td>14) Trout Unlimited Canada (TUC)</td>
<td>Themes</td>
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*It is interesting to compare the results here with the planners rather-focused consideration of the use of GI (see Table 2). In comparison, several organizations presented outlier observations whereby the functions of GI could be associated with specific missions of the individual organizations. In terms of the planners’ perspectives, a wider community orientation on the use of GI elements in planning was noted with fewer other considerations.*

**5.3.2.1 Specific Observations from Organizations on the Use of GI in Land Use Planning**

In terms of the specific uses of GI from the KI organization discussions, there did not appear to be any disagreement with the use of GI elements to support stormwater management for rural settlements or a wider application across rural agricultural landscapes. Some organizations presented this as a logical consequence of the provincial
government’s policy approach in encouraging the use of GI systems for stormwater management within growing, urban communities. The Greenbelt and Conservation Ontario KIs spoke quite matter of fact regarding this aspect of GI use. Other organizations, such as the OSCIA and the Essex Region CA, suggested that rural nonpoint source stormwater management may be the next area for consideration of GI use, i.e., look at mechanisms to control stormwater on the surface of agricultural field areas to protect areas from soil erosion and nutrient runoff.

Some organizations viewed a GI planning strategic approach as a useful means to bridge various divides in rural communities. Specific applications of GI elements such as tree/grassland plantings or local food growing opportunities would be useful endeavours to build rural community resilience; these notions were supported by groups such as Carolinian Canada, Nature Ontario and Huron Community Futures.

Some respondents were quite philosophical on the topic of GI planning. For example, the ROI representative provided numerous conditions by which society would need to change in order to support the notion of a GI planning scheme working alongside traditional grey infrastructure. Other KIs such as ALUS noted some scepticism as to the utility of yet another potential new planning system in Ontario when there are many planning structures and governmental regulations already in place (environmental, social, and economic focused) for communities.

In addition to these observations, some KIs wanted to know concrete steps/actions that would be necessary to implement GI plans, while others were willing to acknowledge that systems slowly evolve over time with additional knowledge being necessary to motivate change from the way things are done today. Some were anxious to implement current GI thought with a stormwater management focus, while others were interested in understanding and exploring how GI planning can evolve, i.e., build on current stormwater management emphasis, apply it to rural agricultural areas, and then integrate it more fully with IWM planning and NHS planning systems.
Some organization KIs were unsure of the overall benefit of a community strategic GI planning schema. They thought individual GI ideas or elements could be useful on their own to derive multiple community benefits, e.g., the use of trees to ameliorate the impacts of climate change, provide property beautification, and a source for nature experience.

The Ducks Unlimited representative outlined the importance of GI within an overall strategic planning approach. This KI provided remarks presenting a scenario whereby a GI plan would open up the dialogue between community stakeholders as to how living infrastructure could be used to address local issues while looking at bigger picture provincial, national or global interests. A broad-spectrum strategic planning exercise could look at, for example, matters such as using GI for aesthetic community resources, or as a means to get the entire community working together on a project. The thinking and observations from the DUC representative were coming from an individual deeply embedded in the planning policy world found in Ontario. He went on to indicate that GI planning on its own would be a difficult concept for most Ontario municipal officials to wrap their minds around. He mentioned municipalities have not moved yet to putting ecological services on the financial balance sheet through their local asset management plans. He compared this situation to the current advanced understanding and acknowledgement of ecological assets for municipal operations as used in the Town of Gibsons, British Columbia (Gibsons, 2018).

Through the KI interviews, observations on challenges/opportunities of various environmental stewardship approaches were reviewed. Interesting comments relative to governance, validity and transparency monitoring issues were noted. For example, natural area easements require on-going validation and reporting efforts that can be costly from an administrative perspective.

The researcher also completed a correlation analysis between the general GI planning perspectives of KIs and their sustainability lens sector perspective on the world, e.g., did the organization KIs with an economic mandate orientation look at GI planning in a
similar manner. The characterization of organization KIs was depicted in Table 4. From this analysis, no discernable consistency in thought on the GI planning topic was detected from the organizations that reflected the principal perspectives of economic, social and environmental thought.

In summary, the KIs provided insightful commentary on the questions being asked of them. Some of the organization participants, as with anything, had more time and interest to discuss the GI topic while others were not as interested. Some of the organization representatives made comments that were supportive of their own organization’s perspective on the way to go about business while making some unfavourable comments on other organizations’ frame of reference perspectives. There were varied opinions on the following matters: the value of nature is priceless versus humans need to make payments to those who own land with natural assets that provide ecological G + S to all; governments need to provide more financial carrots rather than regulatory sticks when dealing with private landowners and environmental stewardship activities; slow incremental change is necessary versus a wholesale implementation change is necessary in acknowledging GI as a tool to assist humankind.

Overall, the KI organization representatives presented worldviews that were reflective of a "glass is half full" optimistic view respecting GI planning, agreeing that GI planning may be a useful aspect in the quest for community sustainability and the resiliency.

5.4 Synthesis

This section synthesizes the findings of the research as they relate to the following three main topics: an overall overview of KIs perspectives on GI planning; the creation of a more robust GI systems planning framework based on commentary from the research participants; and then finally, comments and observations on the research results from a review panel at the University of Guelph. The material included here represents the last three steps of the research as depicted in Figure 9.
5.4.1 Overall Perspective of Research Participants on GI Planning

This sub-section presents information combining the results of all research participants – KI planners and organization representatives as well as the planner Focus Group. To complete the work here, the comments from these individuals were analyzed via a software package provided by QSR’s NVivo system. This system provided a number of analysis outputs: word counts – the most predominant words used by research participants in considering GI planning; tree maps - illustrations of associative words provided by research participant responses in addressing the questions asked of them. Responses to three questions were assessed and the following sub-sections provide the results. The first sub-section 5.4.1.1 deals with the research participants understanding and perspectives of the draft GI systems planning framework as outlined in Figure 11. The next sub-section 5.4.1.2 goes into a review of the participant understandings associated with the question: “In consideration of your work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities?” The final sub-section builds on the results of 5.4.1.2 by asking the question: “What mechanisms should be used to assist in promoting a GI planning system in Ontario?”

5.4.1.1 Assessment of the GI Systems Planning Framework (Draft) Diagram

The research participants were asked to review and comment on the draft GI Systems Planning Framework as outlined in Figure 11. All participants were exposed to this diagram for the first time within the interview/discussion sessions. The resulting responses from the individual participants were analyzed by the researcher as well as running the data through the NVivo software system. From this review, a diversity of perspectives was expressed. Some (a minority) thought the framework was acceptable as a means to open up dialogue amongst stakeholders as to what could be considered within a grey/green infrastructural planning framework. These respondents liked the
fact that the diagram is simple in scope and yet it is illustrative of the diversity of G + S of nature that are usually not considered as a community’s infrastructure.

The next grouping of research participants (again, a minority) believed the framework would be acceptable if alterations were made to it to be reflective of a varying range of issues that had specific relevance to that individual. Some of the participants wanted certain components of GI emphasized within the framework to be reflective of their own specific views of GI planning, e.g., comments made with respect to increasing the prominence of stormwater management.

The final grouping of research participants, for both planners and organizations, believed the diagram had several shortcomings that should be fixed prior to its use. The nature of fixings was quite diverse. To summarize, some felt that services of GI should not be mixed with land use fixtures that are found on the ground as denoted by the grey infrastructure elements depicted in the Figure. Some thought additional elaboration on the multitude of potential GI land elements that are available in rural communities should be denoted on the diagram, i.e., land uses as depicted in Figure 2 and numbering 50+ in extent. Still others thought a better display mechanism was necessary to illustrate the interrelationships of grey and green infrastructures at work, e.g., in some instances green can supplement grey infrastructure, and in other instances GI can totally replace a grey infrastructure system to support human endeavour.

With the divergence in opinion expressed by the research participants, the researcher investigated ways to augment the GI Planning Systems Framework (Draft) (see Figure 11) to address the various issues: modify the framework, search for other examples of GI planning frameworks from the literature. After considering these options, it was decided that the best conceptual framework available was one completed by Rouse and Bunster-Ossa (2013) in their publication *Green Infrastructure: A Landscape Approach*. Their planning framework was suitable to address the issues identified by the research participants, i.e., separate services of GI from the land use goods of GI; clearly illustrate the relationships of grey and green infrastructure working together as a foundation for
community development; illustrate the interactions of the ‘stock’ land use components as they interact to the primary ‘stock’ components of the sustainability dimensions of the economy, the social community and the overall environment. In the consideration of flows and interactions, community resilience results at the end as a ‘leverage point’ of the overall grey and green infrastructure system. The revised conceptual GI Planning Systems Planning Framework (Final) is outlined in Figure 18, and sub-section 5.4.2 goes into a greater description of the framework. Suffice to say here, the revised framework illustrates a much more complex GI planning system structure than what was originally contemplated by the researcher for use in rural Ontario.

5.4.1.2 Utility of a GI Planning System
This sub-section provides a summary overview of the utility of a GI planning systems framework as discussed by the participants in twenty-two KI sessions and the planners Focus Group discussion. The following question was asked of the research participants: “Can you envisage the utility of a GI strategic planning system for use within rural Ontario communities?”

The answer to this question has already been explored somewhat in the separate discussion sub-sections outlined previously for the planners (sub-sections 5.2.3 and 5.2.4) as well as for the organization (sub-section 5.3.2.) For the purposes of discussion here and not to repeat previous information, the KI response information that is outlined here has been analyzed in a combined format using the NVivo software tool.

In considering all the words that were used in answering the utility question of GI planning, the following most repeated top ten words have resulted: planning, natural, lands, areas, systems, water, management, community, use, need. In looking at these words, the importance of planning as well as management and systems is quite evident. In addition, the importance of water as a basic life-giving entity to both human and natural communities is evident.
NVivo was also used to generate information concerning associative thoughts on the utility of GI in planning question from the respondents. In this analysis stage, responses that had common/divergent perspectives on the question were mapped. Meaning making was generated in examining the associations that were derived from this process. On a cumulative basis, three trains of thought were generated in considering GI as a useful tool for planning purposes. NVivo outlined three important associative considerations of GI planning with respect to the following terms: planning, natural and lands. The planning branch had associations linked to the topics of management, habitat, development as well as agriculture. The natural branch had associative linkages to systems, services, wetlands, municipal infrastructure and waterways. The lands branch had a strong water association in addition to its relationship to rural areas, storm events, and building.

5.4.1.3 Mechanisms to Promote GI Planning in Ontario Communities

The final question being examined within this sub-section deals with the general question of assistance mechanisms to make GI planning happen in Ontario. The specific question provided to all research participants was the following: “...if you believe there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?” The intent of this open-ended question was to explore the various mechanisms whereby a GI planning system could be instituted in rural communities. In this question, responses ranged from regulation responses through to voluntary consideration applications where it made sense in the local context. In completing an overall assessment of this question, the researcher has had to be mindful that a variety of perspectives were offered as to what the GI planning system should entail, so it is important that not too much is read into the final summation points raised in the following. To add additional clarity as to what is being presented here, some KIs referred to the implementation of a GI planning structure around one or more sub-components of GI, e.g., strategic community tree planting program, a sub-watershed
stormwater management system. With this in mind, some caution in interpretation needs to be made with respect to the following points.

To begin with, all KIs responded to the question which is aligned with the utility in GI planning question that was asked above in sub-section 5.4.1.2; however, please be reminded that some respondents responded to this question with a narrow interpretation of GI planning related to a specific aspect of the overall notion. In addition, some considered the implementation of GI plan thinking within current systems that are in place in the province, e.g., within an Official Plan or a watershed planning system.

In continuing on with an overall consideration of the answer to the GI planning implementation question, the NVivo system identified the following top ten words from all the KI respondents: plans, need, lands, natural, water, system, use, areas, important, work.

NVivo was used again to assess combined thinking of research participants on mechanisms to implement GI planning. A networked tree diagram mechanism was used to outline associative thoughts of KIs as related to the specific question under investigation. This investigative process generated three branches of thought on mechanisms needed to implement GI planning: plans, need and lands. The branch outlining the idea of plans is a reasonable association as a means to implement the GI planning system. Another branch outlined an association of the concept to need and the importance of water and protection aspects. In addition, matters associated with agriculture, working with landowners, conservation and education were also noted. The final NVivo displayed branch on the question associated its implementation with matters affecting lands and water areas. This is clearly related to land use planning efforts; in addition, the branch also had notations concerning the system, works, compensation, payments and funding.

As a component of the analysis respecting this question, the researcher was interested in whether a regulatory or voluntary approach to implementation should be considered in using GI planning. Through review of all of the research participant materials, the
overwhelming response was that this should be implemented only by way of a voluntary response directed to the specific interests of a particular area. The rationale for this was quite varied – differing GI planning efforts are required for differing issues in various rural areas; this is a new notion and needs time to be examined and understood as to its application in rural contexts. The only area where there was some commonality of thought respecting regulation on the topic, was in the use of GI as a stormwater management operation, and in this instance, there were several KIs who suggested that measures using natural infrastructure should be required to be provided by legislation to build increased functionality and resilience into the associated grey infrastructure stormwater system.

Another theme on implementation from many participant responses was the significant need for education in explaining the GI planning notion for rural contexts, and in particular the value added that can occur to rural communities. Also, some participants suggested that system planning guides would be useful to illustrate examples of GI planning where programs, plans or actions are implemented in conjunction with or separate from grey infrastructure systems.

In conclusion, the research participants as a grouping thought the GI planning notion was an interesting construct, and that elements or a complete system approach of its use would have utility in rural community contexts. With this analysis complete, the next sub-section goes into a description of devising a more robust conceptual framework for GI planning based on the research results.

5.4.2 Revised GI Planning Systems Conceptual Framework

The results from the various research steps offered insights on the opportunities and challenges of using GI for land use planning in Ontario’s rural communities. The Survey of GI Use at the beginning of the research illustrated there were many examples of communities using GI elements but not in a networked or co-ordinated system framework. The KI interviews with individual planners and the planners Focus Group
provided additional insights as to how GI elements are being used in community
development issues today. Also, these sessions highlighted ideas whereby GI could be
useful to addressing current rural community challenges and provide new opportunities
for co-ordinated actions in the future. The KI interviews with organizations were useful to
get GI use perspectives from large and small NGOs and agencies working in rural Ontario.
These discussions were quite far-ranging, as the perspectives of these groups were quite
divergent, but again as a summary of interest in GI there was some commonality of
perspective.

As a result of the input received from the research participants, a new conceptual
framework of the GI planning systems model was developed. This work provided an
opportunity to reflect on the comments received from research participants, synthesize
the information that was given, and then prepare an improved GI planning schematic.

The new strategic GI planning framework is illustrated in Figure 18 below. This
framework entitled as “GI Systems Planning Framework (Final)” was adapted from work
completed by Rouse and Bunster-Ossa (2013) and created using systems design
components developed by Donella Meadows (2008). This system explanation of how
green works alongside grey infrastructure systems is much more elaborate from the
original graphic used in the research questionnaire (Figure 11). The more elaborate
depiction of a GI planning system, while being much more complex to read at first glance,
helps to illustrate the integrative and diverse systems network attributes of a green
system working with traditional grey works as a foundation for community development.
The original diagram from Rouse and Bunster-Ossa was adapted by the researcher to be
more reflective of the topics discussed in the rural community work of this research. The
following modifications were made to the urban-focused original work by Rouse and
Bunster-Ossa:

- ‘Green Infrastructure Stocks’ of Rain Gardens replaced by Community Space; Pervious
  Pavement replaced by Rehabilitation Lands; Green Building Envelopes replaced by 2
  separate stocks of Private Land and Agriculture Lands
‘Leverage Point’ of Public Health Outcomes replaced by Community Resilience

For reference purposes the original Rouse and Bunster-Ossa diagram is displayed in Figure 17 and this research paper’s GI Planning Systems Framework (Final) version is in Figure 18.

Figure 17 - Rouse and Bunster-Ossa’s Green and Gray Infrastructure Sub-systems in the Urban Landscape (Original Diagram)

Source: Rouse and Bunster-Ossa, 2013: p 16.
In reading the revised (Final) Framework in Figure 18, the stock elements of the grey and green infrastructure components should be first examined (outlined in dark shading towards the bottom of the diagram). The figure illustrates there are many land use items comprising GI, and in a best fit circumstance these would work alongside the traditional...
grey infrastructure stocks that people are quite familiar with. The interactions of the 
stocks leave the land use foundation system and provide services and functions into the 
Ecology, Community and Environment system boundaries depicted in the top portion of 
the Figure. The land use foundation system is interrelated to all of the components of the 
community via flows and feedbacks between the system boundaries.

Although this figure is quite complex, it is useful to illustrate the interconnections and 
interactions of grey and green stock elements that together work towards the leverage 
point of Community Resilience, and the achievement of the triple bottom line of 
Sustainability9 (ICLEI, 2016).

In the practical application of using this GI planning framework, acknowledgement needs 
to be given to the services and functions provided freely by the environment to the stock 
components of our human society. This acknowledgement goes back then to the 
material from the literature review respecting the Millennium Assessment for Healthy 
and Resilient Communities (Corvalán et al., 2005), and as further elaborated on by 
Tzoulas et al., 2007. In consideration of the original GI Systems Planning Framework 
(Draft) developed in Step 3 of the dissertation work program (Figure 11), this new 
framework distinguishes the built form elements of GI on the land from the functions it 
provides to the human community; this was a major criticism from some of the research 
participants who wanted the illustration of GI elements to mirror the land occupying uses 
that grey infrastructure has within our communities. In addition, this new framework 
illustrates the stocks of grey and green infrastructure elements that together provide 
beneficial outputs to human society. The mixing of the grey and green infrastructure 
stocks in the diagram is meant to illustrate the potential integrative uses of these 
infrastructure types – they can work separately or together to generate outputs for the 
community. Again, the working togetherness of these infrastructure forms was not

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9 The UN’s International Council for Local Environmental Initiatives defines the triple bottom line of 
sustainability to include a full cost accounting approach to development including the capitals associating 
with the economic, human and environmental perspectives.
clearly illustrated in the original Framework (Draft) diagram which simply showed arrows pointing between the grey and green infrastructure systems.

The reformatted conceptual framework for GI systems planning is offered as an improved diagrammatic representation of the model. This model was presented at a summary of results meeting given to interested KI participants and other research officials at the University of Guelph at the end of the research cycle. The discussion held at this review meeting are outlined in the next section.

5.4.3 Research Review Meeting Discussion

As a final step in the research framework as described in Chapter 4 (Step 9), the results of the research were fed back to KI and other invited research officials at the University of Guelph. This meeting opportunity had been made to the various KI who participated in the research program. Nine of the 21 KI attended this meeting, and several of them came from quite a distance for the hour-long discussion. Both planners and organization KI representatives were in attendance.

The meeting was held in conjunction with a larger rural research meeting function put on by Dr. Wayne Caldwell. This larger meeting is an annual recap event of rural topic research activities that Dr. Caldwell and his associates are involved with at the Rural Planning program at the University. In addition to the research participants from the dissertation work, other research officials from NGOs, the OMAFRA Ministry and the University were in attendance.

The purpose of the GI planning Research Review Meeting was simple. First, the participants were given a brief summary of the results of the various steps involved in the research. Secondly, the participants were asked to provide feedback and provide comments on the GI research findings through a facilitated discussion review process.
A presentation entitled *A Conceptual Planning Framework Using Green Infrastructure (GI) Elements to Build Resilient Rural Communities* (June 23, 2017) was provided and then three questions were asked of the meeting participants:

1) *Is there anything in the GI planning framework or its elements that can assist you/your organization in furthering the development of resilient rural communities?*

2) *Is there anything in the GI planning notion that gives you pause or raises concerns?*

3) *Anything else?*

Useful comments were provided. A summary of these comments is provided below. The following points highlight the comments that were provided, and information is listed as to who provided the information and its content.

The Greenbelt Foundation KI organization representative indicated that they had recently completed a GI planning guide for use by small communities within the Greenbelt area. The guide was compiled using assistance from the GI Ontario Coalition and the guidebook focuses on green planning for a small community (Mount Albert) which is expected to have significant new urban growth over the next several decades. The guide’s intent is to show how GI elements, primarily around stormwater management, can be integrated into various planning areas of the community (Greenbelt Foundation, 2017).

The Ontario Federation of Agriculture KI organization representative was surprised at the high priority that came out of the research respecting stormwater management on farmland. This is a challenging area as the land is in most instances a private resource and needs to be planned in conjunction with drainage works and rivers. Several rhetorical questions were asked: who owns the water that falls on the landscape; how can water be captured and used/shared in drought conditions?

The Trout Unlimited Canada KI organization representative stressed the importance of stormwater management efforts on agricultural lands in order to save soils from erosion, as well as build up moisture levels in the top layers of organic matter. In addition, efforts
to provide programs at the provincial and federal levels of government to help implement policy matters would be a worthwhile endeavour.

The Town Planner from Essex (KI planner) provided several insights into planning with GI in that part of the Province. He stated that GI policies concerning climate change impacts (flooding effects, erosion from farmlands) are serious concerns, and new policies have been added to the Town’s Official Plan regarding these concerns. He stated that if we are serious about implementing protective measures for soil and water erosion from agricultural lands then new legislation requiring GI would be required. At the same time efforts to build understanding and stewardship efforts with agricultural landowners must also be made. Overall, it is a complex subject matter, but it is worthy of continuing dialogue and action.

Several comments were made by OMAFRA representatives. These included the following: 1) Some of the challenges with the topic area are the definitions that are necessary for various terms, e.g., resiliency, scope of interest, green; 2) Further work should be made for stormwater management quality and quantity control mechanisms on agricultural lands; this can help with soil and nutrient retention on the land. Assistance from Conservation Authorities can assist in this regard; 3) It should be recognized that GI respecting equal access to outdoor areas is an important consideration for persons who are disadvantaged, e.g., those who are out of work or are young/old within rural communities.

An environmental consultant (KI planner) suggested that planning efforts should be directed to individuals from three perspectives – those needs that the individual has, those needs of a family unit, and finally the overall community need. All forms of GI should be considered for differing needs of humans. A legislated requirement for enacting a GI planning system is not a preferred method for the future; the diversity of rural area circumstances and specific community needs should be given consideration in the implementation of GI ideals.
No one in attendance objected to or had serious reservations in considering the use of GI planning as a way to approach building community resilience in rural places. The majority of the comments raised by participants presented a verification of information compiled through the earlier steps of the research.

5.5 Summary

Chapter 5 has presented the findings, analysis and synthesis of the methods for the research. The data included here have comprised the results of an on-line GI Use Survey of rural community leaders on their views of GI elements and planning. The bulk of the chapter included summaries of perspectives of GI planning from KIs and Focus Group participants representing planning and organizational interests involved in rural areas of southern Ontario. Analysis and synthesis were provided. The chapter ended with a reformulation of a draft conceptual framework considering GI elements as foundational resources for resilient rural community planning efforts. In addition, reflections on the completed study efforts were provided by individuals at a Research Review Meeting.

The next chapter provides a discussion on the implications of the research findings.
Chapter 6 – Discussion

6.1. Introduction

This chapter presents the problem statement and the research objectives in exploring the topic of GI planning as it could be used in rural communities. The chapter provides a discussion on the challenges and opportunities of applying a planning approach that utilizes GI elements to further health and wellness for rural communities.

6.2 The Discussion

As identified in the literature (Caldwell, 2010; Hodge and Gordon, 2014; Frank and Reiss, 2014), there are many challenges for rural communities. This is measured in metrics concerning the health and wellbeing of existing residents, the ability of the community to be resilient to changes that are happening all around them (economic, social, environment), and prospects for better community design for long-term sustainability. The southern Ontario geography is under intense development pressure and alternative land use futures over much of its region, i.e., uses of land that are often in competition for space and utilization of the available area (human settlement expansion; resource use including agricultural production, aggregate extraction, timber use; natural area set asides and biodiversity protection).

This research set out to examine how GI elements and a systems approach to GI planning could assist in addressing these challenges. From a review of the literature, an opportunity was identified whereby the multi-functional G + S of nature could be used to address current and anticipated planning challenges for our communities. It is expected that the use of GI within a networked, multifunctional planning system framework could pay excellent dividends to the vitality and health of rural municipalities in Ontario.
6.2.1 General Observations

The overall goal for the research was to examine how the elements of GI could be utilized within a systems framework that would in turn be useful to assist in the planning effort of Ontario rural municipalities. To accomplish this goal, the following research methods were used: a literature review, a survey of rural community leaders on their perspectives of GI use, interviews and discussions with planners and organizations involved with land use planning in the Province, and a research review meeting by government, NGO and research officials at the University of Guelph.

In terms of specific objectives for the work, the first objective for the research involved a review of the current state of affairs in the Province respecting the identification and use of GI in plans, programs and activities. The literature review and GI Use Survey of rural Ontario community leaders provided the main research components to address this objective. From this review it became evident that at the municipality level, there are no comprehensive strategic GI element plans as specifically defined in this dissertation in place currently.

In examining specific applications of GI element use in Ontario rural communities, work from the Caldwell et al. (2016) study and base survey – the GI Use Survey identified a multitude of individual GI element applications. These uses of GI provided a number of economic benefits, social capacity development and environmental stewardship efforts that can be summarized by the following: the protection of surface and groundwater quality; the provision of clean water supplies and groundwater recharge; increased health opportunities through outdoor recreation, improved air quality, reduction in summer heat island effects; reduced flooding; local agriculture promotion and food; improved community cohesiveness; reduction in traditional grey infrastructure servicing need; opportunities for community education, community amenity and attractiveness; reduced energy consumption; improved wildlife habitat for enhanced tourism and biodiversity protection; provision of resources (where available) such as lumber and improved soil quality; and climate change mitigation and adaptation efforts.
In terms of planning guidance to municipalities in the Province, in 2014 the Ontario government introduced GI language in its PPS. For the first time, a GI definition and policy was available to encourage municipalities to use GI in conjunction with traditional grey infrastructure (Ontario MMAH, 2014 p. 15 and policy 1.6.2).

In the KI interview stage of the research, several interviewees suggested that their communities had other types of plans that could be considered GI plans. These examples included strategic sustainability plans (Sustainable Huron; Severn Sound Sustainability Plan), and also a nature-inspired community Official Plan (Georgian Bay Township). Several other KIs suggested that they had GI plans in place relative to the specific strategic use of certain elements of GI. Plans in this category included a municipal tree planting program with a significant associated capital and operating budget system in place (Wellington County Green Legacy Programme); another project involved the installation of a rural non-point source stormwater management system within an intensively cropped agricultural sub-watershed (MVCA’s Garvie-Glenn).

In examining GI from a systems planning perspective, the notion of networking various elements of nature to benefit human as well as natural communities is largely missing within the Ontario context. This reflection is made in comparison of the situation as identified in the European literature, primarily, where using nature/natural systems to address climate change impact and biodiversity loss is well entrenched. In addition, the Ontario government policy approach to date has been directed at using GI as a supportive tool to matters of stormwater management, and with a focus in urban areas. This situation can be compared again to the European situation where in the UK, the central planning governance office instructs local governments across the nation to institute GI plans as they can address climate change impacts (United Kingdom, Department of Communities and Local Government, 2012).

The second objective of the dissertation research was to make observations on the critical success factors that are needed to enable a GI planning system to evolve in Ontario. In acknowledging the present evolutionary state of GI thinking in Ontario, this
objective deals with looking for signs whereby GI planning may be created. In terms of offering discussion on this, it is the researcher’s belief that several actions would be required to spur a movement of the current planning system.

First there needs to be an acknowledgment of the value of the G + S of nature that provide clean land, water and air for us to survive. This is the realm of ecological economics that has been in place for several decades now and is gaining traction in Ontario through various studies that have been completed recently (Ontario MNR, 2009; Wilson, 2008).

Secondly, governance in Ontario needs to acknowledge the importance of a GI planning system. Again, a tentative step has been made in regard to acknowledging GI as a stormwater management tool within the Province’s PPS (Ontario MMAH, 2014). In the next update of the PPS, a more holistic green-grey infrastructure definition and policy framework should be made available.

A third step is for civil society organizations to demand that better planning be instituted by government. This is difficult, as these organizations are often funded by government. However, an umbrella organization of primarily environmental agencies and NGOs have come together to co-ordinate actions for this purpose – this organization is known as the GI Ontario Coalition (2016).

A fourth step is the demonstration of the value that can be derived from a GI planning system. There is significant literature on this from European and U.S.A. contexts. Information on GI costs and benefits are available in the literature from the European Environment Agency (2011) as well as from the U.S.A.’s Center for Neighbourhood Technology (2010). These documents provide the dollar savings in infrastructure valuation or benefits to the environment relative to water, energy use, air quality and climate change. Other benefits for health and wellness for human communities include topics on recreation, aesthetics, community connectiveness, noise pollution and excessive summer heat exposures, public education, and habitat and biodiversity
protection. Further discussion on the importance of quantifying the benefits of GI are presented in the opportunities of GI planning sub-section 6.2.3.

For communities, often a local significant adverse event, such as a flood or drought, was the impetus to spurring the use of GI in a local context. In many instances the spur to action response would manifest itself in actions associated with planning for climate change or being more self sufficient in the production and provision of local food for their community. In these situations, sufficient resources were identified as being needed in order for action to occur – the need for a local champion, funding and support from local stakeholders and the involvement of local municipal officials. The actions to change can be associated to Gunderson and Holling’s *Panarchy* (2002): “human interventions and innovation are motivated by ‘self interest.’” It is often a confluence of various forces coming together that forces a wholesale change in the system to occur, and there are elements of this at work in Ontario today.

Another important motivator for action is a case study or example whereby a plan has been instituted and success has been realized. A pilot project can be a powerful tool to create understanding and acceptance of a new approach. As identified in the KI interviews, the Carolinian Canada Big Picture project and the Greenbelt Plan for the Greater Golden Horseshoe are examples of GI planning mechanism at a regional scale.

The Big Picture project of Carolinian Canada (2013) is a natural heritage system approach for the southern Carolinian Life Zone – a zone which stretches across the north shore of Lake Erie and includes lands on the western end of Lake Ontario. The project initiated in 2002, is an aspirational planning effort by this environmental NGO to strategically connect natural areas across this regional geography. The project is being implemented by creating a connected greenway system across the region, using natural areas and agricultural areas. Priority Action Plans (PARs) for the protection of key habitat/species nodal areas for species at risk are also identified. In addition to protecting local biodiversity, the Plan also advocates for the provision of economic, tourism and social development beneficial attributes for communities in the area.
The Greenbelt Plan (Ontario MMAH, 2005) that encircles the Golden Horseshoe of the Toronto-centred region has within it green structuring elements that are embedded in the form and function of the Greenbelt land use policy. Many of the functions of a potential GI plan are contained in the purpose and operational objectives of the Greenbelt, i.e., availability of agricultural lands for local food production, cleansing function of a rich natural system (air, water, land), providing areas for climate change impact amelioration, protection of natural features and water systems, and provision of near urban tourism benefits, all within a distinctive and defining landscape structure. The *protected countryside* designation in the Plan stretches across a multitude of municipalities and has many of the necessary ingredients for a GI plan.

Both of above identified system initiatives, although operating at a regional scale, portray important GI plan nesting opportunities, where linkages/synergies to spaces and actions across the landscape at local areas are identified. They are also effective as a GI planning structuring approach to defining areas that can be developed for human activity and natural areas that should be conserved/protected.

As planning is a never-ending continuous improvement exercise, it is expected that greater acknowledgement and acceptability of comprehensive GI planning will come to exist. It may require a number of interrelated actions to take place as noted above. In addition, additional stressors on the land may be necessary before action is taken, e.g., rural community heightened socio-economic struggles, natural disasters such as repeated floods or droughts.

The third objective of the dissertation research was to assess the applicability of a GI planning construct for use in rural Ontario municipalities. The southern Ontario landscape is highly contested due to the pressures for development and alternative land uses on a mosaic of mostly privately-owned lands. Viewpoints on the utility of community GI planning were derived through KI interviews and a Focus Group discussion with individuals involved with land use in rural southern Ontario. Overall research participants acknowledged that some sort of GI planning system may be of help in
addressing issues on the landscape and within communities. The major discussion point was on what type of system this should be. Some research participants believed a narrow definition of GI should be instituted that supports stormwater management functions, similar to the current PPS policy approach being advocated by the Province. However, some other planner and organization KI representatives enthusiastically endorsed a wider systems planning focus centred on GI.

The research participants that were enthusiastic tended to have some common traits. They wanted to gain acceptance of valuing nature/natural system elements at the municipality level, and they viewed the planner as the appropriate spokesperson for this system to work. The use of the ‘infrastructure’ word was also identified as useful in communicating value to municipal officials and in raising the profile of nature from being a nice thing to have to an imperative for the community. The organization KIs who gave a strong endorsement tended to need to work with municipalities rather than individual property-owners. They could see the value of a GI planning systems framework to bring a variety of stakeholders in a community together, to discuss issues and identify priorities for action.

Some of the less enthusiastic but yet supportive GI planning framework research participants could see some value in raising the profile of nature/natural systems in a community, as this could help with their own organizational objectives such as an increased understanding and support for new environmental stewardship initiatives. For example, measures to enhance water storage retention on working agricultural lands (as a possible water source in times of drought) could also provide beneficial wetland habitat for wildlife as well as increased biodiversity.

The fourth research objective was to develop a conceptual framework that incorporates the community building blocks of GI with traditional grey infrastructure, working together to formulate a new planning approach. Through the research, two differing conceptual frameworks were devised and examined. The initial GI Systems Planning (Draft) version (Figure 11) was used in KI interviews and a planners Focus Group
discussion session. This Framework version was developed based on literature review and the initial GI Use Survey results at the beginning of the research process. The resulting stylized graphic design GI-grey infrastructure draft Framework was created to depict the interrelationships of these forms of infrastructure working together as a resilient foundation in rural communities. The draft Framework was used in all KI interviews and the Focus Group discussion to gather individuals’ perspectives on the utility of such a Framework to guide planning work.

As a result of feedback on the appropriateness of the draft Framework, the researcher felt a more in-depth depiction of grey-green infrastructure working together framework was necessary, and a second conceptual framework was adapted from one available from the literature – the Rouse and Bunster-Ossa (2013) depiction. This second GI Systems Planning Framework (Final) was prepared in consideration of the comments received from the research participants; the GI Systems Planning Framework (Final) is a much more elaborate depiction of the various grey and green infrastructures working together as a community’s foundation. The Framework separates the on-the-ground goods of land use activities from the services they provide for community sustainability and overall resilience. The second GI Systems Planning Framework (Figure 18) was outlined at a Research Review Meeting and there was general acknowledgement and acceptance of the revised Framework.

From the research writer’s perspective, either of the conceptual diagrams could be used to begin the conversation on integrating green with grey infrastructure elements within a community setting; the intent of the diagrams is to simply get the planning conversation started with stakeholders in the community. In conjunction with the diagrams would be the need of a traditional rational comprehensive planning model that planners use to guide plans from vision through to implementation. This model, as presented by Hodge and Gordon (2014), outlines the process as: defining the goals/objectives of the plan; compiling information and analyzing data; developing alternative plan scenarios; evaluating alternatives; deciding on a plan; implementing the plan and monitoring its use for effectiveness and possible future change.
The fifth and final research objective was the examination of various operational frameworks for a GI planning system to operate within. Various approaches could be used here, and these were discussed with the KIs, at the planners Focus Group, and at the final research phase review meeting. The range of options considered here could comprise legislation for a GI Planning Act at one end of the governance spectrum, to a guideline structure that would provide useful case study illustrations of GI systems planning at the other end. The greatest unanimity of opinion from the research participants was for a voluntary basis for creation and implementation as the desired approach at this time. The rationale for this approach came from a variety of perspectives, and the following listing is illustrative of the breadth of possible topics. Several organization KIs suggested that a systems use of GI elements can be implemented now through Low Impact Development criteria for stormwater management. As widespread research on the applicability of a LID system applied to rural areas has not been completed, including within agricultural drainage areas, then a mandatory requirement via an Act process would not be functionally nor politically feasible. Several KIs suggested that due to the variety of rural place circumstances and diversity of local issues across southern Ontario, a one size-fits all GI planning approach could not be realized. Instead, it was suggested it would be preferable if local stakeholders could consider a suite of GI element options, and then work at creating a system whereby they could be implemented in a particular community setting. Still others suggested that due to the vagueness of the GI definition that it would be extremely difficult to implement a plan that had consistency across the Province. A few argued that specific elements of GI, e.g., forest cover and street trees, should be considered as a suitable system that could be designed to have strategic planning purposes across a community. In this instance the Green Legacy Programme approach in Wellington County is an example. Several KIs suggested that a narrowly considered use of GI, to be only stormwater management, could be required through legislation.
6.2.2 Challenges of Using GI in Ontario Rural Planning

There are a number of challenges for GI planning. These challenges were identified through discussions with research participants, and also through consideration of definitions and the current understanding of the term within the Ontario context.

Several of the common challenges for GI planning have been identified by Wright (2011) in, *Understanding Green Infrastructure: The Development of a Contested Concept in England*; these challenges include the definition of the term; the process by which GI plans are formulated, and also then the manner in which they are implemented. In completing the research, many of her identified challenges became evident from the KI interviews and Focus Group discussion. One of the greatest identified difficulties comes from the definition of the term. As the term has a loose meaning and comprises anything that may be green, i.e., a natural system, or a technology that has an environmentally-friendly design, many land uses and features within a rural location can fall under this general description. To some research participants, this definition was very problematic as it could mean many different things to different people. As Wright has indicated, multiple meanings “makes the concept subject to political manipulation or wilful/neglectful bewilderment.” The confusion of the term was most evident in the GI Use Survey portion of the research, as a general definition of nature-based GI uses resulted in responses not expected, e.g., renewable energy supplies or environmentally-based grey system innovations.

The GI term and its use became convoluted with some of the KIs. For example, while the research was focused on the holistic idea of a GI planning system, several KIs slipped from this to a narrower discussion perspective that reflected specific interests, e.g., stormwater management planning or tree planting initiatives.

A final challenge for defining GI is due to existing activities that have accepted current use definitions of the term; in this instance, specific reference was made by several KIs to stormwater management systems using LID technologies. This situation is accepted as being a normal occurrence as individuals tend to view matters from a frame of reference
that they are used to, rather than one that may be foreign to their current way of thinking. All in all, as current definitions of GI use in Ontario are not necessarily aligned with the G+S of nature definition contained herein by this research, there is a possibility for misunderstandings or misinterpretations created with the GI planning concept.

Another challenge that Wright (2011), Mell (2013) and others in the literature have identified is questioning the usefulness of the GI term in a context where the term can be a land use element or a function that it provides. This challenge became abundantly clear with the KI interviews in their review of the draft GI planning framework schematic. Several KIs questioned what G + S of nature were/were not included in the diagram. Because of the discussions, a new more robust conceptual framework was devised that separated land use elements working with grey infrastructure away from the functions that GI provides to communities (see Figure 18). The dissertation researcher created this new GI planning conceptual framework with the hope this issue would be diminished.

6.2.3 Opportunities of Using GI in Ontario Rural Planning

From the research, there is evidence that GI planning can be useful for rural community planning in Ontario.

The rural leader GI Use Surveys completed at the beginning of the research process identified many GI elements being used in many differing areas of Ontario (Caldwell et al., 2016). In the consideration of the responses, and the contemplation of the multi-functional and co-beneficial attributes that GI systems can provide us, the potential connecting of several ideas can pay significant dividends in addressing local community issues, and potentially generate new economic activity.

In addition to the Surveys, themes for GI planning use came through the other research steps. Research participants in the KI interviews and the planners Focus Group provided a number of key statements respecting GI planning strategies. In consideration of KI comments on the untapped potential of GI elements in Ontario, one of the greatest
opportunities is to recognize the beneficial attributes that a GI planning system can have in addressing climate change impacts and biodiversity protection. The Ontario Action Plan for Climate Change outlines uses of GI that can be effective in this regards (Ontario Ministry of the Environment and Climate Change [OMECC], 2016).

In terms of prioritization of GI elements for use in rural communities, there is a great untapped opportunity for the use of GI elements in southern Ontario to ameliorate the impacts of climate change. Currently, there are only isolated examples across this region where measures to reduce climate change impacts – through the completion of climate change adaptation/mitigation plans – have been completed. Another opportunity is mechanisms to enhance biodiversity in southern Ontario. Coupled with ecological economics analyses (Ontario MNR, 2009) and with funding available from various sources (federal/provincial government levels, environmental NGOs such as ALUS, Carolinian Canada, Ducks or Trout Unlimited), payment for the G + S of natural set asides in agricultural rural Ontario areas can assist in reducing biodiversity loss.

Several KIs suggested that a GI planning system can move us from simple environmental stewardship actions to robust planning in conjunction with nature/natural systems. With the challenges before us – both local as well as big picture – a much more targeted effort of planning must be directed to community sustainability and resilience, including human good health and wellbeing. A GI planning system can move a community in this direction.

GI planning permits local community stakeholders to examine their community and prioritize local efforts directed at a variety of GI elements. This prioritization gives voice to local interests that may be funded by others, i.e., NGOs from outside the area, senior federal/provincial government funding programs for new infrastructure, private initiatives. A prioritization of land use effort can be devised to define areas to be protected, and areas that can be changed/developed. The process may be useful in re-engaging senior governments in land purchases in the community to protect priority natural areas, e.g., Leamington Lakefront Re-naturalization Study area.
Several KIs suggested that new frames of reference can be applied to our limited rural area resources using a GI planning strategic approach. In consideration of this suggestion, a LID perspective for stormwater management design can be borrowed from urban areas and applied to all lands within agricultural working landscape areas. A healthy "one land" land/water/air context would be helpful for promoting healthy natural and human communities. Another KI suggested that farmers should be "farming" scarce surface water resources in addition to crops; in this way stormwater retention facilities could be created and natural wetlands could be protected and enhanced.

GI planning can work towards breaking down silos within a community – between landowners with differing values, government departments with operating/capital development agendas, local stakeholder groups with differing objectives, and urban versus rural interests. A common approach with synergistic opportunities being identified can result. Wright (2011) comments on GI strategic planning as – “GI is useful as a negotiation piece in formulating creative outcomes through joined-up thinking, i.e., thinking outside-of-the-box for creative outcome opportunities.”

GI planning can tie various separate planning processes together, i.e., areas experiencing urban growth pressures have integrated watershed plans and natural heritage system plans. GI plans can integrate these efforts to view the quantity and quality of land/water/air resources as community interests. The health of ecological and human community systems should be looked at together. In areas not facing significant development pressures, GI planning can assist in identifying strategic natural assets that can be marketed for income generation, i.e., carbon credit valuation for wetlands, forested areas or other natural areas. In all rural areas, GI plans can assist in identifying measures that are necessary for climate change adaptation and mitigation efforts, and possible related economic development strategies that can be created. Because of the flexibility in the types of elements that can be incorporated within a GI plan, it is reasonable to suggest that nature-based ideas and actions can be incorporated into other types of strategic planning efforts that a community may be involved with, e.g. an Integrated Community Sustainability Plan (ICSP) (International Council for Local
Environmental Initiatives (ICLEI), 2016). The key consideration in integrated GI planning is to consider how nature/natural systems can be used as essential infrastructure for the community.

The GI planning ideas outlined in this research can be used in a variety of contexts, from heavily-regulated to lightly-regulated jurisdictions. For the purposes of the southern Ontario landscape, rural communities in proximity to the Toronto-Hamilton urban corridor have a variety of planning controls applied to the landscape – from provincial plans, to regional plans, to local municipal Official Plans, all within the context of other plans that are present in the area, e.g., integrated watershed plans, drinking source water protection plans, natural heritage system plans, cultural heritage landscape plans, etc. Areas that have less human settlement development pressures applied to them - working landscape rural or more remotely located amenity-based rural municipalities, do not have the same number of planning controls in place. In these less urban focused areas, the natural elements that are present in the landscape can be acknowledged within a GI plan, and be used to lever value across the community.

Greater recognition is occurring within Canada as to the value that eco-assets can provide in terms of essential infrastructure provision to a municipality, such as in the Town of Gibsons, British Columbia. (Gibsons, 2016). The natural assets of the community are being recognized within the municipal corporation (finance, engineering, planning, operations) as to the co-beneficial values these natural assets provide; these include water purification in protected water reservoir areas and riparian buffer features along shorelines to prevent erosion impacts on land use. As rural municipalities in Ontario continue to move towards greater awareness of municipal asset management, it is reasonable to expect that the value of natural assets will obtain greater recognition. GI planning can assist in bringing various municipal stakeholders together to discover and value this green infrastructure for the local municipality.

The use of demonstration projects is a powerful way to move forward with a variety of local stakeholders in discovering how GI elements can be used in a systems framework to
address local issues. GI elements can be used as community resources for education, research, tourism development as well as ecosystem beneficial purposes. Chapter 2, the Literature, provides information on various GI plans that are available from other parts of the world.

6.3 Summary

There is significant appetite for knowledge concerning GI in southern Ontario. This is evident in several conferences that are held on the topic – the Grey to Green Conference in Toronto held each year since 2013. The GI Ontario Coalition of interested governmental and non-governmental organizations in the Toronto-centred area also continue their work on raising the profile of GI information (2012, 2016).

Recently, the senior provincial and federal governments have been outlining funding programs to assist in the implementation of GI works. In Ontario, this is associated with work on the Climate Change Adaptation Strategic Planning work (Ontario, 2016). At the federal level, there is interest in funding new infrastructure to build resilient and sustainable communities across the country (Infrastructure Canada, 2014).

In reviewing the available literature of GI, there is a dearth of research material on the potential of GI for rural areas. Most of the literature, at least in the North American context, is directed at dense urban areas where there is push to break-up the bricks and mortar of grey infrastructure places with more naturalized green spaces. The value of GI being used as a cost effective and efficient tool to aid in the planning and building of rural communities is largely missing. It is the dissertation writer’s hope that this research paper can assist in shedding some light on the green infrastructure topic for rural southern Ontario.
Chapter 7 - Conclusions

7.1 Overview

This paper set out to examine the applicability and utility of a GI planning system to aid in the design and development of resilient rural communities in Ontario. GI planning involves the systems thinking and use of the G + S of nature that can be found in any community. The research conducted here used a qualitative mixed method case study approach involving planners and spokespersons from a number of communities and organizations within southern Ontario. This particular geographic area was selected for study as it has a rich interplay of land use activities with competing public and private interests.

The beginning portion of the dissertation laid out some of the philosophical perspectives by which the researcher conducted his work. First, a statement was made that health and wellness conditions in many rural communities can be improved. Second, issues of community resiliency and sustainability should be explored around the idea that nature/natural systems can assist in this. Third, the research topic was going to be explored through the eyes of a professional land use planner. Fourth, there was an overarching perspective that issues are intermeshed between human and natural community settings. Fifth and finally, the research work acknowledged that a nested and interconnected system exists between local and global communities. Figure 1 provided an overview snapshot of the various topics to be examined by the research.

The literature review (Chapter 2) provided a discussion on the challenge of defining what is meant by GI, and then the specific definition that was used for the research was outlined. Second, a discussion was made on what the responsibilities of a land use planner are, and more specifically, the challenges and opportunities of a planner working within a rural community setting. The literature on how GI is used in planning efforts in Canada/Ontario, and also in other parts of the world was examined. Chapter 2 ends with some background ideas on the evolutionary approach to GI planning that has been used.
in the past, and a conceptual framework outlining how the G + S of nature can provide health/wellness conditions for both human and natural communities.

Chapter 3 provides some context to the land use planning conditions - economic, social, environmental and governance perspectives - that are present today, with a focus on the rural Ontario context.

Chapter 4 provides the research methods used to complete the research. Qualitative research methods as suggested by Yin (2012) and Creswell (2013) included: GI Use Survey by rural community leaders; KI interviews with planners and organization representatives in Ontario; Focus Group discussion with planners; a Research Review Meeting of land use rural researchers at the University of Guelph; and the derivation of a draft and final GI Planning Systems Framework diagram illustrating the relationship between grey and green infrastructure forms that serve as the foundation for resilient rural communities. These methods provided a robust mixed method research framework to complete the work here.

So, what was learned?

Through the literature review, it was demonstrated that limited information is available on GI in Ontario. In reviewing the availability of GI plans in Ontario communities, no instances of this was discovered. There is some evidence of individual elements of GI being implemented in various types of planning and development efforts. In these instances, most often GI use is associated with measures to reduce the imperviousness conditions of urban areas and directed at stormwater management and Low Impact Development activities. There is little GI research for rural contexts in general.

In looking at other jurisdictions around the world, the literature on the use of GI and its use in planning systems is quite extensive. There are many examples of GI plans that are used in municipal jurisdictions in European and U.S.A. contexts.

A survey instrument – the GI Use Survey, was distributed to rural community leaders in Ontario; the results of this Survey were quite instructive in illustrating the ways and
means by which GI, as defined in this paper, is practiced today. The Survey was prepared by the dissertation writer in conjunction with several other research colleagues at the University of Guelph (Caldwell et al., 2016). The Survey was useful in identifying a wide spectrum of GI individual elements that are in effect in a variety of settings across Ontario. More particularly for the southern Ontario landscape, there were many interesting examples of individual GI elements that have been described elsewhere in the international literature. For purposes of classification, GI elements from the Ontario Survey deal with: plans for community liveability and distinctiveness of place; culture, education, recreation and tourism resources; local food and soil quality enhancement capabilities; biodiversity habitat and species at risk protection means; climate change adaptation and mitigation measures; water and stormwater management works; forests and street tree plantings; and other efforts at recycling/refurbishing environmentally damaged lands, e.g., brownfields, spent aggregate resource pits, and idle set-aside lands in agricultural areas. As outlined in the Caldwell work, most of these GI measures create economic activity in a local municipal setting. This economic activity can be by way of new jobs created with GI works. Some GI activities also generate municipal cost savings through the replacement of grey infrastructure with more cost-effective GI measures, e.g., the provision of living tree snow fencing to reduce municipality winter snow clearance costs on roadways. Additional GI planning measures encourage the importation of implementation funds for GI works from outside the local community, e.g., national environmental NGO program funding; federal/provincial program funds to assist in land stewardship efforts on agricultural lands such as in the Windsor-Essex area.

In reviewing the results of the GI Use Survey information, it was interesting to note that there were no examples outlined where GI plans had been created (or at least worded this way) in the sense of a connected, multifunctional green networked system.

In going on in the research work to the completion of KI interviews and a Focus Group discussion, there was evidence that only some research participants thought of nature/natural systems in a holistic GI planning systems sense. All research participants, however, gave general support for the use of a GI planning system, with some providing
caveats for its consideration. Most research participants suggested that, because of the diversity of rural settings, a one-size-fits-all proposition for GI planning is not advised. A variety of explanations for this perspective were provided, and the following reasons are a summary: there is limited rural community capacity in some settings for local representatives - a planner or community leader spokesperson to lead an initiative; the presence of a local environmental challenge is not readily apparent or acknowledged to lead a coordinated community response and to spur action; the role and priority value of the environment in guiding development and land use for a specific location varies across southern Ontario, e.g., a tourism-amenity-rich rural area dependent upon a clean environment versus an agricultural working landscape; and some areas have more senior government planning controls than others, and so the priority for nature-based planning using GI will vary, e.g., a Greenbelt Plan-influenced geographic municipality versus other areas removed from the Toronto-centred region.

The research participants believed there is not an appetite for more government regulation being applied to rural communities, and consequently a mandated new planning system requiring GI element consideration would not go over well. Therefore, because of the varied circumstances of rural communities, such as development pressures, local issues at hand, varying perspectives on how the environment is/not supportive to the local economy, a gradual adoption of GI planning should occur. The specific mechanics of the approach can be derived from GI study and planning templates that have been completed in other places, such as the U.S.A. or Europe.

In reviewing the literature, it is evident that GI plans can be inserted into other initiatives that stakeholders in a community may deem particularly relevant. A GI plan, for example, can be a component of an overall community sustainability planning initiative which has a focus on nature/natural systems. In this instance a voluntary action agenda can be formed by willing community stakeholders who want to use the GI planning process to bring stakeholders together to acknowledge and use the multifunctional co-benefits of nature’s G + S.
In completing the research, a variety of conceptual GI planning frameworks were considered to explain how a GI planning system could be devised and used by a rural community. This examination included review of what was available in the literature and the derivation of several alternative draft display figures. This work was quite challenging due to the complexity of the subject material, and to develop a framework that could meet multiple objectives with an end goal of displaying the associative relationships of grey and green infrastructures working together to form a resilient foundation for rural places. The dissertation contains two frameworks considering this.

The GI Planning System (Draft) framework prepared at the beginning of the research process (see Figure 11) is illustrative of a more simplified version of the conceptual topic but may be easier to understand for some audiences. While some research participants believed the model to be too simplistic regarding an illustration to the complexities of networked green-grey infrastructure systems, some others did not have problems with it. As a result of analyzing the data from the research participants, the researcher set out to alter the initial framework to address concerns/criticisms. As a result of this process, it was ultimately decided that a new diagram would be required. The researcher decided to use a more complex GI planning framework derived from the literature, and this framework was adapted as outlined in Figure 18, the GI Systems Planning Framework (Final). This GI planning framework depicts the tie-ins to suitability dimensions of community life and separates grey-green infrastructure land use elements from the output functions that are derived from a community’s infrastructure.

The research writer believes that either framework, the Draft or the Final one, can be used to discuss the GI planning notion; the use of one over the other will be determined by the depth of knowledge or understanding of the subject matter by a particular audience.

In this research, the applicability, utility and functionality of a GI planning system was tested with a group of Ontario stakeholders involved in land use matters. A variety of
perspectives on the value of GI systems planning became evident and these main ideas are illustrated in Figure 19.

![Diagram of Idea Categories in the Systems Use of GI Planning in Rural Ontario](image)

Figure 19 - Idea Categories in the Systems Use of GI Planning in Rural Ontario

The summary ideas in the above figure have a close alignment to the themes of GI use as outlined in the background literature. The thoughts outlined here were generated principally from information contained within the GI Use Survey and the research participant KI interviews/Focus Group discussion. GI planning efforts can be directed using these ideas and giving local priority to community action schemes derived therefrom. In examining the ideas together, the perspectives of community resilience and sustainability can come into focus. Resilience falls in line with the *free G + S* of nature
that rural communities can leverage for aspects of economic, social and environmental capacity. Access to viewing and participating in natural areas is a mental/physical health enhancement opportunity that provides equity across all socio-economic sectors of a local population. Environmental protection, especially in hazard prone areas, is a preventative, cautionary approach to building resilience into the landscape and community. Economic development opportunities are made available through the capital and maintenance activities associated with GI works. It should also be noted that some GI features have appreciative valuation metrics associated with them if well designed and implemented, i.e., a self-regulating wetland that constantly regenerates itself, and provides multiple benefits for human and natural communities.

The ideas as illustrated in Figure 19 are closely aligned with the themes of GI as outlined in the literature (European Environment Agency, 2011). The beneficial attributes of various GI elements can be compartmentalized within major themes of: community liveability; biodiversity, habitat and species protection; provision of woodlands, woodlots and street trees; water and stormwater management; agricultural soil enhancements; local food production; culture, education, recreation and tourism opportunities; climate change mitigation and adaptation measures; environment beneficial programs such as brownfield cleanup with surface/groundwater quality enhancements.

All in all, the research goal and objectives have been met. GI planning can be used within a framework that is useful for directing discussion on the value of nature to rural areas. Rural areas have, as a universal land use ingredient, large land areas comprising significant amounts of green space and open landscapes. GI planning drives home the potential directed leverage opportunities in the use of nature’s G + S to better both human and natural communities.

Rural communities can tailor the GI planning system to their needs. For example, communities within the Ontario Greenbelt area can tailor their planning efforts within the general provisions specified by the policy framework and legislation defined by the provincial government, e.g., protected countryside economic development and tourism
development, local food production (Ontario MMAH, 2005). Rural communities may use GI assets to define special sense-of-place landscapes for visual protection and land use protections, i.e., Georgian Bay Township shoreline development areas. The provision of local food opportunities and the use of ecologically-principled agricultural production such as permaculture, restorative agriculture, or keyline design systems\textsuperscript{10} can be encouraged to build local food sovereignty and capacity.

Consideration of using GI elements to address anticipated climate change impacts can be had for all rural areas. Climate change will impact all areas, and with this knowledge, efforts to build additional resiliency in local community areas should be made; this can include, for example, the use of relatively inexpensive set-asides in agricultural areas, or adjacent areas to flood-prone lands to be re-naturalized. In addition, municipalities are beginning to have a better understanding on the embedded value for municipal services that can be derived from ecological assets, e.g., municipal clean water supplies.

Adoption of more holistic thinking on working in and with nature will take time. At this time in many parts of the southern Ontario landscape, there is still very much a \textit{clear the land-drain the swamps} mindset as found in the background environmental condition evidence (Chapter 3). However, there are also some instances, as taken from this research, where enlightened local leaders such as planners, politicians or community activists are taking on the challenges of building more resilient and sustainable rural communities. In these certain instances, there is heightened awareness of the importance and centrality of nature/natural systems that can assist human endeavour. As humans are very much \textit{having to feel rather than be told creatures}, the life experiences – and sometimes repeated over and over experiences – may be necessary as a pre-condition to encourage change from the status quo. This circumstance was demonstrated in the research concerning the impetus to enacting a GI measure in a local area. It is expected that in the future additional pressures will be applied to rural communities in the form of economic priorities to enact GI measures. These measures

\textsuperscript{10} A type of agricultural land modification to retain moisture and soil on the landscape; usually used in drought prone areas of the world.
will most likely be centred on more immediate interests such as new job growth opportunities or cost savings in the use of GI. In addition, with increased drought/flood events, it is anticipated that GI use will be acknowledged quicker as an effective response to the impacts of climate change; other beneficial aspects of GI will be slower in their recognition such as their use in protecting biodiversity and the development of natural resilient communities.

Overall, there are many indicators that a GI systems planning framework can be a useful endeavour. This perspective is derived from the inspiration and direction given by many examples of GI planning found in other parts of the world. In Ontario there are public interest aspirations dealing with many attributes of a GI system; currently, the Province’s PPS provides for GI as a stormwater management tool; and opportunities to network GI nature/natural system assets to address bigger picture issues, such as climate change impacts and biodiversity loss, are being discussed.

As a final note on this topic, the aspirations of a GI planning system can be compared to the UN’s approach to good planning. As outlined in Chapter 2 of this paper (United Nations Settlement Programme, 2009; p 19), there are a number of characteristics of a GI strategic planning approach that can be noted. GI planning provides for: a strategic guidance mechanism as compared to a “static land use control and centred in the state approach”; a societal effort that involves “strategic infrastructure investments and principles of land use regulation”; “concerned with space and the protection of special places” (the rural mystic); long term “transgenerational implications of actions”; and “shaped by values and making ethical judgements”.

7.2 Recommendations from the Research

In terms of implementation capability, recognition of the adaptability of a GI planning framework should be acknowledged. GI can comprise one or many things for a community. In an ideal circumstance it would be connected or networked with many GI elements which give the system added value for future adaptability. In the immediate
future, the work of rural planners can assist in implementing the provisions of the existing PPS respecting GI, i.e., promote the use of stormwater management systems and LID in development works. A longer-term focus on GI planning could involve moving into a planning approach where the best of natural heritage protection opportunities would be networked with watershed management plan recommendations to create an integrated greenway, open space community system. In addition, opportunities for economic and social capacity development would also be acknowledged.

In terms of providing guidance documents for the preparation and execution of GI plans, literature from the EU and the U.S.A. can be used. The references in the following paragraphs are useful to defining general systems plans respecting the use of GI. The majority of these references were identified from Chapter 2, the Literature Review.

GI planning guides from the European context are useful in describing plans that can range from specific projects within one municipality through to regional plans that can encompass wide geographic areas (some can reach national and international scales). Publications that provide clear mechanics of preparing a GI plan are available from various government organizations and agencies: European Environment Agency (2011); Giurgui County Council (2011); Leeds (2010); Natural England (2009, 2011, 2013); North West Green Infrastructure Think Tank (2007); Landscape Institute (2013).

A number of scholarly publications have also been produced dealing with the topic of GI planning: Davies et al. (2006); Kambites and Owen (2006); Llausàs and Roe (2012); Lennon and Scott (2014); Mell (2010); Naumann et al. (2011); Sylwester (2009); Roe and Mell (2013). Sandström (2002) provides a useful categorization of GI in a G + S format that can be translated from an urban condition (his work was directed at the use of GI in Swedish cities) to rural communities. His work clearly demonstrates the multitude of beneficial attributes of GI elements that can be provided to build better resilient communities, human and natural.

In terms of considering GI planning material from the U.S.A., guides can be sourced from three main areas: textbooks, government offices, and planning consultancy offices.
Several textbooks are useful to providing contextual discussion to the GI planning topic. These all provide case study examples of GI plans that have been prepared and implemented: Williamson (2003), Benedict and McMahon (2006); Rouse and Bunster-Ossa (2013), Austin (2014), American Society of Landscape Architects (2014).

The federal EPA office also provides planning guides that are primarily directed at stormwater management issues within urban areas, but there is also information here for regional planning efforts directed at urban-rural places (United States EPA, 2014). The State of Maryland has provided useful information on their GreenPrint planning efforts (Maryland Department of Natural Resources, 2003, 2012).

There is a wealth of GI planning information available from various U.S.A. planning consultancy offices: The Conservation Fund (2016); Firehock (2014); Chicago Wilderness (ND). The Center for Neighbourhood Technology (2010) has provided a useful publication documenting the costs and benefits of various forms of GI.

In terms of addressing planning efforts for rural areas, the following publications are illustrative of GI plans for rural geography classifications that may be aligned to similar situations of southern Ontario communities. In an instance for a near-urban regional planning effort, the GI Plan for the Central Missouri area can be reviewed, Our Natural Legacy – A Plan for Columbia and Boone County (Columbia, City of, 2014). A GI Plan associated to a working agricultural landscape area was completed for the Lancaster County planning area in Pennsylvania entitled Greenscapes: Green Infrastructure Element Plan for Lancaster County (Lancaster County Planning Commission, 2009). A GI Plan oriented towards a rural amenity landscape with primary tourism development ambitions is available from Saratoga Plan’s (2006) Green Infrastructure Plan for Saratoga County, New York. A general overview of GI planning is available from Allen (2012) entitled Advancing Green Infrastructure at All Scales – From Landscape to Site.

The above noted reference listings are intended to give greater understanding as to what a finalized GI plan could look like. Reference material to GI planning efforts may also be derived from the GI Ontario Coalition (2016).
7.3 Contributions

There is potential for GI planning in rural locations. This should be aligned to specific needs or issues of an area. It may be associated with other planning approaches in including community sustainability planning, natural heritage system planning, integrated watershed management planning, or energy planning. The aspect that makes GI planning different is that it is focused on nature/natural systems that can be relied upon to build additional resilience in a rural community setting.

Policy makers, rural planners, community leaders, researchers and scholars will be interested in the findings of this research. The following points highlight some of the anticipated interest areas:

a) Policy advisors in various government agencies (federal, provincial) will see GI planning lessons from other jurisdictions that illustrate the beneficial attributes of working with nature. Information compiled from the southern Ontario setting will be beneficial to policy researchers working in rural development, e.g., in areas of general economic, social and environmental affairs; in specific topics dealing with agriculture and agri-food development, tourism and environmental stewardship.

b) Rural planners will find the results of the research helpful as they deal with current and future planning challenges within their jurisdictions. The use of GI planning to address climate change impacts is a highlighted area as it impacts the land base in various communities of the Province, primarily in increased flooding and drought condition events. Efforts to leverage funding from others from away, i.e., outside the local tax base, may assist community planners in addressing the specific challenges of upgrading deficient rural infrastructure or create new economic development opportunities. A local community GI planning effort is a good indicator to senior governments or to benevolent charitable trusts that some co-ordinated strategic thinking is taking place. Current opportunities are also available in building protection mechanisms of biodiversity in southern Ontario, e.g., senior government tax incentive
programs, environmental NGO payment of ecological G + S of natural systems for public benefit on private lands.

c) Rural community leaders, whether they are politicians, administrative staff or citizens, will be interested how GI can assist in making their communities more resilient to present and future challenges. With often-abundant natural/open space features, GI can be used for economic gain (new jobs) or cost savings in current and future municipal infrastructure provision and maintenance. New employment opportunities may avail themselves through the identification of new tourism opportunities using unique natural settings or endeavours. Local municipal staff will be particularly interested in the valuation of nature – the G + S of local ecological systems – to be accounted for in local asset management planning. Community leaders will be interested in the social capacity development attributes of using nature to build common purpose and specific development projects concerning nature/natural elements in their community. Finally, leaders will also be appreciative of the increased environmental resilience that is created within their community/the general landscape, to be used and nurtured by future generations.

d) Research communities that are interested in furthering the use of GI mechanisms within Ontario will find new information that may assist in their promotion efforts. NGOs such as the Green Infrastructure Ontario Coalition will be particularly interested.

e) Scholars who are researching the topic of GI and its various uses will find that the research provides a substantive overview of the current views and uses of GI within rural southern Ontario. There is a compelling argument that GI elements and features within a rural setting can be useful for human endeavour and build capacity (of various types) into the system.

f) All individuals who want to promote the health and wellness of their communities in furthering sustainability and resilience conditions may find the results of the research useful. New leveraging opportunities through the recognition of the co-benefits of nature/natural systems can be identified through a GI planning process.
7.4 Limitations of the Research

This research was limited to a particular geography (southern Ontario) and planning governance structure defined by the Province. The focus of research was limited due to logistical factors to the existing land planning system of this area and to resource issues of time and budget. Specifically, the findings of the research are reflective of the conditions and planning constructs for the southern Ontario area. Although the findings may have application possibilities elsewhere, personal judgement respecting replicability to other jurisdictions and circumstances must be made.

The GI planning research work was directed to southern Ontario, which is under intense development pressures from a variety of alternative uses. The land base has characteristics distinctive from other parts of Ontario as the lands are primarily in private ownership, and the land base is conducive to many alternative and often competing land use activities, e.g., growing settlements with few physical development constraints, agricultural production, aggregate extraction for buildings and road construction, solid waste disposal and other ex-urban activities, and the protection of natural areas for multiple ecological-human functions.

While some of the research has touched upon sustainability within community planning, this research has been directed at the more tangible and immediate concern respecting the resilience of rural communities. Resilience as defined by Gunderson and Holling (2002) deals with our ability to respond to change in a helpful manner. Change in rural communities is a constant consideration and faced with many perplexing challenges. In reflecting upon research participant observations, most of the discussions focused on current issues as well as opportunities that are found in rural communities today, i.e., if current issues are addressed, the opportunity for resilient and sustainable systems in the future may occur.
The application of GI planning in rural Ontario is a new concept that will take time to evolve. Some of the measures that will help it to evolve have been outlined in this paper. Some research participants had a difficult time envisaging what a GI plan would look like, and because of time and resource limitations a more thorough overview of what has been used already in other places could not be attempted.

The consideration of the use of GI for rural communities through my perspectives and understandings as a land use planner has inherent limitations. There are many other professions that are involved in helping to make rural communities more resilient to the challenges that face them. For example, this paper touched only briefly on efforts by engineers, finance personnel, agroeconomists and others.

Finally, the topic area deals generally with big picture ideas that are often hard to comprehend or know what to do with. Planning efforts in dealing with issues such as building community resilience or sustainability efforts to an uncertain future are fraught with organizational difficulties and debate. Many of the topics associated with GI planning are tied up in other wicked problem philosophical issues; for example, before we know how to prioritize something we need to know its value, hence the question of what the value of nature is (ecological economics) needs to be addressed. As well, GI planning involves the age-old question involving the tragedy of the commons: who is responsible for ensuring the land, water, and air that we all depend upon are kept in a healthy state for present and future generations?

7.5 Future Research

Mechanics of GI plans should be explored further for the Ontario context. There is material available from other areas of the world that can be used as guides, but these efforts must be melded into the specific context of the Province. From the European and U.S.A. literature, there are many GI planning documents that may serve as useful guides. One particular document from Europe (Sandström, 2002) *Criteria for Green Infrastructure Goods and Services Planning* provides a good overall guide to GI element terms.
For those interested in economic valuation of GI, efforts should be directed at mechanisms to monetise the G + S of nature within our current economic system. Work by ecological economists are exploring this topic, and there are some interesting recent studies on this topic that are available in southern Ontario contexts. Mechanisms to move the identification of these values into practical spreadsheet valuations on municipal financial balance sheets would be a very interesting research pursuit. In addition, this topic area also deals with the continuing issues of the payments for G + S of nature and this economic valuation could be applied to the breadth of GI elements.

Research on specific strategic planning mechanisms associated with GI elements may assist in the integration of these specialized services into more comprehensive GI planning works. Currently, work is underway regarding rural nonpoint source stormwater management facilities within agricultural areas of southwest Ontario. These initiatives are targeted at efforts to build more resilient agricultural soils, i.e., reduce soil erosion and nearby waterway nutrient-loading impacts. These low impact development designs may be useful in larger watershed area GI strategic initiatives. Other case study analyses from the research compiled within this dissertation or the Caldwell et al. GI publication (2016) may provide other specific GI element mechanisms that can be researched.

This research was directed to southern Ontario. Research in northern Ontario to identify opportunities and barriers for the use of GI in a land base that is richly endowed with natural assets would be useful. The GI Use Survey from Caldwell et al., (2016) had some interesting results from rural areas in the north, e.g., distinctive landscape set asides, ecotourism development, recreational trails with forest management assets. These topic areas can serve as good GI plan subject areas for further research.


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Weber Sandra (2016). [Personal Communication on September 26, 2016].


Appendix A - Statement of Professional Association of Planners in Canada ‘Code of Professional Conduct’

1) To respect and integrate the needs of future generations.
Members recognize that their work has cumulative and long-term implications. When addressing short-term needs, acknowledge the future needs of people, other species and their environments, and avoid committing resources that are irretrievable or irreplaceable.

2) To overcome or compensate for jurisdictional limitations.
Members understand that their work has a potential impact on many jurisdictions and interests. They must therefore practice in a holistic manner, recognizing the need to overcome the limitations of administrative boundaries.

3) To value the natural and cultural environment.
Members believe that both natural and cultural environments must be valued. They assume roles as stewards of these environments, balancing preservation with sustainable development.

4) To recognize and react positively to uncertainty.
Members believe that the long-term future is unpredictable and that adaptable and flexible responses to deal positively with this uncertainty must be developed.

5) To respect diversity.
Members respect and protect diversity in values, cultures, economics, ecosystems, built environments and distinct places.

6) To balance the needs of communities and individuals.
Members seek to balance the interests of communities with the interests of individuals and recognize that communities include both geographic communities and communities of interest.

7) To foster public participation.
Members believe in meaningful public participation by all individuals and groups and seek to articulate the needs of those whose interests have not been represented.

8) To articulate and communicate values.
Members believe in applying these values explicitly to their work and communicating their importance to clients, employers, colleagues and the public.

Notes: Bolded text provided by dissertation author. The intent of the bolding is to be illustrative of the ‘big ideas’ that planners think about in doing their land use planning functions:
Statement 1 - sustainability connections
Statement 4 - resiliency considerations
Statement 8 - values of planners to assist in individual and community health/ wellness
Source: (Ontario Professional Planners Institute, 2014)
Appendix B - Common Definitions of GI from the Literature

The following definitions are accepted by the dissertation author as being clear and succinct definitions of the GI term/concept for the purposes herein.

Definition ‘1’

GI is the network of natural and semi-natural areas, features and open green spaces in rural and urban, and terrestrial, freshwater, coastal and marine areas, which together benefit human populations through the maintenance and enhancement of ecosystem services, enhance ecosystem health and resilience, and contribute to biodiversity conservation. GI can be strengthened through strategic and co-ordinated initiatives that focus on maintaining, restoring, improving and connecting existing areas and features, as well as creating new areas and features. GI planning consists of a planning approach that structures land use on the basis of combining green infrastructure with that of traditional grey infrastructure in our communities. (Corvalán, Hales, & McMichael, 2005).

Definition ‘2’

Green infrastructure is the interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife... green infrastructure is the ecological framework for environmental, social and economic health – in short, our natural life-support system.

Green infrastructure challenges popular perceptions about green-space planning and protection. To many people, open space is simply land that is not yet developed, and green space refers to isolated parks, recreation sites or natural areas. Webster’s Dictionary defines ‘infrastructure’ as the “substructure or underlying foundation on which the continuance and growth of a community or state depends.” Green infrastructure emphasizes the importance of open and green space as parts of interconnected systems. Used as a noun, green infrastructure refers to an interconnected green space network (including natural areas and features, public and private conservation lands, working lands with conservation values, and other protected open spaces) that is planned and managed for its natural resource values and for the associated benefits it confers to human populations. Used as an adjective, green infrastructure describes a process that promotes a systematic and strategic approach to land conservation at the national, regional and local scales, encouraging land use planning and practices that are good for nature and for people (Benedict and McMahon, 2006).
Definition ‘3’

Our nation’s natural life support system – an interconnected network of waterways, wetlands, woodlands, wildlife habitats, and other natural areas; greenways, parks and other conservation lands; working farms, ranches and forests; and wilderness and other spaces that support native species, maintain natural ecological processes, sustain air and water resources, and contribute to the health and quality of life of America's communities and people (Benedict and McMahon, 2006).

Definition ‘4’

Green infrastructure is an emerging planning and design concept that is principally structured by a hybrid hydrological/drainage network, complementing and linking relict green areas with built infrastructure that provides ecological functions (Ahern, 2007).

Definition ‘5’

Green infrastructure is a term used to refer to the living network of green spaces, water and other environmental features in both urban and rural areas. It is often used in an urban context to cover benefits provided by trees, parks, gardens, road verges, allotments, cemeteries, woodlands, rivers and wetlands.

Green infrastructure is also relevant in a rural context, where it might refer to the use of farmland, woodland, wetlands or other natural features to provide services such as flood protection, carbon storage or water purification. Green infrastructure maintains critical ecological links between town and country.

Around the country local partnerships are seeking to use green infrastructure to drive economic growth and regeneration and improve public health, wellbeing and quality of life. It can also support biodiversity and the functioning of natural systems such as rivers and flood plains and help reduce the negative impacts of climate change (United Kingdom & Secretary of State for Environment, Food and Rural Affairs, 2011).

Definition ‘6’

Green infrastructure: A network of multi-functional green space, urban and rural, which is capable of delivering a wide range of environmental and quality of life benefits for local communities (United Kingdom, 2012) - Department for Communities and Local Government.
Definition ‘7’

Green infrastructure is taken ... to encompass connected networks of multifunctional, predominantly unbuilt, space that supports both ecological and social activities and processes (Kambites and Owen, 2006).

Definition ‘8’

Green Infrastructure (GI) is a network of high quality green and blue spaces and other environmental features. It needs to be planned and delivered at all spatial scales from national to neighbourhood levels. The greatest benefits will be gained when it is designed and managed as a multifunctional resource capable of delivering a wide range of environmental and quality of life benefits (ecosystem services) for local communities. Green Infrastructure includes parks, open spaces, playing fields, woodlands, wetlands, grasslands, river and canal corridors allotments and private gardens (Natural England, 2009).

Definition ‘9’

Green infrastructure is an approach that communities can choose to maintain healthy waters, provide multiple environmental benefits and support sustainable communities. Unlike single-purpose gray stormwater infrastructure, which uses pipes to dispose of rainwater, green infrastructure uses vegetation and soil to manage rainwater where it falls. By weaving natural processes into the built environment, green infrastructure provides not only stormwater management, but also flood mitigation, air quality management, and much more (United States Environmental Protection Agency, 2014).

Definition ‘10’

Green Infrastructure can be broadly defined as a strategically planned network of high quality and semi-natural area with both the environmental features which is designed to provide a wide range of ecosystem services and protect biodiversity in both rural and urban settings. More specifically green infrastructure, being a spatial structure providing benefits from nature to people aims to enhance nature’s ability to deliver multiple valuable ecosystem goods and services such as clean air and water (European Commission, 2012).
Green Infrastructure for Ontario’s Rural Communities

Introduction to Survey

This survey is being distributed to planners and other rural leaders and practitioners within Ontario to identify innovative ways in which green infrastructure is currently being used to achieve economic prosperity objectives, build communities, save money, and enhance the environment.

While there are many definitions for green infrastructure, for the purpose of this survey, green infrastructure is defined as "natural vegetative systems and green technologies that collectively provide society with a multitude of environmental, social and economic benefits" (Green Infrastructure Ontario Coalition, 2012, p. 2).

Further background information can be found at the Green Infrastructure Ontario Coalition website: http://www.greeninfrastructureontario.org/report

Our central focus lies in the ways that green infrastructure can benefit rural areas of Ontario by identifying how the goods and services of nature can be used in a sustainable fashion to create economic and employment opportunities, provide cost savings to rural municipalities, and thereby enhance community resilience and health. The information gathered from the survey will be used to assist in identifying innovative practices that will be widely profiled across the province.
1. Please provide the region or municipality you represent.

___________________________________________________________

2. Please provide the organization you represent (Name).

Municipality ______________________________
Health Unit ______________________________
Conservation Authority ______________________________
First Nations ______________________________
Community Futures ______________________________
Other ______________________________

3. Please consider the following categories. We would like to identify innovative programs, policies, and uses of nature that contribute to economic prosperity objectives, community building, saving money, and/or enhancing the environment. Please identify any programs, policies, or uses that you are aware of within your area (including First Nations lands if applicable). You are welcome to provide more than one response per category.

Community Liveability (including environmental aesthetics, health and well-being, community cohesion, sense of place)

_________________________________________________________________________________

Culture, Education, Recreation, and Tourism

_________________________________________________________________________________

Local Food Production, Soil Quality Enhancement

_________________________________________________________________________________

Biodiversity, Habitat and Species Protection

_________________________________________________________________________________

Climate Change Adaptation and Mitigation

_________________________________________________________________________________

Water and Stormwater Management

_________________________________________________________________________________

Woodlands, Woodlots, and Street Trees

_________________________________________________________________________________
Other (including vacant lands and/or recycled lands, landfills, brownfields)

____________________________________________________________________

4. Considering your answers to the above question, are there any examples within your area that are so innovative that you think they should be shared with other areas of the Province. Please describe below.

____________________________________________________________________

5. We will be conducting several interviews. Would you be willing to be contacted to discuss any of your responses to this survey?

Yes____ No____

6. Are you interested in receiving our final results?

Yes____ No____

7. If you answered yes to question 5 or 6, please provide your contact information below.

Name_______________
Title ________________
Email __________________
Phone _______________

Thank you for taking the time to participate in our survey.

Powered by SurveyMonkey
Appendix D – GI Key Informant and Focus Group Interview Scripts – Planners and Organizations

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 (Planners KI Questionnaire Script)

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 stormwater 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 an 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? 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).

I’d like to share with you a proposed conceptual framework for GI planning that I have prepared that works with/in replacement of some forms of traditional grey infrastructure. This framework is intended to be a strategic planning tool to outline areas in a community to be conserved and areas that can be developed. GI planning would use the major themes depicted in the above graphic (on the right side) as a strategic planning framework to guide planning and development. A holistic systems-based multifunctional network plan of GI elements would result from this work.

5) Does the conceptual planning framework of illustrating how ‘grey’ and ‘green’ infrastructure would work in a community make any sense to you? Why or why not?

6) How does this diagram fit/not fit with your ideas on the use of GI elements in planning?

7) In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not?
8) If you believe there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized? Do you think this system would assist communities in addressing resilience and sustainability challenges?

9) If you believe there is limited or no utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency/sustainability challenges?

10) Do you have anything else you would like to share with the research team?

11) Would you be interested in attending a meeting at the University of Guelph where the summarized results of this research would be outlined from participants in the research, i.e., persons interviewed for the study including those with existing innovative practices of GI use, provincial organization representatives, rural planners from OPPI. Observations/comments on the findings to date would be welcome at this meeting. Yes____ No_____ Maybe______
Illustrative Example –
A Southern Ontario Community with Typical GI Elements
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

(Organization KI and Planners Focus Group Questionnaire Script)

**INTERVIEW GUIDE: KEY INFORMANT INTERVIEWS**

**Introductory Commentary**

Key informant interviews are being held with various organization leaders in the Province to get an understanding and appreciation of the use of GI for planning purposes in rural communities.

For the purposes of discussion here, GI Planning is defined as: *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.*

Elements of green infrastructure can be illustrated in the attached photo (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 stormwater management context is a 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, I’m exploring the usefulness of GI as it can be applied to rural communities. This has several components: 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.

From the literature, green infrastructure constitutes the goods and services of nature that together form the basis for health and wellness conditions in human and natural communities. The following figure illustrates the concept:
Conceptual Framework of Green Infrastructure Supportive of Healthy Human and Natural Communities

I’d like to share with you the following graphic that outlines how GI planning would work. Green infrastructure would work with/replace some forms of traditional grey infrastructure in providing the foundation for community development and conservation.

GI planning would use the major themes depicted in the above graphic (on the right side) as a strategic planning framework to guide planning and development. A holistic systems-based multifunctional network plan of GI elements would result from this work.
**Question Script:**

1) Based on this brief overview of GI planning, do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

2) Does the outlined diagram above depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

3) In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?

4) In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?

5) In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges?

6) Do you have anything else you would like to share with the research team?

7) Would you be interested in attending a focus group at the University of Guelph where the summarized results of this research would be outlined from participants in the research, i.e., persons interviewed for the study including those with existing innovative practices of GI use, provincial organization representatives, rural planners from OPPI. Observations/comments on the findings to date would be welcome at this meeting.
   Yes_____ No_____ Maybe______
Illustrative Example –
A Southern Ontario Community with Typical GI Elements
Appendix E - Notes from GI Key Informant Interview Meetings: Planners

The following pages outline the detailed notes from the discussions held with key informant planners over the fall of 2016 – spring 2017. The material is organized to include a brief overview of the specific geographic location that the key informant was operating in. Information deemed relevant to the specific operating conditions of a particular area were noted, and the information for this was taken from readily available information sources that are noted in each section.

Generally, information on a particular community was taken from websites associated with the particular place and could include information from Statistics Canada census materials, an Official Plan, community strategic plan, financial statements.

The KI interview information provided here is for the following:

1) Town of Essex Planner, Jeff Watson (also present was Rita Jabbour, Assistant Planner)
2) Environmental Planning Consultant, George McGibbon
3) Georgian Bay Township Planner, Nicholas Popovich
4) Maitland Valley Conservation Authority GM and Registered Planner, Phil Beard
5) Sudbury Planner, Stephen Monet
6) Township of Tay Valley Planner, Noelle Reeve
7) County of Wellington Planner, Mark Van Patter
Key Informant Interview with Jeff Watson, Town of Essex Policy Planner– Dec 5, 2016

(Rita Jabbour, Assistant Planner also present)

General Situation Description - The Town of Essex Policy Planner is an older, experienced municipal planner who is currently in charge of preparing an updated Official Plan for the municipality which has a population base of approximately 20,000. The town has lower tier status within the County of Essex structure. Based on a review of planning governance structure in the area, the municipality has strong local municipal planning autonomy, and is dealing with, amongst other normal land use matters the challenges of building a land base resilient to impacts of climate change, i.e., intense flood events, changing environmental conditions such as invasive species. The land base is principally agricultural in nature with large field crop production as a primary activity. Several concentrated settlement areas are present within the Town: the Essex townsite in the northern portion of the municipality, with Harrow and Colchester located in the southern portions. The majority of the land base is in private land ownership with only a few parks and recreation areas in public ownership.

Municipality of the Town of Essex

Information Sources: Town of Essex website; Jeff Watson  Personal Communication, December 5, 2016.

Discussion follows the ‘Planners’ Questionnaire Script

Question 1 - In consideration of the research definition of GI planning, do you believe that the GI element that you have previously identified (using land use policy in rural landscapes to deal with issues such as stormwater management, natural heritage area protection and impacts from climate change) can be a component of an overall GI planning system? Yes/No/Maybe. . . please explain your answer.
- yes, consideration for climate change adaptation/mitigation action planning should be included in Official Plans. Currently various components of action plans are looked at individually with weighting applied in a reactionary manner. Matters such as stormwater management, and agricultural production impacts on stormwater should be looked at in an integrated manner for an entire watershed area.

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

- we are moving beyond sustainable which means keeping things the same and moving into a resilience mindset whereby we need to plan to be adaptive to changing circumstances.

Question 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.

- Official Plan policy needs to anticipate challenges that an area may face. In the Essex area major challenges are associated with stormwater management, and stormwater quality and quantity issues associated with large industrial scaled agricultural operations are very significant.

- land use policy should be directed at sustainable agricultural production (see US National Research Council 2010 report). This form of agriculture can address all forms of production: food, fiber, feed and biofuels. Sustainable agriculture would include the following: soil management including conservation (no till) tillage, and cover crops; crop and vegetation diversity management including crop rotation and intercropping, use of cultivar mixtures, and management on non-crop vegetation; plant breeding and genetic modification of crops, molecular markers and genetic engineering in cultivar development; water use management, water quality management, nutrient management including precision agriculture; weeds, pests, and disease management in crops; managing efficiency of animal production systems; animal health and welfare. Distinctions made between bio-mass and bio-fuel sources of materials.

- considerations of total cost accounting for agricultural production should be made – beyond simple economic costs of production but inclusive of social and environmental costs/benefits as well. A GI planning system may enable these broader picture notions to be considered.

- Also discussed agroecology as the way to go to move away from monocultures, and also provide for local food initiatives.

- stormwater management systems need to be designed in recognition of specific circumstances of a particular municipality’s setting. In the Town of Essex, heavy ‘brookstone’ clay soils impact the potential of LID stormwater infiltration technologies; while fish habitat is discussed within the Town’s drainage ditches, the ‘soil soup’ water quality conditions must also be acknowledged.
Question 4 - What do you believe are important elements to include within a GI planning framework as discussed above?

-considerations for mitigating the impacts of climate change, managing stormwater systems on a regional scale, looking at mitigating impacts of large-scale monoculture agricultural production, protection of and enhancing natural heritage systems

- in terms of agricultural production considerations, minimum size of farm land acreages should be set, and also provide for value added farm uses.

- In the past planning policy was concentrated on urban settlement areas . . . consequently “did not pay a lot of attention to the agricultural land base which is a large component of the local economy”. A GI planning system may re-orient considerations on this extensive land base.

- provincial regulation is required to force consideration of new GI stormwater management technologies; however, the low permeability of clay soils within Essex limits the use of LID technologies in rural settlement areas. Additional direction from the province is required.

-Existing Town Official Plan does not discuss green infrastructure technologies, but new policies and actions have been adopted by Town Council as part of the OP policy review currently being undertaken.

Question 5 - Does the conceptual planning framework (see Appendix) of illustrating how ‘grey’ and ‘green’ infrastructure would work in a community make any sense to you? Why or why not?

-a qualified yes; interrelationships on the diagram should be better described; too simplistic

- system needs to provide for weighting options that need to be considered with grey interrelationships that are unique to specific geographic locales, e.g., areas with heavy clay soils.

- graphic is confusing with the arrows of ‘grey’ and ‘green’ pointing at each other; what does this mean? A better way should be used.

Question 6 - How does this diagram fit/not fit with your ideas on the use of GI elements in planning?

-an integrated decision-making tool is required to look at grey and green infrastructure systems together. Buildings can comprise both grey and green components. It is important to be mindful of design mechanisms to address impacts of climate change.

-the overall title should be a systems design framework that includes interrelationships of both grey and green systems. Also need to acknowledge that tipping points do not support a ‘continuous growth’ cycle, e.g., now experiencing 1:1000 year storms such as in Ellicott city, Maryland (July 2016).
Question 7 - In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not?

-yes, this can be looked at here; a wakeup call in one year to move away from only a grey stormwater management approach in rural settlements.
- wider perspective on agricultural lands also needs to be made. Climate change impacts on rural lands need to be considered – more intense storm events and mechanisms to reduce soil erosion; also look at the impact of greenhouse gasses on agricultural crops; greenhouse gasses cause a shorter life span for plants

Question 8 - If you believe there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized? Do you think this system would assist communities in addressing resilience and sustainability challenges?

-various approaches required. Provincial regulations to deal with impacts of climate change; current climate change action for Ontario is weak with respect to impacts on agricultural production. Tools are required to translate GI technologies into everyday land use planning approaches. Information is required to define cost effective use of GI which is required to ‘market’ these new ideas to elected officials. Education is also required. Additional research to document the benefits of GI techniques to address challenges found within the rural landscape (water and land use) is required.

-acknowledge precautionary principle in land use considerations and consider extreme changing conditions due to climate change.

Question 9 - If you believe there is limited or no utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency/sustainability challenges?

-not applicable

Question 10 – summary comments? - need to consider green technologies that can assist in rural areas. Work needs to be defensible and demonstrate benefits, e.g. agroecology can assist and benefit farmers.

Question 11 - Interested in recap meeting attendance - yes
Key Informant Interview with George McGibbon, MCIP Planning Consultant – Dec 16, 2016

General Situation Description: Mr. McGibbon is a planning consultant with extensive experience spanning over a 35-year career. He has certification in the planning field in both the Ontario/Canadian and US contexts. His company’s headquarters are in Burlington, Ontario. Mr. McGibbon is a resident of Port Colborne (population 18,000) where he has spearheaded a number of local environmental initiatives in that community. He has extensive experience working in various communities, and with clients from the private sector, first nations, and various levels of government. He has been an environmental planner with his own firm since 1996. Mr. McGibbon requested consideration to be a key informant at the OPPI Conference in October 2016.

Municipality of the Town of Port Colborne

Information Sources: McGibbon-Wakefield Inc. website; City of Port Colborne general website; Personal Communication, December 16, 2016.

Discussion follows the ‘Planners’ Questionnaire Script

Question 1 - In consideration of the research definition of GI planning, do you believe there are GI elements that can be useful of an overall GI planning system? Yes/No/Maybe. . . please explain your answer.

- George used the institution of promoting biodiversity in the Port Colborne area as an example of instituting GI for community betterment – EAC initiative to improve monarch butterfly habitat with the use of milkweed plants along roadways i.e., leaving milkweed to grow along county road right-of-ways to provide food and habitat. “Using the existing infrastructure to make something special happen” – mowing of municipal right-of-ways is timed to permit milkweed plants to provide food, habitat for monarch egg laying. Instead of 3 cuts of roadside rural ditches, the maintenance schedule moved to 2 cuts with education to abutting residents as to the rationale for ‘messy’ ditches. The following websites provide additional background:


GI initiatives should ideally be directed at the community/municipality level involving the participant in his/her vocation and have meaning at both the family structure and individual levels.

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

-as outlined above; special locational consideration of Pt Colborne acknowledged along ‘butterfly flyway across Lake Erie; promotes unique sense of place; community capacity development

Question 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

-as outlined above

Question 4 - What do you believe are important elements to include within a GI planning framework as discussed above?

-elements of a strategic GI plan are laid out in conceptual terms – 1) need a questioning mind – consider impacts/opportunities to water, land, species. GI can comprise natural areas or be introduced into built up areas including green roof/wall applications; 2) need discipline to look/question things differently. This requires an appropriate setting and resources involving time, research capability to examine alternative approaches to addressing challenges; 3) use models where they exist to structure and document conditions. This will expose ‘surprises’ to existing circumstances; 4) good data drives good analyses and can address current doubt conditions, e.g., climate change refugees and their impact on local communities.

Question 5 - Does the conceptual planning framework (see Appendix) of illustrating how ‘grey’ and ‘green’ infrastructure would work in a community make any sense to you? Why or why not?

-the use of GI planning should be considered in terms of plans for the community, individuals vocation, and family circumstances. The diagram too narrowly defines the positive attributes of GI. Need to look at nature beyond narrowly defined municipality considerations – can be also considered by the larger community or by the individual. Need to remember that “what we experience, can be a large motivator of what we want to do about it”.

-In terms of the elements of GI diagram, the respondent looked at the elements from a functioning perspective – GI micro-climatic effect; carbon sequestration; nutrient cycle assistance and toxicity reduction for land, air, water conditions; part of the hydrologic cycle.

Question 6 - How does this diagram fit/not fit with your ideas on the use of GI elements in planning?

-additional elements of GI planning can be looked at; other elements are at play beyond those identified in the picture of Rockwood.
Question 7 - In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not?

- GI strategic planning is currently not at work in Ontario municipalities as the concept is too new and abstract. However, it may be useful as a tool to open up discussion looking at the practical opportunities of GI to assist human and natural communities, i.e., carbon sequestration credits in prairielands, forests, agricultural areas.

Question 8 - If you believe there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized? Do you think this system would assist communities in addressing resilience and sustainability challenges?

- There is utility in considering planning using GI but it needs to be considered in terms of opportunities/constraints to the community, to a sponsoring organization, and to the individual (how can I be of assistance as a community member, family member and at the place where I work).

- Planning for GI use has utility to open up discussion; it may be a useful planning tool if it is associated with good science and data to back up notions. A process is needed where a variety of options can be explored, and priorities set. Priorities should not always be the easiest to implement, as greater utility may be derived in other less tangible items, but these have greater payoff. For example, Clean Air Hamilton’s strategic examination of air quality has a multitude of action items that can have tremendous payoff.

Question 9 - If you believe there is limited or no utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency/sustainability challenges?

n/a

Question 10 – Anything else?

1) Things that gain from disorder, e.g. nature potentially – Fragile to Anti-fragile conditions. https://www.amazon.com/Antifragile-Things-That-Disorder-Incerto/dp/0812979680

2) Motivation to change is hampered by status quo bias – looking for information to confirm your current thoughts or the way things are done is referred to as ‘confirmation bias’. “Things that we think are important, bias the way we think”. Often this points towards short term fixes with quick results.

3) Solastalgia – disconnect to nature relative to environmental change in an area – solas as ‘comfort’ and algia as ‘pain’ – the landscape can cause this to occur to inhabitants (coal mining with mt top removal; https://en.wikipedia.org/wiki/Solastalgia - Albreight coined the concept in 2005 and it is now considered a component of climate change impact.

-A significant point of discussion revolved around the inability of the inhabitants of the southern Ontario landscape to be concerned about protecting the natural resources of the area when there is so much abundance, e.g. 20% of the globe’s fresh water is contained within the Great Lakes basin; abundance of land that can be easily developed.

-Clean Air Hamilton’s Community Climate Change Adaptation Plan is a good example of community action directed at a significant environmental issue for the City. http://www.cleanair.hamilton.ca/

Question 11 - Interested in recap meeting attendance - yes
Key Informant Interview with Nick Popovich, Planning Director Georgian Bay Township – October 28, 2016

General Situation Description: Mr. Popovich has been a practicing planner from the early 1990s. He was hired as the Planning Director for Georgian Bay Township in 2014. He works for a lower tier municipality within the Muskoka Regional District, the Township of Georgian Bay. The municipality comprises 10,000 permanent residents with a significant tourist trade sector, primarily in the summer months, increasing the population 3-fold. The land area comprises Canadian Shield rock lands with lakes and small arable land areas scattered throughout the community. There are many small towns and villages within the overall municipality. Tourism is the principal economic development activity and this area within the Muskoka tourist district area of southern Ontario. Approximately 42% of the land area is within crown land ownership, representing interests of the federal (national parks and waterways), and the provincial government (parks and managed forest areas).

Municipality of the Township of Georgian Bay

Information Sources: Township of Georgian Bay Website; Personal Communication, October 28, 2016.

Discussion follows the ‘Planners’ Questionnaire Script

Question 1 - In consideration of the research definition of GI planning, do you believe that the GI element that you have previously identified (an Official Plan with policy that is ‘green’ in nature) can be a component of an overall GI planning system? Yes/No/Maybe. . . please explain your answer.

-the township is a mix with urban, rural and waterfront areas. Rural is defined as non-waterfront and non-urban areas; incorporates crown lands with large areas with MNRF forestry licenses
- overall landscape has strong place attachment, i.e., sense of place. There are many well defined areas within the Township; national park; 2 first nations; western edge of the Trent-Severn canal; UNESCO world biosphere along the coastline; the biosphere is generally defined across municipal borders to include lands within 150 m along the eastern Georgian Bay shoreline. 
- strong interest by people interested in their ‘slice of paradise’; this is a reality throughout muskoka – people are generally not interested in new campgrounds, marinas, etc.
- diverse rural landscape makes area special – Biosphere designation; 23 PSWs- most wetlands of any municipality within Muskoka
- tremendous numbers of endangered and species at risk – massassauga rattlesnakes; fox snakes along the coast line.

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

- Official Plan maps out in policy protected natural areas. Also enhanced considerations are given for fish (Fish habitat - type 1 critical for spawning) is zoned, i.e., zone the water and no development within the area. . . no other municipalities in Muskoka have done this. Zoning the water to protect the feature. All forms of wetlands acknowledged in the Official Plan (provincial, regional, local).

- Inputs for NHS and OP updating – fish habitat from MNRF - late 1980s data; MNRF species at risk; district natural heritage; ducks unlimited wetland mapping.

Question 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

- in a rural context, politicians need to acknowledge provincial policy and the PPS which is strong, i.e., starting in the 2005 version and continuing in the 2014 update, municipality planning shall be consistent with provincial policy to promote development in urban areas, limit scattered rural area development, and protect environmental areas.
- GI involves putting in place mechanisms to acknowledge and protect the natural environment; protecting land via stormwater management on a site or a subdivision within a settlement area; at a larger area, GI would comprise crown forests, wetlands and other natural areas.
- Conservation easements would also be a component. Trails are limited within the Township.
- Lake system health program gets at carrying capacity issues; definition of sensitive, moderate and over-threshold levels for potential development on inland lakes. Now, system is moving away from specific development numbers on a lake; instead using general numbers, as science is not sufficiently specific enough with new technologies as well as general environmental uncertainties.

- Every piece of development on the water needs site plan control. . . revegetate the shorelines, shoreline vegetation via riparian buffers, and stormwater management details.

- When you look at the OP, zoning and site plans, these all speak to GI; Official Plan = a GI plan.
Large area 900 sq kms within the municipality – “the municipality has placed an intrinsic value on
nature – not a numeric one” – what is the value of nature from an ecological valuation perspective?

**Question 4** - What do you believe are important elements to include within a GI planning framework?

- acknowledge the importance of natural features; the value of nature is priceless. Include features as outlined in question 3.

**Question 5** - Does the conceptual planning framework (see Appendix) of illustrating how ‘grey’ and ‘green’ infrastructure would work in a community make any sense to you? Why or why not?

- GI planning makes sense, for the most part in Muskoka. Food production not that applicable in Muskoka; however, the ‘Recreation, tourism and parks’ element is very important – “The economy is the environment and the environment is the economy” in Muskoka
- preserve and protect the environment very important in planning documents
- water levels are important due to climate change considerations; water access only properties need to have access to water (2013 low water levels in Georgian Bay)

**Question 6** - How does this diagram fit/not fit with your ideas on the use of GI elements in planning?

- 6 factors of GI planning have been incorporated into the planning documents for the municipality (but not local food).
- GI planning more applicable to municipalities in southern Ontario; disjointed natural attributes landscape – GI planning more valuable in a more ‘developed’ rural landscape (ag and settlements) rather than an undeveloped area (area between GB and Sudbury). Grey infrastructure in the north would be rail corridors and roadways.
- a distinction may be made in areas between those areas that are richly endowed with natural areas and those areas that do not have these resources

**Question 7** - In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not?

- GI planning focused on stormwater management would work well in urban service areas in MacTier and Pt Severn; these areas are serviced and GI elements could be integrated
- already implementing a ‘GI plan’ within the rural/waterfront areas of the township – protection of environmental features, and promotion of recreation; GI terminology not specified
- Food production not possible in the area – rocky area. Evolution of area – from clearing the land for agriculture, with logging, and then tourism (with vegetation re-generation)

**Question 8** - If you believe there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized? Do you think this system would assist communities in addressing resilience and sustainability challenges?
Question 9 - If you believe there is limited or no utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency/sustainability challenges?

- not answered

Question 10 – Anything else?

- GI planning is buried within and throughout the planning documents for the Township – OP, Zoning, Site Plan Control by-law

- example of GI planning within a settlement area – 100 acres in Port Severn (Pt. Severn Heights). First cut is the natural heritage environmental impact assessment which protects ½ of the land base, i.e., habitat for fox snake; 2nd cut is developing a stormwater management system for the area (post development flows need to meet pre-development conditions) – another 10% removed; then development area is outlined.

Another example – development for the Oak Bay golf and country lands - 500 units on 300 acres on Oak Bay. Map 149 – development areas surveyed; other areas generally defined within the zoning by-law

- “not a GI plan but protecting the 'green' in various other ways”

Question 11 - Interested in recap meeting attendance – yes
Key Informant Interview – Phil Beard, MCIP, General Manager, Maitland Valley Conservation Authority – August 24, 2016

General Situation Description: this key informant is the manager of a Conservation Authority and is also a registered professional planner. He has been with the CA since 1979 – nearly 40 years. The Conservation Authority is leading efforts to manage stormwater management on an integrated, systematic basis to control soil and excess nutrient runoff into the receiving local stream and ultimately to Lake Huron.

The Maitland Valley CA comprises a watershed that straddles several municipal boundaries but is principally located within the northern portion of Huron County. It also encompasses the northwestern portion of Wellington County as well as the northern portion of Perth County. It encompasses approximately a 50-km coastline on Lake Huron where there is a concentration of cottage development. The overall landscape is characterised by production agriculture with smaller towns/villages scattered throughout the rural landscape.

As with the overall mandate of other CAs in the province, the Maitland Valley CA is tasked to dealing with matters associated with water management (flood and erosion matters, low river flows), land and water good environmental protection stewardship initiatives, environmental conservation education efforts, land use regulation and active/passive recreation provision opportunities. The CAs’ strategic tag line is ‘Working for a healthy environment’. It has produced several ‘Watershed Report Cards’ for the overall CA watershed as well as for several sub-watershed areas within it. The report cards are useful for benchmarking overall health conditions of local water resources (surface and groundwater), and key natural heritage attributes (forest cover, wetlands and other natural areas).

The CA has an annual revenue stream of over $2.5 million, with approximately $1 million of that being derived from municipal levies.

General Geographic Location of the Maitland Valley Conservation Authority:

Discussion follows the ‘Planners’ Questionnaire Script

Question 1 - In consideration of the research definition of GI planning, do you believe that the GI element that you have previously identified (the Green Legacy municipal tree planting program) can be a component of an overall GI planning system? Yes/No/Maybe. . . please explain your answer.

Question 1a) - Best practice implementation for the Garvey-Glenn project is a component of GI – this technique identifies areas to provide stormwater retention on the land; this includes grassed waterways, berms with variable drainage flow rate devices, permanent hay areas adjacent to streams, riparian buffers, windbreak plantings. This is reflective of the components of a rural stormwater management system. Need to do more than just RSWM to keep soil/nutrients on the land and out of watercourses. Cropping and tillage practices help to prevent soil erosion. Interest and understanding of the value of cover crops is increasing however. Prevention is cheaper and more effective than treatment/trapping technologies – based on the $3million invested on the 4,000 acre Garvey-Glenn watershed restoration project ($750/acre), for the 470,000 acres of prime agricultural land within the overall Maitland valley watershed would result in costs of over $350 million. Compare this to the $34 million funds available for all of southwest Ontario for GLASI initiative. A culture change in drainage to encompass rural stormwater management understanding needs to take place with respect to “slow it down, spread it out, and let it soak in” approach where appropriate. Needs also soil loss prevention though year-round plant cover on the land.

An important component of GI planning that requires a robust response to rural stormwater management challenges. A comprehensive rural stormwater management plan needs to be devised for each watershed area.

1b) Wingham River Flats Ecological Park is a component of GI and is an important education centre to explain the importance of nature and to restore the river as a natural channel. Planting native trees, shrubs and wild flowers adjacent to the river . . . Restore the floodplain and improve fish habitat. . . planning with nature as the most resilient system.

- useful as a focus for training of the resilience of nature; a learning centre for municipal recreation staff on maintenance for natural areas. A clash of cultures between those wanting manicured clean/organized spaces and the biodiversity and resilience that natural systems provide. Important for GI planning to consider the individual elements, but also consider maintenance and management requirements for an initiative. In a rural circumstance with limited resources, buy-in to a plan is important to get respect and co-operation to maintain. Planning needs to have a management, maintenance program beyond the actual project. Staff/volunteers need to be trained in how to maintain a natural area. ‘Devil in the detail’ on the aesthetics of a particular area – natural design versus manicured landscapes. Public spaces are highly valued, and changing the culture is a great challenge; visual diagrams are important to illustrate what the area will look like with the changes.
Question 2 - Can you please outline how your GI element assists in deriving notions of resiliency in your area/community? Resiliency defined to deal with future impacts and existing conditions.

Resiliency is assisted via measurement on the landscape – seeing is believing, working with stakeholders - the landscape needs to withstand conditions of too much heat, too much moisture and not enough moisture. Is it easy to look after; it doesn’t take a lot of expertise to manage. Things can be designed to withstand future changes in climate. Projects are supported from top down initiatives by funding of the province in a conservation protection mindset. Greenway design idea and name came from the work done by David Crombie with the Waterfront Regeneration Trust in the “90s” for Blyth, Wingham and Lucknow.

Value of nature is everywhere in rural areas and needs to be tapped into; see Smart Prosperity initiative.

Question 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.

What does a GI planning framework do for rural areas? – a program to be implemented??

It should restore ecosystems, address impacts of climate change, and consider fossil fuel impacts. Need to move beyond simple natural heritage objectives. Need to add systems for rural stormwater management – quality and quantity controls are needed in rural Ontario. Water needs to be managed in both wet and dry conditions falling on green cover. Need to look at mechanisms to rehydrate the natural landscape. Create a system that does not create flooding or passes on polluted water to other areas.

Why are we growing row crops in floodplain areas – 2,000 acres of annual crops grown in flood prone areas upstream of Listowel – flood plain is part of the natural stream function of the river. The economic system needs to recognize $10 - $15k/acre for farmland, and forested floodplain lands valued at $2k/acre or less. Current drainage programs reward people that are doing wrong things with respect to public resources such as rivers. Within the watershed there are 470k acres in prime ag lands, AND 600k acres in actual production. Includes land that is marginal for row cropping and land that buffers watercourses. “Need to devise a system that rewards people that are doing the right things for both private and public benefit.”

Question 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.

Examples come from existing teams working within Maitland Watershed Partnerships. The MWP’s are comprised of two Teams. Terrestrial Team formed in 1999 with an overall goal to provide a “functioning and profitable natural area system” – targets directed at forests (number and size); also triple natural connections across the landscape via buffers on watercourses, riparian buffers, new connections and corridors; increase natural cover in the watershed from %18 to 26%; healthy watersheds should have over 30% natural cover; Cover consists of clearings,
old fields, plantations and woodlands”. Also the Water Action Team - info available on website under ‘community projects: Maitland Watershed Partnerships’. Water Action Team is intended to protect and improve water quality and quantity. – implement BMP’s on majority of target areas (recognize groundwater importance, conduct water budgets on sub-basins, etc.); need to work at reducing runoff, retain soil moisture and improve shallow groundwater recharge. Need to be concerned about quality of water to meet minimum drinking water standards of Ontario – lower e-coli levels to meet recreational swimming standards and pathogens/antibiotics of concern to public health. Lower PCB levels in water at mouth of Nine Mile River (port albert location) and Maitland river. Reduce nitrates and phosphorous levels in watercourses – tie “land management planning into Official Plans and local nutrient management by-laws”; reduce heavy metals in waterways below Listowel.

Question 5 - Does the conceptual planning framework (see Appendix) of illustrating how ‘grey’ and ‘green’ infrastructure would work in a community make any sense to you? Why or why not?

Priorities are directed at support of grey infrastructure. The strategy needs to illustrate how grey can be replaced with green. Cost savings. . . . Promote community based approaches to conservation education. Lack of money can drive innovation. . . but often traditional design standards get in the way.

Example – new Wingham public school stormwater management design with a tradition stormwater pond. Need public policy and engineering profession to consider a low impact development design and implement it. Shallow wetland over a larger area could have been implemented instead of traditional stormwater pond; to make ‘green’, volunteers needed to procure funding, and then agree to maintain plantings over the establishment phase. Should not have to rely on volunteers to do green infrastructure – need public policy to require green infrastructure to be incorporated into the design of stormwater management.

Question 6 - How does this diagram fit/not fit with your ideas on the use of GI elements in planning?

Restoration agriculture is important as a component of GI and local food production that considers the local environment; need to redesign farming and food system that is compatible with natural ecosystems. Restoration agriculture approach with crops that mimic the ecology of the area in which they are grown, i.e. heartnuts, hazelnuts, sea buckthorn, fruit, canes, and silvopasture lands.

- restoration agriculture needs to be considered in conjunction with natural ecosystems
- food production – as a GI element it needs to build and restore ecosystems, be resilient to stresses brought about by a rapidly changing and more unstable climate and the transformation away from reliance on fossil fuels. Need to build a food system that is nutritious and sustainable) within a climate-impacted world; need to promote community gardening and orchards. Can grow more fruit and nuts in the community; also can grow more perennial vegetables (asparagus etc).

Question 7 - In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not?
A GI planning system can work but not solely through municipal planning. Work with local groups already working on food/agriculture system. Look at innovators who are already using a restoration agriculture approach (See examples listed in “agriculture and climate change” see MacRae paper)

**Question 8** - If you believe there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized? Do you think this system would assist communities in addressing resilience and sustainability challenges?

GI planning can work with local champions, local groups to support leaders, technical supports, economic incentives to support change, in a long-term effort spanning many decades.

- Pattern after the Coon Creek conservation and stewardship initiative; also keyline design for water management in agricultural areas. [http://www.keylinevermont.com/Keyline.html](http://www.keylinevermont.com/Keyline.html)

- Concentrate on how things can be done differently, e.g., restoration agriculture. Also need to match economic necessities with resilient ecosystem systems, e.g., New York drinking water protection program in the Catskills with funding support for a drinking water plan to provide water supply to New York City a great success. – assist farmers to support protection of water supply and help them to market the products produced.

**Question 9** - If you believe there is limited or no utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency/sustainability challenges?

N/A

**Question 10** – Anything else?

Land use planning not the primary mechanism to lead this type of change. Maitland Valley CA has a GI plan in ‘place’ via separate initiatives (Maitland Watershed Partnerships). Believes in comprehensive planning with stakeholders involved – can achieve many things with motivated individuals, e.g. Garvey-Glenn sub-watershed improvements motivated by extreme weather event with flooding, erosion of soil and loss of nutrients, now that landowners are seeing the benefits of rural stormwater management and changes to cropping/tillage practices, they are more interested in undertaking further changes and more people interested in getting involved.

- Mother nature very resilient; excellent bio-engineered project in Goderich e.g. bluff stabilization project in proximity to the sewage treatment facility in Goderich.

- GI often works as a response to disasters; GI planning uses a ‘soft environmental footprint’ approach; it builds upon goods and services of nature.

- Interested in asking “what are the principles and practices to make GI planning work”? – is it a program, or a planning system? – from a watershed management perspective, GI involves working with nature to build resilient community systems – both human and natural.

Overview: significant interest in planning and building a resilient watershed in the Maitland Valley CA area. Land base comprised of a significant agricultural land base (80%) and only 18%

CA role to **promote stewardship of natural resources throughout the watershed**—only public agency left that provides extension services. Provincial Planning Policies are set by the Province. CA’s assist municipalities to identify and develop policies for natural hazard and natural heritage areas in their land use plans.

Locally, there is a **growing** interest in building resiliency to climate change conditions. Many stories on planning with nature/natural systems. Important to consider ecological integrity to fit with rural community resiliency.

- Garvey-Glenn **watershed**, part of the lakeshore watershed area, is an interesting case study. Deals with low input rural non-point source stormwater management; however, Garvey-Glenn ‘demonstration project’ is not a ‘sustainable’ development practice, e.g. $20k for one drainage berm!

**Question 11 - Interested in recap meeting attendance** - Yes
Key Informant Interview with Dr. Stephen Monet, Greater Sudbury Planning - March 17, 2017

General Situation Description: Dr. Monet, is the Manager of Environmental Planning Initiatives within the City’s Planning Department. This key informant works in a geographically large, single tier municipality that comprises a rural hinterland centred on a major settlement area, Sudbury, i.e. one of the geographically largest municipalities in Canada. Approximately 160,000 people reside in the overall community.

The city is characterized by pockets of smaller village/hamlet settlements located on arable lands between the predominant rock outcroppings of the Canadian Shield. There are also many scattered small lakes in the area. The primary employment base is quite diversified with mineral resource extraction activities occurring in parts of the rural area, and the government, education and social/health sector activities centred in the urban part of the municipality. Approximately 42% of the land base is in public ownership representing crown lands that have a variety of functions, i.e., managed forests, provincial parks.

Dr. Monet volunteered to be a key informant at the OPPI conference, October 2016. Environmental Planning Initiatives is one of 3 sections within the Planning Services operation. Other sections are Development Approvals and Community and Strategic Planning (see website organizational chart).

Other environmental organizations in the area – Conservation Sudbury (Nickel Belt Conservation Authority); NGOs such as Coalition for a Liveable Sudbury

Municipality of the Greater City of Sudbury

Information Sources: City of Greater Sudbury website; Greater Sudbury Natural Heritage Report, May 2013; Personal Communication March 17, 2017
Discussion follows the ‘Organizations’ Questionnaire Script

Question 1 – do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

-Reviewed page 1 material – definition of GI as used in this research; familiar with concept of goods and services of nature

Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

-In reviewing the strategic planning framework using GI, elements of nature should not be mixed with outcomes derived from their services, e.g. climate change mitigation/adaptation, biodiversity protection. Just as grey infrastructure elements are found on the landscape so should GI elements. Elements can include many features, i.e., wetlands, stream buffers, forests, etc.

Question 3 – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?

-In considering GI as a component of strategic land use planning, this concept can be used in rural Ontario communities where the desired outcomes associated with various GI elements are given recognition in the local context. For example, in the Sudbury area, the mandated natural heritage system components of the PPS are acknowledged as important green elements in community planning, e.g. provincially significant wetlands, species at risk. Other elements such as significant woodlands or valleylands are not as important as there is an abundance of these natural assets in the local geographic context.

GI planning is a valuable concept in systems thinking to look at the benefits of nature beyond the specific intrinsic value of a natural heritage element. GI systems planning may provide another perspective whereby communities can look at bigger picture values to society of nature. For example, for a wetland, look at other beneficial attributes of the area beyond its important biodiversity habitat protection and groundwater/surface water protection values. These may include key habitat linkage corridors, tourism development benefits, etc.

“The use of the word infrastructure is useful to denote societal benefit”. The term needs to be considered in relation to the specific planning context. In Sudbury, the landscape is comprised largely of trees with pockets of agricultural lands and small communities. In contrast, the southern Ontario landscape is comprised of large communities and agricultural land areas with small pockets of natural areas (trees and water feature areas). The GI planning context is set by the general conditions found within an area’s landscape matrix.

The use of subwatershed studies to protect key watershed features is well understand. The studies are useful for identifying priority lands to be conserved with respect to water protection (both quantity and quality aspects). A fine-grained land use perspective is derived.

The use of GI from a stormwater management perspective is understood to protect water bodies from excessive storm event flushes. A more holistic GI planning framework would help to identify intrinsic values of natural habitat areas; this would assist in building resiliency for landscapes. The
contributions to a healthy ecosystem are understood through the provision of naturalized corridor rather than a cement channel/pipe.

**Question 4 – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?**

- The term GI is used in Sudbury in the regreening efforts for the area. Over 10 million trees and liming efforts to deacify areas have been added to the landscape over the past . . . Through these efforts, minor stormwater runoff improvements have been made to the receiving waterbodies as an added benefit. The original impetus for the regreening efforts was landscape aesthetic purposes in key visual corridors. Efforts today and in the past, can be visualized via a GIS on-line tool for the Greater Sudbury municipality.

The regreening efforts by the public and through direction with environmental authorities are now targeted to specific locales; for example, protecting drinking water supplies in Lake Laurentian/Lake Ramsay from adverse stormwater runoff events. GI is useful to assisting with less grey infrastructure or its total replacement in certain locations.

The consideration of GI strategic planning needs to be reflective of the varying contexts within the province. The role of various forms of infrastructure will vary in respect to the context.

**Questions 5 - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges?**

n/a

**Question 6 – Other comments?**

- How does GI distinguish itself from other planning systems is an interesting question? Research should answer this question; does the notion resonate with people? Can it be distinguished from watershed planning where water/stormwater management is the principal focus?

Environment Canada looking at “How much development is too much?” for Cdn. Shield areas; document not released. The southern Ontario anthropized landscape is subject to the “How much habitat is enough?”

**Question 7 – Attendance at recap meeting?** – Cannot participate in a follow-up meeting. However, willing to provide additional information as a sounding board on perspectives from northern Ontario.
General Situation Description: Noelle Reeve is the Planning Director for the Township serving in that role since 2009. She is the principal Township planner in charge of community Official Plan preparation.

The Township, a lower tier municipality in south Lanark County, is primarily rural with strong agricultural, and forestry resource use interests.

The population is approximately 5,000 with a stable population base over the past several decades. There is a strong summer tourism population influx with small lake-based water recreation. A great majority of the Township land base is in private ownership, with less than 5% of the area in Provincial government crown land status (provincial parks and forestry management areas).

According to Ms. Reeve, the Township has a strong environmental focus with an idyllic rural countryside focus; the Municipality’s motto is ‘... a change of pace’. Ms. Reeve has been exposed to GI plan thinking via previous work experience in the US around the Chesapeake Bay area prior to 2009.

Discussion follows the ‘Planners’ Questionnaire Script

Question 1 - In consideration of the research definition of GI planning, do you believe that the GI element that you have previously identified (community gardens and provision of riparian features along waterways) can be a component of an overall GI planning system? Yes/No/Maybe. . . please explain your answer.

Yes, these are components of green infrastructure. See responses under question 2 for further explanation.
Question 2 - Can you please outline how your GI element assists in deriving notions of resiliency in your area/community? Resiliency defined to deal with future impacts and existing conditions.

-ideas include using municipal property to grow food for local community, e.g., The Table community garden in Perth using a portion of a municipal park for this purpose. Another initiative is using municipal land adjacent to the Tay Valley Township Municipal office to grow community food rather than flowers.

-also municipal planning approvals via site plan control to create riparian buffers adjacent to water areas, rather than grassed areas. Working with the local Conservation Authority to get plants (shrubs/trees) to revegetate areas adjacent to water.

Question 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.

-planners need to work for community sustainability. Move to actions on the ground. Planners can assist in addressing bigger picture ideas such as climate change.

-consider innovative ideas that are specific to unique rural circumstances. Reforestation and re-naturalization through site plan control – revegetate the lawn to more natural conditions dependent upon setbacks from water 3 – 10 – 30 m naturalization efforts next to water areas. Partner with the local CA to be provided with shrubs/trees to replant areas next to water areas—building permits in proximity to water motivates action. Site plan agreements for all properties, with specific vegetation/plantings interest within 100 m of a waterway. May also include ephemeral streams. Always standard to have a 3 m area with native groundcovers or shrubs/trees. If land slopes/contours are present, then maybe 10 or 30 m setbacks for lawns/septic beds may be required. Also may require eaves troughing to redirect roof water away from open waterways.

-Conservation agreements are placed on land title – site plan agreements require deposit of $1500 to ensure compliance. Partners in the form of Lake Associations are motivated to go beyond ‘fair report card ratings’ on particular lakes.

-Cost avoidance for future flooding with wetland protection; Carbon sinks for forests and wetlands; use carbon offset funding mechanisms.

Question 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.

-natural elements are important components of GI, i.e., wetlands, forests. Also riparian zones adjacent to waterways. Other components include local food production, and water quality/quantity controls on the landscape.

- everything is green within the Rockwood community picture and a question may be raised, why is there a push for protection of green infrastructure within a rural context when there is so
much of it. The key is to highlight priorities within a local context, e.g., identify significant woodland areas to be preserved – deep forest interiors (100 m distance), rare species, old growth areas

-map riparian areas adjacent to waterways.

- Township has 66% forest cover; important to highlight priorities within all the GI of the township; e.g. on a watershed planning basis (Noelle was a watershed planner in the US), use Tom Shueller’s work from the Center for Watershed Protection which has defined the following priority area considerations for water protection: 1) if area has 25% impervious cover then this is a write-off for quality control designs; 2) if 10-25%, then there is some caution in the landscape (careful treatment); 3) at 10% impervious cover, then things will be ok for water protection. These levels of imperviousness need to be mapped at a very fine scale to give meaning to a GI planning system.

- tipping points are important to define in an area; drought conditions and microburst rain events need to be considered and factored in a GI planning system.

Question 5 - Does the conceptual planning framework (see Appendix) of illustrating how ‘grey’ and ‘green’ infrastructure would work in a community make any sense to you? Why or why not?

- differing matters are listed in ‘grey’ versus ‘green’ infrastructure; things are outlined in ‘grey’ while actions are generally defined for the ‘green’;

- important to define actions as this makes the ‘green infrastructure’ a rich construct; however actions and items should not be mixed together. Possibly denote outcomes from various ‘grey’ and ‘green’ infrastructure items – a separate diagram. Specific measures - keystone landscape definition is important.

Question 6 - How does this diagram fit/not fit with your ideas on the use of GI elements in planning?

- GI planning consists of something more than simple elements on the ground; outcomes remind persons of the multifunctional benefits derived from specific actions. A planner needs to be conversant and lead on the notions of GI - biodiversity protection, prevention of soil loss, climate change impact protection, etc.

- important for rural planners to think of bigger picture items such as GI resources that are available within rural settings.

Question 7 - In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not?

- yes, GI planning from a strategic perspective has a place in rural settings. Negative cascading effects may occur without a strategic review of the significant GI resources found within a rural setting. May be more important in instances where there are not provincial plans in effect or where CAs do not have significant resources (in rural areas with weak municipal tax bases). Eastern Ontario has tremendous provincial resources that are not adequately identified, i.e., UNESCO Rideau Canal world heritage site.
- significant gaps in big picture planning in the area – there are no integrated watershed management plans in the area; MNR/Parks Canada dam management directed at a utilitarian effort to feed water to the Rideau canal; also the Tay canal for tourism dollars to maintain water levels for boating with weak regard for overall watershed protection conditions. Friends of the Tay watershed association plan is outdated (20 years old); recent source water protection plans directed at very precise locations, i.e., only 5 kms of the 500 kms of streams in the township are considered. What is the impact on water quality by the additional 5000 people that come in the summer. Some interior lakes have mandatory septic sewage inspections which are supported by Lake Associations and Tay has was an award for this proactive achievement.

- some initiatives looking at quality concerns of water but much left to do, i.e., pesticide applications on agricultural fields, Beckwith dry cleaning solvent dumping, salvage yard pollution, etc.

Question 8 - If you believe there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized? Do you think this system would assist communities in addressing resilience and sustainability challenges?

- GI planning in the area may be of use. Protecting GI resources build resilience. . . wetlands/forests recharging groundwater and help to mitigate droughts and remove peak events for floods. . . Help stakeholders such as farmers, cottage owners, etc. to have a beautiful landscape. Can assist in improving the local economy.
- better available mapping to outline critical GI issues; what are the riparian cover limits. Quality of GI needs to be mapped – some areas getting better (reforestation) and others degrading over time. Better mapping is required; MNRF mapping information from the 1990s-aerial coverage. Support for information is uncertain. 2005 PPS significant woodlands info from MNRF; what about significant valley lands delineation? Planners in Lanark County have defined areas via wording but not mapping. Headwaters areas delineation also need to be defined. “Critical components of GI need to be delineated as if significant areas are not protected then cascading negative effects may result in the local context.”

Question 9 - If you believe there is limited or no utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency/sustainability challenges?

n/a

Question 10 – Anything else?

n/a

Question 11 - Interested in recap meeting attendance - no
Key Informant Interview with Mark Van Patter, County of Wellington Manager of Planning and Environment – August 4, 2016

General Situation Description: Mr. Van Patter is a long serving municipal employee, being the Manager of Planning and Environment (retired March 2017). Wellington County is located within the outer ring of the Greater Golden Horseshoe. It is municipality of approximately 120,000 people with a diversified rural land base with several larger communities situated within it. The County surrounds the City of Guelph.

The population of the County has had a steady increase over the past several decades. The land base is predominantly in private land ownership, and economic activity (especially the southern portion of the county) is impacted by its proximity to the large Toronto-centered area to the east.

Municipality of the County of Wellington:

Information Sources: Wellington County website; Green Legacy website; Personal Communication, August 4, 2016.

Discussion follows the ‘Planners’ Questionnaire Script

Question 1 - In consideration of the research definition of GI planning, do you believe that the GI element that you have previously identified (the Green Legacy municipal tree planting program) can be a component of an overall GI planning system? Yes/No/Maybe. . . please explain your answer.

- yes, tree planting is an important component of GI. The Green Legacy program representing tree planting within the municipality is extremely important – it is intended to address challenges brought on in Southwestern Ontario where “one of the largest clear cuts in history” happened to make way for agricultural production.

- tree planting an important mechanism that can address challenges of climate change; Oxford University 2015 study indicates that easiest large-scale mechanisms to address this issue includes increasing carbon content in soils and planting trees; a ‘no regret’ mechanism to buy us additional time to address challenges of climate change. Tree planting has many co-benefits – increasing crop yields, protecting farm land, providing habitat for species, etc.
Question 2 - Can you please outline how your GI element assists in deriving notions of resiliency in your area/community? Resiliency defined to deal with future impacts and existing conditions.

- the Green Legacy program assists in community resilience to address challenges; climate change impacts; protection of lands/water; economic viability of rural communities; environmental benefits. Assists in addressing the land stewardship ethic that Aldo Leopold championed. Important for the community to accept change notions and have strong local leadership, e.g., warden Brad Whitcomb. All generations should be involved in the activity to create acceptance and understanding, i.e., “promotes an environmental land ethic for all generations”.

Question 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.

- main sustainability indicator is that the program has been contagious; spin off local programs established such as Trees for Mapleton; private land interests have bought into the planting of trees due to economic performance as well as environmental stewardship objectives being met. Windbreaks can increase farm crop yield productivity by 10 - 20% in proximity to the trees. Tree sales also are made with spin-off employment opportunities. Important to understand and acknowledge the interests of landowners.

Question 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.

- Important to address stormwater management issues (quality and quantity controls) for both rural villages and hamlets as well as storm run-off from agricultural fields. Stormwater management guidelines need to be revisited to anticipate increased intensity of storm events.

- Acknowledge benefits of trees within street right of ways and in villages and hamlets; recognize benefits as described by TD Economist reports. Differing values of trees in rural locales may be required.

- Artificial wetlands to assist in quality/quantity controls to receiving water bodies within agricultural areas.

- Creation of rural bike trails for tourism development opportunities, especially in interior areas (away from the Great Lakes) of southern Ontario.

- Green roofs and green walls for micro-climatic effects; may be useful in hamlets/villages. Also in addressing stormwater management flows to equate pre and post development flows.

Question 5 - Does the conceptual planning framework (see Appendix) of illustrating how ‘grey’ and ‘green’ infrastructure would work in a community make any sense to you? Why or why not?
- conceptual framework should include additional tie-ins illustrating how GI can work with/replace grey infrastructure. Opportunities for stormwater management on agricultural production lands should be shown.

- the use of green infrastructure within rural areas should be encouraged; it comprises a valuable resource that can assist rural land stewardship initiatives. Stormwater management in agricultural non-point source situations can be aided by green infrastructure elements.

**Question 6 - How does this diagram fit/not fit with your ideas on the use of GI elements in planning?**

- GI planning needs to have a strong communication component. You need to build trust between stakeholders. Not something new being placed on the landowner by the Province, i.e., distrustful conditions permeate rural Ontario, i.e., constant introduction of additional regulations and requirements of the Province on private land owners.

- Additional consideration to source water protection should be tied into the model, i.e., protection of drinking water resources in rural Ontario as well as water intakes on the Great Lakes.

- Communication and understanding are important components of a GI planning strategy. “Most things in the world build on trust – need to work together for the betterment of all”.

- Economic interests of property owners must be acknowledged. GI strategy can be worked to address what landowners need while also addressing bigger picture ideals (climate change impact amelioration, biodiversity protection, environmental stewardship).

**Question 7 - In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not?**

- A strategic GI planning strategy may build on current initiatives that are in place respecting environmental protection, water conservation in rural areas, e.g., tree planting initiative, rural clean water partnership between urban and rural communities (Guelph and Wellington County).

- It is important that the community accepts GI initiatives – not something pushed by elitist environmentalists, or by the government; it is important not to talk down to private property owners.

**Question 8 - If you believe there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized? Do you think this system would assist communities in addressing resilience and sustainability challenges?**

- GI planning system may be of use, if above points in questions 6 and 7 addressed.

GI planning can build on good things happening in planning already, i.e. Natural heritage system planning, compensation plans for loss of trees/habitat protection

Often serendipity to make things happen – experts, working with politicians and community civil society leaders.
Question 9 - If you believe there is limited or no utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency/sustainability challenges?

N/A

Question 10 – Anything else?

- important to address climate change issues by adding carbon in soils and also by planting trees
- As farmers have greater assets than the average household in Ontario, they can afford to assist in environmental stewardship initiatives.


- important to contact Ontario Crop and Soil Improvement Association for commentary on GI planning for rural Ontario
- 75% of all farms in Ontario have an environmental farm plan – GI planning can be supportive of existing interest
- “what one generation looses, the next one doesn’t remember”, e.g. tree planting in southern Ontario over the past century. We are at a pitiful level now.

Question 11 - Interested in recap meeting attendance – yes
Appendix F - Notes from Planners GI Focus Group Discussion

The following pages outline the detailed notes from the discussions held with planners at a Focus Group meeting held in Huron County on October 19, 2016 Goderich Ontario.

**Focus Group Discussion Notes with Huron County Planners**

General Situation Description: This focus group session was held with the planning staff from the County of Huron. Sandra Weber, Development Planning Manager, organized the session with 10 other staff from the municipality. These staff have responsibilities as planners completing tasks as upper tier county municipal staff, and also having contracted responsibilities to the 9 lower tier municipalities within the county.

The country comprises a rural landscape with an extensive agricultural production economic base. Commodity crops and large livestock facilities are predominant. Small settlements comprising an assortment of towns, villages and hamlets are found in all areas of the county. Tourism development is focused along the Lake Huron waterfront. The population is approximately 60,000 and this level has been stable over the past several decades. The land is predominantly in private ownership.

**Municipality of the County of Huron**

Information Sources: Huron County website; Personal Communication with Sandra Weber, October 19, 2016.

**Focus Group Discussion Followed ‘Organization’ Questionnaire Script**

Presentation made to the following planners: Victor Kloeze, Suzanna Reid, Carol Lemming, Jenn Burns, Craig Metzger, Laura Young, Claire Dodds-Weir, Sarah Martin, Denise Van Amersfoort, Monica Walker-Bolton, Sandra Weber

Following comments provided by individual members of the planning staff:
- one planner talked quite passionately that farmland is an important component of green infrastructure in a place – the soils, the cleansing capabilities to deal with stormwater. BMPS (beneficial management plans) can include grassed swales, cover crops, etc.

- one planner questioned what is the geographic governance scale that we are dealing with – dealing with individual properties within a municipality or a regional scale beyond individual municipal boundaries

- another planner pointed out the importance of green space as it relates to mental and physical health, i.e. take a walk outside for mental wellbeing, and access to green spaces to promote physical activity.

- planning for a resilient land base can be considered in a rural sub-watershed area and consider everything as being comprised of some form of green. For example, rural stormwater management initiatives are important, e.g. rural stormwater management model project helps “rural communities in their work to better manage water runoff during storm events... to assist stewardship professionals as they work with rural residents to support their efforts to pinpoint project locations and dimensions, retain topsoil on land, and keep sediment, bacteria and chemicals out of the water” (see email via Suzanna re GI efforts respecting water stewardship initiatives in the area).

**Question 1** – do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

Scale? – what is my interest area?? – looking at various scales? Answer: for current research, looking at mechanisms to assist municipalities in their land use planning efforts

Categorization of natural green infrastructure elements is problematic – research should emphasize the health and wellness aspects of nature. What are the considerations in a rural setting to consider the need for proximity to open space facilities versus ‘going outside and taking a walk’ – are rural municipalities more/less accessible to natural open space settings?

**Question 2** – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

– no, the diagram depicts a cyclical process between grey and green infrastructure elements. How does this make sense – one replaces the other?

– the diagram depicts elements of landscape space in some instances and in others it presents notions of community sustainability, e.g. biodiversity protection. Diagram mixes elements of sustainability with land use constructs.

- unsure how elements of the economic base are depicted in the GI elements; grey infrastructure needed to provide living/working base understood through energy, communications, transport and building systems

- within a watershed area there is very limited grey infrastructure, and therefore GI framework may be more appropriate in an urban context; source water protection efforts look at “how water flows through a watershed and this is a component of Integrated Watershed Management”.
- agriculture can be a component of GI

- unsure how graphic depicts the importance of rural landscape as idyllic pastoral locales, i.e., views to the lake, views of Maitland Valley. Can the notion of cultural heritage landscapes be incorporated into the GI construct?

- recreational/utilitarian active transport modes can combine grey and green infrastructures, e.g., the Goderich to Guelph rail corridor within a naturalized space

**Question 3** – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?

- natural heritage system planning is a key component of GI, and currently a Natural Heritage Strategy is being completed in Huron County.

- Official Plan by in large discusses land uses – GI thinking leads you to different places. Existing land use layers are perceived as uses on the land. GI is a bigger picture strategic thought – important public service benefits on private lands. GI encourages strategic thinking, e.g. forest cover benefits to land owners as well as the broader community. . . . Existing Official Plan reflects existing conditions after land was cleared for agricultural production

- it can assist in building bridges with engineers, e.g., a naturalized channel that has multi-beneficial attributes. GI strategic thinking can be of assistance in furthering strategic analysis

Grassed waterways, naturalized systems. . . . GI may be of assistance in adding value to the proponent as well as to the general public.

**Question 4** – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?

- GI planning can help with strategic thinking, e.g., demarcation for living snow fences to maximize reduction in snow drifting/county snow plowing operating costs

- payment for ecological goods and services is just one option; instead demonstrate cost savings through research and science

- we can’t fight nature – let’s work with nature. A nature-based system should be favoured over time. Things that are designed in harmony with nature are more resilient overtime such as the shorelines of Lake Huron. Development/setbacks along the shoreline is a controversial issue currently.

- need demonstration of the utility of naturalized stormwater facilities.

- greater economic gain respecting crop productivity gains relative to windbreaks

- most beneficial mechanism to implement is with a policy framework that has on the ground demonstration projects; in this way can also build local knowledge and acceptance, e.g., agricultural lands grassed swales . . .
- GI planning may represent next generation of thinking around the use of landscapes. GI thinking provides strategic thinking to further both human and natural communities conditions. May “Provide a new thinking lens”.

- what about progressive rehabilitation of aggregate landscapes? – should also be a component on landscape enhancements.

Questions 5 - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges?

N/A

Question 6 – Other comments?

– many examples of using green infrastructure to assist in rural landscape protection. Suzanna offered to provide many good works examples from the current water protection steering committee work, i.e., naturalized stormwater flows, living snow fences, etc.

General Observation: no opposition to the general notion; some uncertainty of the utility of a green planning system in a place where most of the landscape is comprised of living things, including the soil

Question 7 – Attendance at recap meeting? -yes, if available
Appendix G - Notes from GI Key Informant Interview Meetings: Organizations

The following pages outline the detailed notes from the discussions held with key informant planners over the summer 2016 – winter 2017 time period. The material is organized to include a brief overview of the details of the organization, and some context of why it would be relevant to the GI planning discussion. Information was collected on the organization from readily available sources and included the following: organization websites, strategic plans, annual reports, financial statements.

The KI interview information provided here is for the following organizations:

1) ALUS (Alternative Land Use Services) Canada
2) Carolinian Canada
3) Community Futures Huron (formerly Huron Business Development Corporation)
4) Conservation Ontario
5) Ducks Unlimited Canada
6) EcoHealth Ontario
7) Essex Region Conservation Authority (CA)
8) Friends of the Greenbelt Foundation
9) GI Ontario Coalition
10) Ontario Federation of Agriculture (OFA)
11) Ontario Nature
12) Ontario Soil and Crop Improvement Association (OSCIA)
13) Rural Ontario Institute (ROI)
14) Trout Unlimited Canada (TUC)
Key Informant Interview with Bryan Gilvesy, ALUS Executive Director - September 7, 2016

General Description - The organization has been running a program in Norfolk County since 2007. It was started by the Norfolk Land Stewardship Council in conjunction with the Ontario Federation of Agriculture to bring additional ecological restoration benefit to marginal or retired agricultural lands in the area. The program offers technical support and an incentive-based mechanism whereby land payments are made for beneficial ecological services for restored wetlands, grasslands or other natural areas. Since 2007, the program has expanded to four other farming areas of Ontario – Eastern Ontario, Grey-Bruce Counties, Lambton and Elgin Counties. In 2016 the program became part of a national charity with an aggressive expansion plan to market ecological stewardship payments for conserved lands on farms and ranches across the country.

Funding for the organization comes from charitable foundations and donations. There are a few staff involved in administration. As a summary since 2007, in Ontario, funding of $1,600,000 has been invested in ALUS programs to provide ecological services on 1,800 acres of private farmlands.

Information Sources: ALUS general website; ALUS information Norfolk County at Mr. Gilvesy’s home farm website http://yuranch.com/; Personal Communication September 7, 2016.

Interview followed ‘Organization’ Questionnaire Script

Question 1 – Do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

ALUS alternative land use services - a community led organization that is interested in making communities more engaged environmentally and in turn more productive. Trying to build community . . .breakdown of community via silos embedded within the Provincial Government – urban separated from rural, separated from food production and rural community development. ALUS promotes bottom up planning with motivated environmentally-minded individuals.

- lack of systems planning thinking evident all around us, i.e. fast food restaurant in Tillsonburg has highest per capita sales of any facility in Canada (Tim Hortons?), and it doesn’t sell any field crops from the local area – Norfolk county has the most diverse field crops of any place in the world

- Important to include social aspects of infrastructure – community sense of place, local food production, etc.

-Number one way to improve your farmland in Ontario is to tile drain it. Drainage Act works at cross purposes to moving towards sustainable watershed management.

- ALUS Ontario has produced 1000 acres in wetlands – stormwater retention facility in the form of an artificial wetland that is adjacent to a coldwater fishery. Used to settle out sediment and also catch nutrients before draining into the receiving body. Marginal lands that are not conducive for growing crops. 36 drainage structures with taps within Norfolk County. Drainage superintendent manages the water after the spring flush is done with. Some resilience is built-in to managing the surface and groundwater using ALUS, and community stakeholders. Various
players are involved in making projects happen, and this includes work with Conservation Authorities.

- A green infrastructure environment is found in Norfolk County – smaller acreages with many hedgerows, streams, forests. GI thinking can tie the entire landscape together: infrastructure for all. This can build on the strong ‘sense of place’ that exists in Norfolk.

- ALUS is aligned with green infrastructure thinking – refer to the ALUS bible. “ALUS: THE FARMER’S CONSERVATION PLAN”. all resources in ALUS work available at http://alus.ca/resources/research/

- ALUS is helpful in translating the concept of green infrastructure to folks – including social responsibility in conjunction with environmental enhancements of ecological services.

- Value for ecosystem services and the value of community connections – ALUS completed a social survey to measure community values change over time. Main point is that ecological goods and services valuation needs to go in hand with community support – community quality of life indicators and the work of ALUS in the community need to be mutually supportive. See publication entitled, “Alternative Land Use Services (ALUS): A benchmark survey of public opinion on the environment in relation to farming and the quality of life in Norfolk County”.

Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

- Building blocks of grey and green are ok; piped facilities with water quality parameters – measurements in drinking water facilities can also be measured within wetland areas, e.g., filtration system story in Halifax – a $300 payment to a farmer to reduce the land area where the farmer previously added manure nutrients to the land; area was within the drinking water headwaters area. Compare this approach to the one where $150,000 would have been needed to be spent to reduce nitrates from the water source by an artificial means; wetlands good at filtered out water pollutants.

- “The refuge of people unwilling to change”; the bureaucratic defense of OMAFRA is to not admit to a point source polluter by the farmer. 40% of corn is going to fuel production. Phosphorous pollution to the Great Lakes . . . a rethink is required of our production system – nitrates into the groundwater and phosphorous releases into the Great Lakes need to be better managed. Need to build resilience into the system. Farmers need to speak up to manage nutrient management. OMAFRA very paternalistic – feeding people is important but what about the pollution discharges? Precision agriculture and using nutrients smarter – don’t give nutrients to the Great Lakes. Anything outside of mainstream agriculture is perceived as a threat.

- ALUS is intended to assist how individual farmers fit into the bigger environmental picture; funding available with incremental change and on the ground demonstration. Understanding as a ‘crow at the end of the row’ – projects, not so called ‘best management practices’ sell to the local community.

Question 3 – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?
Demonstration project in Norfolk County looking at GI. Keith Robichoud, CAO Norfolk with funding from federal gov't to work with green infrastructure development in Norfolk County. Also in parkland county, Alberta with the Vermillion River (southwest corner of Edmonton) with a watershed management program in all areas of the province. A regulatory change for GI planning is underway.

- Elgin County which has intensive production farming can be also be used to assist with environmental initiatives.

**Question 4** – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?

- Planning exercises cause people grief; distinctions created between haves/have nots. “Signs of a magical place” . . . planning exercises create targets – winners and losers within an area. Instead plan to work with willing partners first . . . getting willing hosts encourages others to think of bigger picture ideals.

- We are so bereft of ecological services that we should take anything we can get. . . ALUS is a market-based system in a non-scarse money system. Going to market for mitigation dollars, corporate social responsibility dollars . . . ALUS dollars are decided by the community – payment rates are set for different projects – based on land rental rates – a proxy for land value rates. In Norfolk County set at $150/acre (rental rate established a decade ago) – truly getting the marginal lands as land rental rates are now at $200/acre.

- Carbon sequestration is sold to the marketplace on an annualized basis for all time. . . off setting grassland habitat protection to permit tallgrass production – 20 year timeline with $350/acre/year payment. Provide additional naturalized landscapes that the science has demonstrated. We don’t need to prove that something is successful. . . monitoring is only useful to manage the payment schemes.

- Communities are evolving; ALUS money may be spent on planning such as in Grey-Bruce to better understand where priorities should be set. ALUS has sent dollars into communities in the $100s of thousands.

- OMAFRA completing a reverse auction for stewardship initiatives – one incentive payment being done up front with individuals competing against each other - invisible benefits index is not transparent.

- The planning system can assist in refining payments over time – you should get paid based on ecosystem services that are more/less beneficial. Ecosystem services increase when moving closer to people and moving closer to water. Ecosystem valuation needs to be thought more by planners.

- Conservation authorities are not respected as they tend to be thought of as government – building bureaucracies rather than putting actions on the ground. Important to add ‘additionality’ onto the landscape. ALUS spends their monies on adding ecological services. Norfolk tree coverage at 30%; Perth at 2 – 4% tree cover but county is not near water. In Perth we need to think of water resources in a green infrastructure system that is different, i.e. reflective of food production.
Questions 5 - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges? N/A

Question 6 – Other comments? N/A

Question 7 – Attendance at recap meeting? - yes, if available
Key Informant Interview with Michelle Kanter, Executive Director, Carolinian Canada - August 23, 2016

General Description - Carolinian Canada (CC) is a non-profit environmental coalition whose primary mission is to “advance a collaborative conservation strategy for healthy ecosystems within the Carolinian life ecozone” (taken from the 2014-2017 Strategic Plan). This ecozone is defined by a unique biogeographic zone of flora and fauna which stretches along the north shore of Lake Erie and is referred to as the ‘Deep South of Canada’. This area is the most ecologically diverse ecological region in the country; it also contains species at risk populations that represent more than 30% of the total found across the country. The area faces significant development pressures from urban and rural land uses that increasingly diminish and fragment the remaining natural areas within the land base.

CC has been in existence since 1984. They work to create and compile scientifically-backed information that is made available for beneficial environmental protection, stewardship and enhancement efforts respecting natural areas. CC has implemented Conservation Action Plans on prioritized endangered natural areas through direct ownership, easement and encouragement efforts to private/public land owners. A ‘Big Picture’ inspirational vision has been devised across the entire Carolinian ecozone to demonstrate the location of existing natural areas and corridors, and also the potential for new natural linkages that could create a more robust and resilient natural heritage zone in the area. CC has aided in the development of natural heritage plans that are required in the provincial planning system to be prepared for municipalities within the CC ecozone.

CC’s staff and volunteer members devote a significant proportion of their time and resources to education efforts and to forming collaborative partnerships between funders, landowners, government agencies, volunteer individuals and groups. The organization is led by a small staff and board of directors with an annual budget of approximately $400,000. Their funding comes from government sources, donations from corporate, foundation and private individuals as well as some earned revenue.


Interview followed ‘Organization’ Questionnaire Script

Question 1 – do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

- looks at the landscape in the following framework– it comprises natural lands and water (habitat), and cultural lands that are permeable and non-permeable. Environment Canada recommends 30 -50% natural cover for healthy landscapes.

- typical metrics for conservation include area protected and restored and number of plantings. In the Carolinian Zone, it should also include the number of people involved in an initiative.

-“healthy landscapes are dependent on healthy natural heritage systems”. “Low impact standards should be adopted across the landscape” – need to think beyond stormwater
management in urban areas to get the greatest benefit from natural infrastructure. Need to build resiliency into the landscape with diversity, variety of redundancies, etc.

- Planning language is beginning to discuss ‘low impact development’ using natural infrastructure – Climate change will bring more extreme weather – e.g. intense storm events – will provide additional challenges to stormwater management. Natural infrastructure can help to address this issue cost-effectively and proactively.

- there is a need to clarify urban development limits; greenbelts are needed everywhere in the southern Ontario landscape context. Most natural areas are significant in Carolinian Zone due to their limited extent.

**Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?**

- Overall yes – simple and effective
- natural areas are more than trees/forests – it includes diverse habitats including forests, grasslands, wetlands
- water and soil management could be broadened to include ecosystem services for air, soil, water and healthy landscapes;
- Community sense of place could be broadened to include healthy communities / health (mental and physical) / green jobs
- grey infrastructure should also include low impact development. ‘Natural’ green infrastructure should be separated or definition highlighted.

**Question 3 – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?**

- Definitely – if GI planning looks at nature first, there is great potential for multiple benefits for rural landscapes. If done well, it can be the intersection of community planning with natural heritage systems and greenways planning.
- Community and agriculture planning can benefit from incorporating natural features and ecosystem functions, often with cost-effective results. GI planning is at the nexus of conservation and cultural planning. GI planning should look at how things connect together, and add other benefits to the landscape, e.g., connected trails within greenways provide enhanced value.
- With many partners, Carolinian Canada developed Conservation Action Plans (CAP) for ecological hotspots with a focus on the protection of rare species and habitat, i.e., 15 have been created for areas across the Carolinian Zone.
- GI planning is reflective of planning process for Conservation Action Plans (CAPs). These plans focused on sites identified in a biodiversity hotspot analysis developed in conjunction with Environment Canada, Department of Fisheries and Oceans, Nature Conservancy of Canada. Represent hotspots of endangered and rare habitats within Carolinian Zone based on data
available – should add Six Nations, Erie shoreline. Carolinian Canada in general is a hotspot for biodiversity in Canada.

- ‘Big Picture’ vision guides CAPs. They set conservation targets for various areas – 80% of the zone is currently covered. .. via a natural heritage systems perspective. Represents a functional network of groups that work together for 400 priority actions for 130 priority targets (8 per CAP / with hundreds of nested targets) for species of risk, and habitat and cultural resources. A team of partners for each CAP identify priority areas, keystone targets, threats, key stakeholders and priority strategic objectives and actions.

- Carolinian Canada has collected 150 commitments for implementation: from national parks, municipalities, local groups. Objective was to have consistent mechanism to prioritize, monitor and update actions. All voluntary; need to work together not fight, and GI planning can work.

- Carolinian Canada works in harmony with agricultural uses of the landscape and promotes adoption of best practices to support natural heritage and biodiversity. Promote good stewardship of whole landscape. – promote functional natural systems. “creating a landscape that is healthy”.

- we plan and operate by the “3 S Big Picture best practices for healthy landscapes – Save existing nature / biodiversity; Steward the whole landscape using best practices; Seed and grow native plants to restore lost habitats (start with priority restoration areas for highest efficiency).

**Question 4** – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?

- CAP work would be easy to integrate into GI strategic planning - it works closely with rural landowners and municipalities and has identified priority actions that could be integrated into GI. Would require more collaboration with municipalities.

- potential GI implementation initiatives within CAPs with diverse stakeholders – e.g. rain gardens, hedgerows, dam removal

- Often an ‘awareness gap’ – natural system improvements don’t need to cost a lot and they can make big changes on the landscape for people and nature – using GI as a framework.

- Agriculture lands can be part of good land stewardship – ag lands can support GI (natural infrastructure) but it needs to be done carefully.

- link to watershed plans that look at both water and land. .. GI planning should bring “all things together” – DFO, CAs, municipalities.

**Question 6** – Other comments?

- GI has the opportunity to link to climate adaptation plans as an important component; carbon capture with provincial and federal government programs is only one aspect. Natural systems are the best way to adapt to climate change and help communities stay healthy in terms of air, water, soil through extreme weather events for example.
- Diane Saxe states planting trees is the closest thing we have to a magic bullet solution to the challenges of our time.

Find something that resonates with people; “people are the most important element in planning & implementation”.

- Important to work together to enhance natural systems; involves bringing stakeholders together: engineering, conservation, community planning, community health, climate experts. All are involved and working towards one solution.

- Barriers: lack of funding to complete plans.

Question 7 – Attendance at recap meeting? – yes
Key Informant Interview with Paul Nichol, Huron Business Development Corporation General Manager – October 19, 2016

General Description – This organization is a non-profit CFDC that works in partnership with industry Canada. They have been in Huron County since 1993 with an overall mandate to “help entrepreneurs make their future in Huron County.” As a member of the Federal Economic Development Agency for Southern Ontario (FedDev Ontario) they are partially funded by the Canadian government, i.e., approximately $250,000 each year. The organization provides management counselling, business loans and support for community projects that strengthen the local economy. Over the past 30 years, the Corporation has been a partner in over 400 distinct economic development and business projects in the County. Investments in programs have been made in excess of $30 million during this time frame with various levels of government. A wide range of projects have been supported; e.g. tourism development, school to work bridging programs, doctor recruitment. Five staff work in the operation, with their office centrally located in the County in Seaforth.

Information Sources: Website for Community Futures Huron; Personal Communication, October 19, 2016.

Interview followed ‘Planners’ Questionnaire Script (an Original GI Use Survey Respondent)

Question 1 - In consideration of the research definition of GI planning, do you believe that the GI element that you have previously identified (Sustainable Huron community plan) can be a component of an overall GI planning system? Yes/No/Maybe. . . please explain your answer.

-does the consideration of green infrastructure as a starting premise potentially bias the discussion within a strategic planning framework?

“What are the natural resources here that are going untapped within Huron?” – within the Sustainable Huron project, green infrastructure within the community was identified as a valuable asset.

Sustainable Huron - What are the things that you value in your community and how do we maintain them? – an integrative strategic planning exercise.

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

-2 levels of GI within Huron County. One is farmland and they are doing a good thing in Huron in protecting the soil base. Is the whole ecosystem sustainable? – at one time, the area comprised 20% wetlands, and now there are 2%. Is this sustainable?? Looking at mechanisms to protect the land base via use of subsidy dollars to maintaining green infrastructure in the area.

An important question is “what is the value of GI and who should pay and who benefits”. Climate change policy is also a component of GI as it affects types of agricultural production systems, e.g., cash cropping versus livestock production.
Question 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.

-discussions within Sustainable Huron revolve around many aspects of environmental issues, e.g. Agricultural resources via OSCIA and Wood Forestry Association; work on clean water initiatives via cottage associations and CAs. Many initiatives are underway to protect natural resources in the area and “there is a good return on investment – things are improving respecting the land and water”. Another important interest area in the area is local food and permaculture undertakings, i.e. mushroom fungus from trees to tea production, birch tree syrup opportunities, enhanced protein powder from crickets. Important to “Harvest overlooked natural assets”.

Question 4 - What do you believe are important elements to include within a GI planning framework as discussed above?

1) Cultural and natural heritage components – in the 1980s being taught productivity at all costs; now environmental stewardship is given common thought. Maintaining the resource as multi-generations are embedded within a family farming situation. Now corporate farms with up to 10,000 acres and a mindset that “take care of the land resource and it will take care of you”. Cover crops are used to rebuild agricultural soils.

2) Innovation important for the river is an economic asset that needs promotion as a tourism asset, e.g., the video of the lower Maitland River with its various activities in all seasons of the year.

3) Land use planning needs to consider ‘highest and best use of land’ but this may not be a viable concept within a short-term economic thinking lens. “Need to turn economics on its head?” Cannot ignore the competing uses of land within an area, e.g., the Walton reuse of an aggregate mined-out piece of former agricultural land for reuse as a motocross track and activity centre.

4) Cultural heritage thinking within the Brussels and Goderich downtown landscapes are important initiatives. For a pastoral rural scene, the old $2 dollar bill view can be an example, i.e., a maple tree within a valley scene on a farmstead in Richmond, Quebec on the St. Francis River in the eastern townships.

Question 5 - Does the conceptual planning framework (see Appendix) of illustrating how ‘grey’ and ‘green’ infrastructure would work in a community make any sense to you? Why or why not?

- conceptual framework embodies a municipal governance approach to the issue. Overall impression is that green/grey are in competition to one another. The overall image reflects a stormwater management perspective – not all about risk mitigation but should consider opportunities. Green features are assets not liabilities.

-How can land use planning functions be improved in looking at natural assets. Municipalities don’t necessarily look at the land from an environmental stewardship asset perspective; this may be more associated with environmental groups or agencies such as conservation authorities. Example of a natural asset seen as a community liability is the Howson dam in Wingham. . . but this is a politically charged issue.
Question 6 - How does this diagram fit/not fit with your ideas on the use of GI elements in planning?

- Municipal hard ‘grey’ structures on one side, but more nebulous non-municipal stakeholders with big picture notions embedded in the green environmental side.
- Risk adverse policy/decision makers associated with grey thinking. “Economic development function is becoming a stronger force in local/regional affairs.” Planning is to engage the community to promote economic endeavour as well as protect important environmental assets.
- Not a strong economic function displayed; role of the planner to further economic endeavours needs to be acknowledged. As an economic planner, you need to define your assets - financial, social and natural capitals. Natural capital is within economic developers’ purview.
- As an economic planner, you need to start with an asset-based approach. These are categorized as financial, social, human and natural capitals embedded in the community. All assets are important for a viable community – the farmland, the lakeshore, the communities are all important assets for community economic development.

Question 7 - In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not?

- A qualified yes with an ‘outside of the box thinking’ approach – a mechanism to think of climate change and the soil type within the Maitland area for growing hazelnuts for the Ferraro Roche factory, Brantford location. The natural resources of the area can be tapped into for the area.

Question 8 - If you believe there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized? Do you think this system would assist communities in addressing resilience and sustainability challenges?

- Cannot be talking about rural Ontario unless you are considering green infrastructure and natural resources. Natural assets are present. In Huron County planning policies are dated . . . 40 years old. Based on a notion that if agriculture is doing well then, the county will be doing well – first Official Plan in rural Ontario in 1973. Not a simple answer. . . tool needs to look at the full suite of green infrastructure – all aspects need to be considered including the natural assets as well as the agricultural land base. Need to go beyond the land resource base – need healthy communities. Need to consider “The planning notion needs to look at the optimum use of the resource for the long term”. We may need additional natural use areas to consider the complexity of the environment. . . not a simple notion. “Need to plan for healthy populations beyond simple land use issues – Sustainable Huron as an example”. “The consideration of quality water and land is as important as the availability of financial capital to grow the local economy.”

Question 9 - If you believe there is limited or no utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency/sustainability challenges?

n/a
Question 10 – Anything else? - no

Question 11 - Interested in recap meeting attendance - yes
Key Informant Interview with Conservation Ontario: Kim Gavine, General Manager and Jo-Anne Rzadki, Business Development & Partnerships - September 8, 2016

General Description - Conservation Ontario (CO) comprises the head office of CAs in Ontario. The office is in Newmarket, Ontario where a staff of 11 deal with co-ordination, information sharing and central policy issues for the 36 CAs within the Province. The CAs are generally located in the densely settled portions of the province – the area to the south of the Canadian shield/Algonquin Park in southern Ontario as well as in areas of major population concentrations in northern Ontario.

The CAs are governed by the Conservation Authorities Act, RSO 1990 (currently being updated). CAs have responsibilities principally associated with water resource management issues (drinking water supplies, flood control, watershed water balance issues) as well as environmental protection matters (development constraint regulation, stewardship initiatives). Co-benefits of water storage facilities or flood control structures often offer co-benefit opportunities for public education/recreation pursuits. The central Conservation Ontario office compiles ‘watershed report cards’ which provide a standardized measurement metric as to how various watershed areas in the Province are doing with respect to certain key natural resource variables, i.e., quality and quantity attributes associated with surface/groundwater resources, and key natural features (forests, wetlands). The Conservation Ontario office also organizes one of the largest conservation symposiums on the continent (Latornell Conference) on an annual basis.

The Conservation Ontario operation has a $3million budget (2016 Annual Report) that is funded through membership fees to the CAs across the province (approx. $1.2 million or 40% of all revenue); and the remainder coming from special projects and senior governments.


Interview followed ‘Organization’ Questionnaire Script

Question 1 – do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

- rural non-point source agricultural runoff should be considered as part of federal government’s GI infrastructure funding program – this to include swales, grassed waterways, shelter belts, artificial wetlands, woodlots, etc.; natural green infrastructure with stormwater management systems that can assist in reducing environmental impacts. Controlled drainage systems with taps in the landscape – South Nation, Maitland, Essex, Ausable Bayfield, etc. Subwatershed planning by CAs to protect natural heritage and working landscapes. Erosion controls via a controlled wetland system (Scott drainage system) Green Cover Canada (soil and crop improvement association)

Watershed management planning and economic benefits (Wanghong Yang, U of G) watershed modeling

CAs’ integrated watershed management planning system is akin with a ‘one landscape’ farming community mindset. IJC water quality board is establishing a standard planning framework of
what constitutes a ‘good’ watershed plan to address nutrients going to Lake Erie. Some CAs do these, and some do not.

Province needs to embrace integrated systems – IWM – working landscapes, natural heritage systems, etc.

IWM looks at water quality, various stakeholders and then all work at putting a plan together. . . for shared ownership prioritizing land use efforts via watershed plans. Look at multiple use beneficial opportunities e.g. Halton Region. Other CAs look at watershed planning at a higher level of analysis such as preparing for the watershed report cards e.g. Upper Thames. Not all community stakeholders involved here however.

An IWM plan may be prepared by stakeholder groups and then presented as a community plan to municipal entities to assist in updating municipal plans. Land owners may not be involved directly here. Economic benefits of green infrastructure planning need to be highlighted – higher upfront costs with larger long-term benefits as well as marketability benefits. Costs of development have been identified for low impact development, i.e. see info for Mike Walters, Lake Simcoe CA. Credit Valley CA is involved in municipal natural asset study and is looking at cost benefits, ROI of LID.

BMPS and the benefits of rural stormwater management; Grand River water management planning which includes waste water optimization planning, water supply management considerations. Contact Joe Farwell or staff Sandra Cooke or Louise Heyming, GRCA Rural Water Quality initiative; benchmarking important with modelling studies.

Sustainable Technologies Evaluation Program – STEP is about to embark on a study to consider the Drainage Act as a tool for Green Infrastructure.

Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

KG -discussion around illustrating water and drinking water should be noted; add Great Lakes as a stand alone benefit for communities. Use a ‘one water approach’ where drinking water, stormwater management and sanitary water management issues are considered.

Question 3 – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?

– GI planning strategies are not the same as IWM planning. Rural Ontario municipalities are piecemealing things together for working landscapes, natural heritage planning, etc. All municipalities should do IWM planning everywhere.

Natural capital assets in Gibson, BC is an interesting ‘best practice’ in a municipality defining value to natural services. As noted above CVC also engaged in this project in Ontario with Peel region
Adaptation planning is required to adapt to challenges – adapt to threats such as climate change. Need for GI relative to future air impacts, carbon sinks, vegetative technologies. Need to see multiple benefits of green spaces.

Question 4 – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?

– new legislation in the form of a Green Infrastructure Act; promote understanding of LID to various rural locales – inform and educate CAs and promote CA expertise, implement demonstration projects, evaluate and share lessons learned, understand and develop solutions to overcome barriers to implementation. Need to demonstrate economic benefits of GI, i.e. quality of life, human health. Rain gardens cost more money upfront but reduce long term municipal expenditures, i.e., people maintain the stormwater management facilities. On-going education is important.

Questions 5 - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges?

– N/A

Question 6 – Anything else? – look at examples of showcasing water innovation; Ausable-Bayfield, Maitland CAs. Also Niagara on the Lake implementation of GI elements; Norfolk’s Port Rowan sewage lagoon converted to a stormwater management facility with associated other benefits (bird watching, rural property landscape enhancements).

Question 7 – Attendance at recap meeting? maybe (JR)

General Description - Ducks Unlimited Canada (DUC) is an environmental charity whose mission is to “conserve, restore and manage wetlands and associated habitats for North America’s waterfowl.”

The organization is the largest charitable institution in the country directed at conserving habitat. They undertake their mandate through measures such as land purchases, management agreements, conservation easements and leases.

The organization has been in existence since the 1930s and is affiliated with US-based Ducks Unlimited. DUC has approximately 500 employees that work in offices located across the country and their restoration works are in strategic waterfowl travel/staging areas across Canada. Within Ontario their interests lie mostly in the Great Lakes-St. Lawrence River area where they are engaged in improving habitat conditions in coastal Great Lakes areas as well in the few wetland areas that remain since colonization. The challenge of wetland loss reduction continues due to the high land values and economic development pressures on the southern Ontario land base.

DUC has a national annual budget of approximately $90 million. Nearly ½ of their funding comes from government grants; with the remaining portions coming from programs, non-government partnerships, grassroots and philanthropic fundraising. The bulk of their expenditures, according to national accounts involve restoration of wetlands (75%); a revolving fund that secures conservation easements on land and then requires the land to be resold (13%); education, communications and government/business involvement (12%); and research (5%).

In Ontario DUC has worked recently on implementing landowner programs involving conservation and agricultural interests, exploring the opportunities of green infrastructure use for artificial wetland development and stormwater management; invasive species eradication (European water chestnut and Phragmites); wetland restoration in the Lake Simcoe and Georgian Bay areas; and policy work with the Ontario government to stop wetland loss by the year 2025, i.e., A Wetland Conservation Strategy for Ontario 2016-2030.

Information Sources: General Ducks Unlimited website including information on DUC, Annual Report 2016; Personal Communication, October 28, 2016.

Interview followed ‘Organization’ Questionnaire Script

Question 1 – do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

-Health of ducks is an interesting metric to illustrate the health of the landscape - notion has morphed over the centuries

- a strategic initiative to waterfowl - wetlands and the services that resonate with the public Natural green infrastructure - a challenge with green is that its typically highly engineered (i.e., bioswales, porous pavement, etc.) and very urban focussed. . .Natural green infrastructure like wetlands is best implemented in rural or near-urban areas, where there are many more restoration opportunities. So we use the term natural GI (or just natural infrastructure) to distinguish this type of GI.

Engineered systems - highly engineered in an urban context, e.g. - grey to green conference
Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

- makes sense; intentional arrows with supports/replaces grey infrastructure. Add wetlands to supplement traditional stormwater management. Source water protection assistance.

Need a mix in investments - Lake Simcoe with ambitious targets to reduce phosphorous levels. Rural non-point source pollutants to mitigate the nutrient loading into the lakes; strategic combination of infrastructures is required.

Question 3 – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?

- NHS planning; watershed planning are environmentally focused initiatives. GI is wider implications to quality of life, local food. A lot of effort goes into separate initiatives; - line is unclear. My point here was: we already have 2 similar types of planning tools that apply to rural communities (NHS and watershed planning), and there’s some overlap in those 2 tools. If there’s going to be another planning tool along the same lines, how will it differ and what added value does it bring? GI planning should bring notions together in addition to quality of life (recreation, leisure). Can we build upon existing processes/systems? e.g. Community sustainability plans like the one for Severn Sound Community Association.

- strategic initiative – conserve existing habitat and restore habitat where it is most important; coastal marshes in the lower great lakes are continentally significant for staging waterfowl. Protecting, securing and managing wetlands in these areas. Also conservation of habitat for breeding waterfowl with 8 priority habitat areas. Coastal marshes time and money - less from the prov/fed. Going to securement of these areas e.g. via acquisition, conservation easements & also management agreements with 25 year terms. Sometimes purchase lands - coastal habitats - gov’t and non-gov’t. Put easement in place and then sell it. Funding for inland drainage. . . Conservation easements require annual compliance in terms of monitoring and assessment the baseline condition. . . Conservation agreements to maintain conservation land tax grants/ ecological gifts. . . Wetland conservation projects range in size from 1/4 acres to 100s of acres. . . North American waterfowl management plan. . . With funding NAWMP - matching with federal/state and DU Inc (US sister organization) and Cdn gov’t funding resulting in a match of up to 4 to 1 . . . NAWMP Funding in Ontario since the mid 1980s. . . 2/3rds of the waterfowl come from the prairies. . . Prairie pot hole region. . .

- DUC supports use of market-based systems to compensate landowners for ecosystem services produced by wetlands on their land- carbon offsets for wetlands, etc. MOECC, as part of the cap and trade system is currently developing 13 carbon offset protocols (to quantify and verify the amount of ‘x’ carbon captured by different practises like avoided conversion of grassland and afforestation)- DUC and others are studying carbon capture rates etc. by wetlands. For wetland restoration, there’s a lag time from the time of restoration until the wetland becomes a net sink of GHGs - referred to as the switchover time – Release of methane and nitrates are factored into this assessment.

- phosphorous storage on ag lands. . . DU brings forward the best science forward for wetland ecosystem services. . . flood mitigation benefits for wetlands.
- can assist in GI planning; support for rural landowners to protect and restore their own green infrastructure.
- assurance and confirmation that natural systems are helping the overall system;
  - DUC is undertaking a study to assess how much wetland is enough, e.g. on a watershed or municipal basis, for southern Ontario. DUC and the Green Budget Coalition (NGOs) have asked the Federal govt to set aside 15% of their infrastructure to spend on natural GI -
  - Southern Ontario has lost about 3/4 of their wetlands; need more back on the land...the question being asked by gov’t and others is how much more; and to answer that question, a key consideration is for what purpose? i.e., what wetland ecosystem service(s) is most urgently needed to improve watershed health or meet other local community goals. Goal for wetland services - % differences for various ecosystem services. Flood mitigation, recreation, etc.

Question 4 – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?

- land use planning - build the science; work with landowners to build and understand and conserve wetlands... With education and extension. Also educate federal/provincial agencies.

Questions 5 - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges?

- N/A

Question 6 – Anything else? – no

Question 7 – attend a recap meeting - maybe
Key Informant Interview with Suzanne Barrett, Ecohealth, Coordinator of EcoHealth Ontario; and Stewardship Network of Ontario (SNO), Chairperson – September 22, 2016

General Description - Ecohealth Ontario comprises a collaborative undertaking created in 2014 with a website presence at http://ecohealth-ontario.ca/

It comprises a group of “professionals from various organizations in the fields of public health, medicine, education, planning and the environment” that are actively engaged in a “collective impact” networking and information sharing enterprise. The collaborative gradually evolved over the past half decade through discussions with various individuals in the above fields centred in Toronto. Forests Ontario’s ‘A Healthy Dose of Green’ white paper released in 2014 was a primary motivator for collective action on the topic of natural spaces and healthy people. Funding for the collaborative comes from the Ontario government (Trillium Foundation), the environmental NGO Forests Ontario, and on-going in-kind support from organizations participating in the initiative.

Information Sources: General Ecohealth and Stewardship Network of Ontario websites; Personal Communication, September 22, 2016.

Interview followed ‘Organization’ Questionnaire Script

Question 1 – Do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

Definition of GI – living should be emphasized in the definition of ‘green infrastructure’. The average person understands what green is, but the notion of the item being ‘alive’ should be emphasized in the definition - distinguishes it from other ideas of green infrastructure such as renewable energy

Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

- in the diagram, grey infrastructure is well understood – these are tangible items that persons understand; green infrastructure categories are not the same. For example, green infrastructure benefits are described such as community sense of place, biodiversity protection. Mixing tangible and intangible categories in the illustration.

The picture illustrates the ‘things’ that green infrastructure comprise. This is easier to understand. For example, the interconnections associated with water (overland drainage, groundwater, streams, etc.) are the elements of stormwater management.

Question 3 – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?

Question is being answered with respect to Stewardship Network of Ontario and Ecohealth organization perspectives. Does not want to comment on the utility of incorporating regulation within the planning system – will leave this to others. She will comment on the concept as it is associated with SNO which is engaged in stewardship of natural resources and Ecohealth which can be nested within the GI planning concept. GI planning is a principle motivator for various stewardship initiatives, and associations with natural health.
SNO has been established to share information and build community capacity, i.e. A KNOWLEDGE BROKER can assist in furthering the role of GI in local municipality settings. GI planning provides a bigger vision envelop for what SNO is engaged with.

Ecohealth Ontario is currently working on a policy toolkit that promotes the incorporation of ecohealth policies within community planning documents, i.e. the beneficial qualities – both mental and physical health that are associated with quality natural environments. The GI planning concept provides one more opportunity to promote and incorporate the concept of ecohealth within the planning system. Ecohealth component of GI is not well understood and needs to be acknowledged within planning systems.

As background reference, green infrastructure is not a new term – the Lake Ontario waterfront work in the early 1990s referred to the waters edge as green infrastructure to the urban community. Through the recent planning design work for the southern Ontario landscape, planning terminology has focused around ‘the complete community’ – “a healthy, robust natural system is a necessary component of complete communities”.

It is incorrect to consider green infrastructure within a narrowly defined category. Unsure of where the association with water/stormwater management functions has come from. Should consider the concept as embracing nature/natural systems – an ecosystem approach where humans/nature are inter-related.

People/politicians understand the common definition of green natural systems – may need to differentiate this form of infrastructure away from traditional grey infrastructure which has a diminished ecological footprint. May need to emphasize living part of green infrastructure. Stormwater management is only small component of the overall GI tent.

See federal government definitions of GI to contrast various definitions of GI – from their stakeholder input survey, GI may be defined in one of several ways – infrastructure that promotes human health and wellbeing (all environmental service forms of development (sewer, water); or building things in an environmentally conscious way; or building things that are resilient to climate change and natural disaster; or natural infrastructure.

**Question 4** – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?

There is a utility in the concept; a powerful idea. However, reluctant to make comments on how the planning system should be amended. Important to include the concept within the planning system – create better understanding and support for nature/natural systems within the existing land use planning system

**Questions 5** - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges?

N/A

**Question 6** – Other comments?
Various options are available to further the notion of GI planning within the current planning system of Ontario. 1) create a new strategic planning system incorporating GI thinking; 2) build on existing tools/techniques to make GI planning happen. In what ever form it takes, it is important to take care of existing land, air and water resources.

We want GI thinking to assist in furthering stewardship, natural systems securement and layered land use planning tools. Important to consider the broad notions of health, using planning tools.

Unsure why within the planning system, GI has ended up with a narrow definition, i.e. GI is principally a stormwater tool associated with hydrologic functioning.

Important to position it correctly – people need to acknowledge the goods and services of nature in the areas where people work and where the natural services are provided. Important to consider and acknowledge an ecosystem approach – look at planning work from a biodiversity protection perspective.

Whether GI is used as a definitive planning tool, or a topic area motivator, there are many different ways by which we can move forward. Robust natural systems are essential to building resiliency and reducing vulnerability to future adverse conditions, i.e. climate change impacts.

An ‘ecosystem planning approach’ is important that considers many components.

**Question 7 – Attendance at recap meeting?** -yes, if available
Key Informant Interview with Kevin Money, Director, Conservation Services Essex Region Conservation Authority – December 5, 2016

General Description – Essex Region CA is one of the 36 conservation authorities in the province with their jurisdiction is centred in the Windsor area, the extreme southwestern corner of the province. The Authority was established in 1973 under the governance and mandate provisions of the Ontario Conservation Authorities Act. They are responsible for the furthering of “the conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals” within the area. www.erca.org Their jurisdiction encompasses approximately 1,700 square kilometers within the municipalities of Essex County, Windsor and Pelee Island. There is a staff of 36 who work with an annual budget of $9.2 million. Approximately 1/3rd of their revenue is obtained through municipality levy, 25% comes from senior levels of government, and the remaining portion comes from service fees and community donations.

The Authority provides significant information on their mandate and operation on their website. The organization’s mission statement is outlined in their Strategic Plan:

All elements of a place are interconnected – our community, its environmental health, healthy lifestyles for our citizens, and our economy. Life recognizes our living, thriving, sustainable natural systems. Life refers to the people of our community; their health and protection, and our shared heritage. We embrace this place and make it our home. For life.

The 2016 Annual Report highlights the significant topics the Authority is involved with: climate change including issues of erosion and flooding, Great Lakes, landscapes and habitats, sustainable communities, and building a strong resilient organization. The 2016 Watershed Report Card highlights several of the significant challenges the Authority is dealing with: poor surface water quality conditions; limited areas in forest cover, wetlands. The Report Card indicates groundwater is in good condition due in large part to the clay soils of the region that cap any surface waters from getting into lower groundwater areas.

In reviewing why the Authority was chosen as a key informant organization, this was due in part from the initial GI Use Survey work that was completed for the examination of GI and economic activity in the province. Kevin Money, Director Conservation Services responded to the Survey with many interesting approaches to the use of nature to assist in local economic activity. He highlighted efforts to retain agricultural soils on the land through various incentive programs to propertyowners. Also, the CA has an interesting economic partnership initiative where they operate a demonstration farm where various innovative environmentally-friendly cropping and landscape use practices are tested and researched. The Essex Region Demonstration Farm, established in partnership with senior governments and the Ontario agricultural community has been in existence for several decades now.

Information Sources: General Essex Region CA website, includes information on Strategic Plan 2016-2025 – Sustaining the Place for Life, Watershed Report Card; Personal Communication, December 5, 2016.

Interview followed ‘Organization’ Questionnaire Script
Question 1 - Do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

CA is attempting to add additional nature/natural systems into the landscape which has been significantly altered after colonial occupation. Waterways are highly contaminated with ag land sediment. Brown run-off ‘land soup’ is a good illustration of impacts of colonialization on the landscape.

Tool has not been constructed to manage water on the agricultural landscape – a missing element with the drainage act. Muck from bottom is placed along edge of drain; vegetation kept back from drainage ditch to maximize potential rapid water flow from field drains.

Essex region attempts to assist in rebuilding natural cover in the area. Many challenges. . . see ‘one million trees’ campaign (hard copy) info. Forest cover at 4% which is lowest in Ontario. Document states that 1 million ash trees to be lost representing 20% of the tree cover in the county.

Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

-GI planning makes sense; very similar to strategic plan strategic objectives for the conservation authority (see hard copy plan)

-Important to have a 360-degree community overview; community sense of place is very important, with balance achieved in the middle of various drivers. . . Economic drivers mixed with fixed entities in the landscape set the sense of place for the community.

-Graphic is a bit odd as outcomes from GI, (climate change protection) are mixed with elements of GI

-Essex should be defined with variety of natural features, e.g., prairies, wetlands, multiple-function types of features within the aquatic natural systems, especially using the Great Lakes as a means to define the region.

Question 3 – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?

-need balance so GI planning is essential. Blue-green algae blooms in the waterways are indicative that things are not in balance.

- The CA mandate is to build GI in the region; organization to support and fund initiatives. The goal is to build natural habitat - improve natural capital. “They are the leader in the region in putting this as a priority. Many of their initiatives fall under the umbrella of GI.”

Question 4 – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?

-funding; land use policies - riparian buffers along drainage ditches. Current land use system doesn’t help the provision of GI. With integrated watershed management plans this will build
capacity in the area. This plan is currently not in place – many sub-watersheds within the area and other matters have been a priority, i.e., see website for listing of various projects such as source water protection, east leamington erosion and land protection study, etc.

-To formulate a useful GI plan, key individuals in the community are required to get buy-in and acceptance right from the formulation of the GI planning proposal. Natural heritage system plans with features on the land within a systems context are important considerations in the preparation of a GI plan. Habitat, both aquatic and terrestrial are of primary importance.

-GI plans can go further than other plans by a conservation authority such as source water protection plans; these plans are primarily concerned about drinking water quality and quantity issues. Integrated watershed management plans look at water issues from a broader perspective ensuring water quality/quantity in the community.

-GI planning can make the existing system better as currently the Essex region is not in balance, i.e., significant agro-production but not sufficient consideration around soils management and good production techniques (maintaining organic content in the agricultural soils, provision of cover crops, keeping water on the land and a wholesale management of agricultural lands water on the landscape).

Questions 5 - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges?

n/a

Question 6 – Other comments? – No

Question 7 – Attendance at recap meeting? - yes
Key Informant Interview with Friends of the Greenbelt Foundation: Tom Bowers (TB), Research Manager, and Kathy Macpherson (KM), Vice President Research and Policy - August 15, 2016 via a telephone conference call

General Description - The Foundation is a non-profit organization founded in 2005 that is intended to “nurture and support activities that preserve and enhance the Greenbelt’s agricultural, rural and ecological integrity. Public awareness and appreciation of the Greenbelt is also an important element of the Foundation’s work”. The Greenbelt itself is a land use policy entity set by the Provincial government that has been applied to a broad swath of peri-urban rural lands (approximately two million acres) surrounding the Toronto-Hamilton urban conurbation. The Greenbelt was created in 2005 for many reasons: to encompass unique natural areas on the southern Ontario landscape, e.g., the geologically significant Niagara Escarpment; the Oak Ridges Moraine which is also an important groundwater recharge aquifer for drinking water supplies; to recognize and protect natural heritage system areas that comprise wetlands, forested areas, habitats for species at risk, etc.; and to protect areas for agricultural production and scenic rural landscapes, i.e., the countryside. In addition, to the above, the Greenbelt also provides a boundary to urban development that has been spreading out from the Toronto-Hamilton centred area over the past century (Ontario Government Greenbelt Plan, 2005).

In referring to administrative details of the Greenbelt Foundation, they have a staff of 13 people that is primarily funded by but operates at arms length from the provincial government. Since 2005, the Foundation has “invested and leveraged more than $47 million into farming, environmental protection, and tourism projects to make the Greenbelt a great place to live, work, play, and grow.”


Interview followed ‘Organization’ Questionnaire Script

Question 1 – Do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

TB – everything that is green/natural can be construed to be GI; what have you gained with this notion within a rural context? A broad definition could muddy the policy formulation conversation that is currently underway in Ontario. GI is more valuable with a more refined definition and application.

KM – appreciates the notion of GI being a useful device to assist human endeavour; but is concerned about lack of concept focus. Appreciates the attempt of a land use planner to push the utility of planning with nature, rather than against it. Unsure of the utility of planning with a GI strategic focus, as the concept encompasses many facets of nature and is unfocussed.

TB – prefers a narrowly-defined notion of green infrastructure; something that includes an engineered/managed natural system that provides ecological support for both human and natural communities, i.e., water management and linked natural systems. GI should ‘support’ the natural system – it is a tier down from nature. Nature is nature without applying a new definition to it.
Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

- services for humans (buildings, networks) are outlined with ‘grey’ but ‘green infrastructure’ element depiction quite limited (some examples of goods/services of nature are outlined only)
- items are not described as ‘services’. “Muddies the water”. Also the circles are not all encompassing but instead point at ends of the spectrum. Why?

Question 3 – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?

KM - people in general don’t understand the services provided by natural assets; the notion of GI may assist. People understand infrastructure, and therefore this may assist in explaining how nature can benefit human beings.

TP - the framework should be narrowed in scope; the management approach will be adjusted for the purpose by which the natural assets are intended to be used. For example, in consideration of an anthropocentric worldly view, forests can be managed for biodiversity enhancement versus a service to a nearby urban area – how you quantify the assets of the resource (its value) will determine how the asset is to be managed. Establishing the value of the GI service is important in its particular locale.

- GI is important for providing human services as well as protecting natural assets (air, water, land). “we need a viable ecosystem to survive and so GI as a reductionist thinking concept doesn’t get you anywhere; we already know that a healthy environment is important for human survival.”

Question 4 – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?

TP – supports a GI systems planning approach – it represents an engineered/managed approach of nature/natural systems that connect to urban areas, e.g. a water management system that incorporates forested areas that provide water retention/cleansing functions to promote sustainable urban development. Natural areas such as forested areas are already recognized as a component of natural heritage systems – don’t need further terminology associated with this topic.

KM – unsure if GI planning strategy term is useful; may or may not be. Already have natural heritage systems planning in place, so how would this form of planning assist.

TP - providing services needs to be acknowledged – what are the beneficial outcomes provided by GI. Narrowing the focus to engineered/managed services to assist human endeavour should be emphasized.
Questions 5 - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges?

-an interesting project. Interesting to see what planners will have to say about the notion.

Question 6 – Other comments? – No

Question 7 – Attendance at recap meeting? - depends (on availability and timing)
Key Informant Interview with Ontario Green Infrastructure Coalition Representative - Deborah Martin-Downs at Credit Valley CA Office – August 10, 2016

General Description - This coalition formed out of discussions with interested government, non-government and business leaders in 2009 in the Toronto area around the general topic of ‘green’ infrastructure. Since that time the group has completed research on the topic and has moved into an advocacy coalition position that encourages information sharing and organizational networking. They have a website at http://greeninfrastructureontario.org/ that provides background information on the topic, with administration support being provided by the Toronto and Region Conservation Authority.

In 2012, the Coalition released a report in conjunction with Ecojustice entitled “Health, Prosperity and Sustainability: The Case for Green Infrastructure in Ontario.” This document succinctly provides a definition of GI:

*Green infrastructure is defined as the natural vegetative systems and green technologies that collectively provide society with a multitude of environmental, social and economic benefits. GI takes many forms including the following: Urban forests and woodlots; wetlands, waterways and riparian zones; meadows and agricultural lands; green roofs and green walls; parks, gardens and landscaped areas; bioswales, engineered wetlands and stormwater ponds. It also includes soil in volumes and qualities adequate to sustain green infrastructure and absorb water, as well as technologies like porous pavements, rain barrels and cisterns, which are typically part of green infrastructure support systems.*

At the time of the report’s release, the coalition represented the following organizations: Toronto and Region CA, Conservation Ontario; general association organizations (Ontario Parks Association, Ontario Association of Landscape Architects, and the provincial landscape trade association, Landscape Ontario); several environmental NGOs (Evergreen, Green Roof Toronto, LEAF). The coalition’s membership has expanded since then.

Funding for the organization comes primarily from in-kind support by its members as well as Ontario government grants, i.e., Trillium Foundation operating and special project grants from time to time.

Information Sources: Green Infrastructure Ontario Coalition general website; Personal Communication, August 10, 2016.

**Interview followed ‘Organization’ Questionnaire Script**

**Question 1 – do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?**

-Overview of GI as envisaged by her/GI Ontario Coalition – GI “focus areas” include the following topics: agriculture (all types from local to ag industrial scales), green roofs/walls, urban forest, stormwater systems, public spaces, natural heritage. All of these assist in related areas of: climate change, health, energy, economics.

-Coalition interested at one time in a GI Act for Ontario; GI needed to be directed to both urban uses (green roof) as well as rural areas for ‘political reasons’.
Groupings formulated by ‘focus areas’ to push GI notion forward. . . .Ag group. . . Public spaces group. . . etc. Existing groups are the green roof people, and also the LID people. LID extremely important in highly impervious areas and not so much in more rural locales.

Ag/NHS and watershed systems. . . street trees are located in any location, hamlet to large city. All trees should be considered. . . regardless of location (not just ‘urban’ forest areas).

Biodiversity enhancement/protection is not included as a ‘focus area’ as this is a ‘hard sell’. Coalition doesn’t want to put all of their ‘eggs in one basket’. Mono-culture tree plantings, etc. Municipal politicians/general public have a hard time relating to the necessity of diverse ecosystems. . . why? Put it more in the notion of providing diverse systems that can adapt/adjust to changing circumstances – this generates greater acceptance and acknowledgement.

Cost effectiveness of planning with GI can be demonstrated with the increased marketability of development lands, for example.

Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

- In looking at the conceptual framework, parks/recreation spaces should be added to built ‘grey infrastructure’ side – builds on the assets that are already in place; promotes joined up thinking to combine green and grey infrastructures

- energy conservation should be noted as a ‘service’ of GI, i.e. summer shading effect, winter cold protection

Question 3 – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?

There is utility of a GI planning framework that is distinct from other planning systems such as watershed management planning. GI planning goes beyond water management considerations. . . it is important to link street trees, for example that have tremendous water storage capabilities in the tree canopies with energy saving opportunities.

Anchor pieces and linkages are important components of GI planning. Provide connecting links that can include permeable - penetrable, porous spaces; these include agricultural fields, institutional grounds, active park spaces, golf course lands, etc. to connect natural areas together.

GI planning important to bring diverse stakeholders together, and examine alternative scenarios, e.g. what is better in an area - many small wetlands, or create a few large wetlands.

Question 4 – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?
– to further utility, use services of GI Ontario Coalition; study further applications and uses of GI by looking at examples elsewhere where GI has been applied in both urban and rural locations, e.g. BC green tool kit, Karen Firehock ‘strategic planning using GI’.

Form additional alliances with ALUS, (i.e. payment for goods and services), and also Ducks Unlimited which is a NGO furthering environmental beneficial elements on private lands.

Recognize strong beneficial effects of GI on the landscape. . . with a stormwater focus. This is applicable in either urban/rural areas. “Functions of GI services are applicable wherever they occur”.

Education and understanding is important, e.g., Credit Valleys rural landowners guide to CA floodplain management requirements.

Recognize challenges of various meanings for GI, e.g. new federal infrastructure program that looks at green to mean low environmental impact, i.e., environmental friendly traditional development.

Questions 5 - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges?

N/A

Question 6 – Other comments? – No

Question 7 – Attendance at recap meeting? - yes
Key Informant Interview with Peter Jeffery, Senior Policy Farm Researcher, Ontario Federation of Agriculture – Sept 29, 2016 - individual responses; not to be reflective of overall organization

General Description – The Ontario Federation of Agriculture (OFA) is a non-profit Federation with headquarters in Guelph and has been in existence since 1956. Their primary activities include education to members and others (government regulators, politicians, Ontario non-farm citizens) regarding the requirements for successful farming in the Province. They have an extensive geographic extension services function across all farming areas of the Province, i.e., field offices with staff in 52 counties and regions. They have partnerships with 27 commodity groups in Ontario as well as they have members on 23 coalition groupings with interests in farming activity. They have staff in their head office that provide a research and communications function on farming issues. Their website provides member service contacts and lists 100s of farm input businesses in 33 categories. Over 36,000 farm operators are members, making it the largest organization of its kind across the country.

As outlined from their 2016 Financial Statement, the Federation’s purpose is to work “collaboratively towards a profitable, sustainable future for Ontario farmers.” The federation is a $9 million per year operation with their funds being primarily generated by membership dues (approximately ¾ of total revenue) as well as other sources (government program management, investments).

Information Sources: OFA general website which includes 2016 Financial Statement; Personal Communication, September 29, 2016.

Interview followed ‘Organization’ Questionnaire Script

Question 1 – do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

– no general questions or observations.

Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

– GI systems planning approach makes sense; however, it should be recognized that many grey elements of life also have green aspects that can be utilized, e.g. hydro corridors for greenways, trail development.

- it is important to acknowledge the added environmental and ecological service values that food lands provide; these include the provision of biodiversity and wildlife; climate control; erosion control, recreation and tourism and other aspects outlined in GI graphic.

- inclusion of GI within ag land areas can have both good and bad impacts to farmers; these matters are associated with public vs private benefits. For example, in recreation promotion circumstances, additional concerns with trespass, bio security issues, land use impacts due to compatibility of recreation activities (ATVs).

- high level conceptual notion may be difficult to excite interest – an academic interest with limited appeal to average folks. Government policy and regulatory environment is very confusing, e.g. Trails bill with easement on private property being mandated without owners’ knowledge
“Reflective of poor lack of understanding and the public process as to how society works; also who is responsible for what is very confusing” – GI planning may add to the confusion.

Question 3 – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?

– Can be accommodated if there is a broader recognition of what ag lands provide us. Municipalities/province/public at large do not acknowledge the benefits that ag areas provide us. Important to recognize the presence of the features/functions of ag lands - the need for stormwater management, increased resiliency to storm events provided by rural lands. Incremental development without overall systems planning in the area north of Toronto has resulted in unintended consequences further downstream, e.g. the finch avenue washout from a storm event. Going in now retroactively to try to reduce the impacts of paving and impervious development in an urban area. Is it possible to build a cumulative impact of development model when there are uncertain future circumstances? - the capacity of the ground has been diminished. There has been only recent consideration for stormwater management - 1960s development with downspouts connected into the sewers. GI looks at diminished flows into combined sewers, recognizing that retroactive redevelopment design is difficult.

In terms of rural stormwater management, Drainage Act implementation is not universal across the province; in some areas municipal drains are serving as important conduits for overland flow conveyance and water storage. “Tile drains are useful to allow filtration through the earth; erosion problems are caused when ground is frozen or through fast run-off in storm events; tile drains may assist to reduce environmental impact if properly designed

– GI planning can be useful in certain respects. “GI planning may be effective dependant upon the policy framework on what it is predicated.” Some things for consideration:

a) who pays for public benefits derived on private lands, e.g., Green Belt imposition; the OFA supports the retention of ag lands in the area

b) the friction in the land interplay area of natural heritage systems and ag land production. For example, consider the need for buffers. Under the drainage act, an area is set aside on one side of a municipal drainage ditch to conduct maintenance. Does it make sense to designate an area as a buffer for 30 meters on both sides of the ditch? “Need a realistic discussion on the extent of buffers”.

Another example is setting aside lands within a grape vineyard - the heavily managed natural areas that grow up between the vine rows. ‘Land set asides’ need realistic consideration – significantly managed but are natural. New co-ordinated plan review (in which document? – the Greenbelt Plan) looks at 15-meter buffer instead of 30 meter buffer extent. Still not consideration for payment for services.

Reasonable planning must ensue between providing land for ag production versus set asides for nature, e.g. scrub secondary growth in retired fields should not be considered as natural heritage feature lands. A provision to allow for removal outside of county tree cutting by-laws should be provided for.
c) More is better in setting aside buffers – any land area provided will assist in "capturing nutrients and run-off" to a receiving waterway; however who pays? There is a reduction in productive food production area which could be compensated via cover crops and environmental services benefit payments.

d) Too much emphasis given to trees in the southern Ontario landscape – what about other natural species, i.e. grasslands, endangered species.

- Unrealistic 30% natural cover in a rural land base that has the best agricultural land in all of Canada. Standard was set by environmentalists to assist in cleaning up the most polluted areas of the Great Lakes - the ‘areas of concern’ areas. Ag land comprises 5% of the provincial landscape; crown land is 87% of the land base for northern Ontario and represents natural cover. Some counties have tree cover exceeding 50% of the county base. Kent is some of the most productive land in the province - not reasonable to have 30% of the land base for nature. System needs to recognize that ecological services are also available in ag lands - Climate change mitigation, biodiversity, attenuating storm events, groundwater recharge, services are also met with pasture land and crop lands.

Question 4 – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?

- GI planning is useful to acknowledge the benefits of natural areas; need mechanisms to incentivize natural area protection (see graphic); education for the public and the politicians and policy makers. - kick off to the Province’s ‘soil strategy’.

Watersheds - some do better than others; need to work together. Farmers are not the enemy. Conservation ON supportive of OFA – OFA Board chair says: "one landscape - active farmland provides a suite of environmental benefits". A managed landscape that has economic benefit – production and nature services. GI planning may assist in thinking and working collaboratively together. Ontario comprises many differing land use aspects – urban areas, rural non-used areas, ag areas, natural areas.

Questions 5 - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges?

- NA

Question 6 – Other comment? – No

Question 7 – Attendance at recap meeting? – Yes
Key Informant Interview with Joshua Wise, Ontario Nature Greenway Program Manager – August 15, 2016

General Description - Ontario Nature is an environmental non-profit organization that has a long history of championing its principle focus of connecting people with nature. It was established in 1931 and has its headquarters in Toronto. It completes its advocacy work in protecting wild species/spaces through a diverse range of activities - nature reserve ownership, land easements, education programs and literature disbursement. It has a membership of over 30,000 and uses a ‘Nature Network’ comprising over 150 organizations in Ontario.

The goals of the environmental NGO are the following: Protect and restore nature to reverse the ongoing trend of biodiversity decline in Ontario; Strengthen the nature network to build grassroots capacity and build the collective voice for nature conservation; Connect people with nature to decrease nature deficit in the community and build commitment to life-long stewardship; and Strengthen organizational capacity to increase Ontario Nature’s impact (Ontario Nature 2015-2016 Annual Report). For several decades now, they have promoted the need for connected landscapes; their Greenway Program is noted on their webpage.

The organization has an annual revenue stream of approximately $2.6 million and they derive their funding from donations, bequests, program grants and membership fees. They have a staff of 30.

Information Sources: Ontario Nature general website, including information on Greenway Program @ https://www.ontarionature.org/; Personal Communication August 15, 2016.

Interview followed ‘Organization’ Questionnaire Script

Question 1 – do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

General Observations – in sync with green infrastructure systems planning. I was provided handouts of work Ontario Nature as an advocacy group has provided. They push the importance of biodiversity enhancement as a primary driver. Publications include: NHS ‘best practices’ 2014 report, i.e., Guelph received award for NHS planning policy on this; Value of nature in southern Ontario handout ($84 billion/year); Growing the Greenbelt publication and Annual Report “Ontario Nature protects wild species and wild spaces”.

- greenway planning (part of GI planning) is an important component of Ontario Nature’s work

Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

– additional details required in the schematic as to what components are a part of the GI strategic planning overview (insufficient detail in the model). Schematic does not outline implementation mechanics that illustrate the benefits of the GI planning systems model; insufficient information provided.

- need to promote biodiversity rebounding, climate change impact adaptation and build community resilience
Question 3 – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?

GI is part of the natural heritage system in southern Ontario. Many opportunities are available to enhance natural heritage systems using green infrastructure, i.e., create open space linkages in community-built fabric.

- Working at the nexus of agricultural and natural heritage systems; they are inextricably linked and healthy systems are required in both. Acknowledged that natural systems in proximity to large populations have more value due to their ecological services for cleansing air, water and the land, e.g., wetlands in proximity to Toronto.

- working with ecological valuation of nature to work within the economic system; moving into new elements of natures’ services, e.g., carbon sequestration beneficial attributes

- important to acknowledge the increasing importance of ALUS; “the working landscape can directly benefit the farmer as well as nature.” Marginal lands can be used to assist natural heritage system. Also important still to acknowledge that there are limits in the ecological valuation system. “Another tool to assist in furthering natural wild species and wild spaces agenda”.

Question 4 – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?

- GI planning system needs implementation ideas to illustrate how it can assist; simply a concept. GI planning can provide more tools, and redundancies to protect natural systems. Additional layers of understanding and support provide better layers of protection

- work at implementing “How much habitat is enough. . . Ecological health for a Region set at a minimum of 30% coverage (additional natural coverage better). Extremely difficult to achieve in the settled south, and so therefore additional green infrastructure on the landscape is important.

- The best practices guide was an objective to assist planners to quickly look at natural heritage system planning; an additional tool to explain the need to protect nature

- The landscape doesn’t create the constraints to development in southern Ontario; it is the buy-in for the acceptance of the need to protect nature. The land is ripe for development and the public interest goes beyond local interests only; it is important that work with municipal planners and community leaders takes place.

- appreciation for resilience with a variety of options protected and provided for. Greater knowledge of nature’s attributes to build complete communities is important, i.e. proximity to nature for good mental health and wellbeing.

- it is important to acknowledge that as southern Ontario continues to develop that limits to ‘progress’ must be set, e.g., The greenbelt, land use policy. The environmental impact of development has not properly been assessed on the southern Ontario landscape over the past century – mitigating impacts to ecological communities have largely not been considered.
Questions 5 - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges? – N/A

Question 6 – Anything else?

- GI planning needs to build the case to further agriculture viability while at the same time assisting in natural heritage protection – A green infrastructure strategic planning approach can identify what are the problems and then create a discussion forum to address identifiable opportunities. The policy realm is needed as well as understanding how the business market works.

Question 7 – Attendance at recap meeting? – yes
Key Informant Interview with Harold Rudy, Executive Officer, Research and Business Development, Ontario Soil and Crop Improvement Association - August 30, 2016

General Description - The Ontario Soil and Crop Improvement Association (OSCIA) was created in 1939 as an agricultural organization by the Income Tax Act of Canada with the following objectives: (a) producer awareness; (b) development and delivery of stewardship programs; (c) support local association development; and (d) strategic alliances for fulfilling the organization’s mission and addressing consumer concerns.

This mission of the OSCIA is: “Facilitate responsible economic management of soil, water, air and crops through development and communication of innovative farming practices”.

The organization administers environmental stewardship and production enhancement programs from several ministries and agencies: Ontario Ministry of Agriculture, Food and Rural Affairs, Agricultural Adaptation Council, Ontario Ministry of Natural Resources and Forestry, Environment Canada. Information sharing from research initiatives is shared in education and information programs, field days, regional events, local demonstrations and theme conferences. Currently areas of interest to farmers include soil health, crop production, bioenergy, and grassland bird conservation.

The Association represents more than 4,000 members in more than 50 local county and district branches across the province and is a significant presence in all the major agricultural areas of Ontario.

The Association has a total annual revenue stream of $18.7 million. Nearly 95% of their revenue comes from government payments for administration of programs, with the remainder of their budget coming from donations and membership payments.

Information Sources: OSCIA general website including Annual Report 2016; Personal Communication August 30, 2016.

Interview followed ‘Organization’ Questionnaire Script

Question 1 – Do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

- high level overview of GI planning framework is ok; ‘food provision’ box should also include fibre production associated with the bio-economy and biomass. GI can be aligned with green economy thinking and associated with current government priorities, i.e., pollinators and climate change.

Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

- makes sense but unsure how it rolls out in a community. People will develop priorities that are associated with their local community context – working at varying degrees of ‘green’ communities, and how ‘grey’ fits within the area.

- important to inventory extent of GI that is in place; this can then be used to consider targets, expectations, and theoretical constructs. Consider metrics such as tree cover, and green linkages within a community. Connections for enjoyment such as parks and recreation facilities. Have an
understanding of the existing infrastructure and then ask, what more can be done? – process helps landowners to figure what they should do to help out.

**Question 3** – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?

-strategic planning will work but making sure that background info is available is important; can then match with community priorities.

OSCI association is successful; it is entrusted to give out funds to private landowners ($100 million) – they work as managers that provide actions on the ground that match with federal and provincial priorities. Examples of programs available from their website: Species at Risk Farm Incentive Program, GLASI program to remove phosphorous from the Great Lakes, Species at Risk Partnerships on Agricultural Lands-Grassland Stewardship Program, Environmental Farm Plan with mechanisms to provide environmental enhancements to private lands (riparian buffers, windbreaks, riverine fencing, nutrient management, conservation cropping programs).

EFP successful as it attempts to explain how an individual property is connected to the wider landscape – the watershed. There is some ‘tension’ around BMP implementation on individual farms to those measures that are wanted versus what is needed for particular locations, e.g. manure storage. Many innovative ideas supported to deal with nuisance wildlife from natural areas (raccoon, deer, coyote). Some interplay between crop insurance value for monies expended for a field edge location for crop damage from wildlife. Also payments for wildlife attacks on farm animals.

BMP actions have differing longevities for various land stewardship mechanisms, i.e., permanent pasture, cover crops, etc. May vary from permanent to differing time periods (3 years up to 15 years).

Getting better in identifying priorities by topics, farmers needs, generic landscape needs. Permanent cover crops are being provided. Metrics for measuring success include miles of windbreaks provided (a length from Montreal to Windsor), acres of shelter belts. . . acres of protected species habitat, etc.

**Question 4** – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?

-inventory for GI provision needs to be set via an academic assessment and expert advice, e.g. percentage of various natural heritage types.

- Comprehensive stormwater management planning for rural areas has not been completed. Mega water storage projects or even in-stream dam structures will not take place now due to environmental impact concerns. So, opportunities of stormwater management on private lands
needs to be considered. Headwater storage projects can be completed to reduce ‘gully gushers’ but these engineered systems are quite expensive. Landscape stormwater management controls are needed that can slow the water down and release it slowly over time. Need to work with Ducks Unlimited to permit temporary water impoundments, i.e., puddle ponds that Ducks Unlimited prefer as well as deep ponds.

- unsure of the availability of system information on lands that are drained via various conveyance devices. This information may not be comprehensively integrated and mapped – need to consider urban/road ditches, municipal drains and creeks and stream – see Sid Vander Veen.

Recreational areas - parks, pathways, conservation lands are important contributors to quality of life.

Full potential of GI systems will vary from community to community. Some areas have GI and others not so much. Conservation Authorities and towns/villages pushing environmental agendas; capitalize on funds to push GI. Align with stewardship activities.

-It is important to set suitable levels of natural area land asides that are reflective of a realistic balance in achieving public interests such as employment for food/fibre production as well as provide protection of the environment.

-Important to recognize the value of class I, 2 and 3 lands for ag production; lower classes can be used for other purposes including biomass production, pasture, etc.

- important to measure success to explain ‘value for expenditures of public dollars’, e.g. count bobolinks in hay fields, etc.

-individual property owner objectives will not necessarily align with bigger picture community ideals; community leaders need to show priorities for local contexts. OSCIA is getting better at identifying natural system priorities – however, not universally accepted as differing areas of Ontario have/have not GI elements e.g. farmlands in eastern Ontario cannot participate in GLASI program, even though they may have issues in their area.

-Political dilemma of targeting as to who benefits and for what public benefit. . . Social benefits to individuals and communities at large. EFP implementation sometimes has cross purpose outcomes, e.g., improved habitat for animal wildlife that may impact field crops-nuisance animals. Set-aside lands may be impacted by invasive plants which in turn may increase field crop expenses.

Questions 5 - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges?

N/A

Question 6 – Other comments? N/A
Question 7 – Attendance at recap meeting? -yes, if available

Key Informant Interview with Norm Ragetlie, Director, Policy and Stakeholder Engagement - Rural Ontario Institute (ROI) - July 28, 2016

General Description - The Rural Ontario Institute is a non-profit charity whose mission is “developing leaders and facilitating collaboration on issues facing rural and northern Ontario.” The organization has been in its current form since 2010, but it has had a longer existence in the form of other earlier rural organization incarnations. Their headquarters are located just outside the City of Guelph.

ROI’s website gives a good overall view of the activities they are engaged in.

One of the main staples of the organization is its Advanced Agricultural Leadership Program (AALP). This program has been underway since 1987 and it consists of a rural executive officer training program to those in business, government or NGO roles. The 19-month training program offers a wide assortment of learning and collaboration opportunities.

ROI also provides information on the opportunities and challenges of life within rural Ontario. They have used census data to report on the current circumstances found in rural communities – the ‘Focus on Rural’ reports.

ROI participates in numerous leadership training and conference events to voice the rural perspective on things. They participate in various provincial initiatives to share and gain knowledge.

The organization has an approximate $1 million budget with funding provided from a variety of sources: $600,000 from grants and contributions (primarily the Provincial Government), funding from program delivery and foundation/private donations. There is a staff of 3.

Information Sources: Rural Ontario Institute general website, including ROI 2016 Annual Report, Focus on Rural Reports; Personal Communication July 28, 2016.

Interview followed the ‘Organization’ Questionnaire Script

Question 1 – do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

– the ‘themes of GI’ as outlined have differing characteristics of nature embedded within them. Soil production, retention, protection is a process that ties into the production of food, the cleansing of water, production of wood for forest products, etc. Planning proposals often have narrowed beneficial attributes outlined without due consideration to the many multi-functional valuable attributes of nature – economic resources for employment, solar gain for renewable energy. The 8 GI themes are too generalized to provide substantive meaning to folks. . . maybe 3 are necessary from basic element to human need outcome, i.e., availability of soil, water/air/land cleansing and then food production.

Ecological economics can provide insights into the ‘value’ of nature, i.e., ONES
Food production can include many ideas: wildcrafting, foraging, permaculture... the story of wild ginseng in the history of Canada. Proposal I’m outlining is taking the principles of permaculture applied at the individual property level and taking the concept to the planning and development of an entire community.

- Humans see ourselves separate from the environment - but we are all part of one system. A re-awakening of the potential for environmental systems planning may be occurring but there are numerous barriers in the way.

**Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?**

-a GI planning framework makes sense. Some further disaggregation of the themes may be required to explain nature circumstances for differing community locales – rich soils in some areas for food production; gravel deposits dropped by glaciers near to demand; etc.

- Structural elements of themes are mixed up with processing/production systems. Structural elements of cycles of energy, water and others create secondary benefits to humans. Ecological systems models are important to understanding the benefits of nature.

Examples of a nature based planning system are available, e.g., Niagara Escarpment plan which has taken multiple generations to develop.

**Question 3 – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?**

- strategic planning framework can be useful. Similar to efforts of ROI – collaboration amongst multiple stakeholders with diverse values. Facilitate conversations with diverse stakeholders to address wicked problems in rural contexts. Many parallels to a GI planning system and work of the ROI, i.e. rural transit, youth retention, integrated human service plans with institutional services shared amongst small communities (schools, gov’t offices, recreation facilities, hospitals)

- “take advantage of the systems that we are living with”.

**Question 4 – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?**

- GI planning framework has value with following caveats:

- Need for understanding and acknowledgement of natural resources at various geographic scales – local and regional. Understanding of interconnections within and outside the immediate area. Watershed areas are important – river systems and the Great Lakes.

- A framework needs to be put in place to promote understanding of the importance of local ecosystems; can be tied to larger processes taking place in the world today.

- Numerous barriers to using a GI planning system needs acknowledgement – pressures to complete strategic plan are absent, unless there is a crisis or there is strong local interest; short term thinking and economic interests hold sway; lack of funding to undertake a comprehensive
study; unless an external threat to an existing situation is felt such as new development then impetus to conduct strategic thinking in an environment with limited resources is problematic; long term thinking is often absent at a local area; multiple governance structures and power debates often get in the way.

Questions 5 - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges?

n/a

Question 6 – Other comments?

- Effort is worth pursuing but fraught with many challenges“ . . . see above.
- “Provide resources (time, funding, public engagement) to provide for comprehensive planning”
- Recognition of natural heritage systems within Official Plans is a step forward.
- Regulatory and land stewardship mechanisms are required; public education important.
- Important to recognize natural elements and the changing nature of circumstances – climate change, invasive/non-invasive species change, etc.
- Make public land acquisition for important habitats a government priority (again); something from the 1940s – 1960s and then regulation of private lands started to take over . . .
- Public land acquisition and private land stewardship important, i.e., ALUS, Ducks Unlimited, Environmental Farm Plan work. Also public benefit acknowledgement through conservation land tax breaks.
- Conceptual long-term problem solving on issues for a landscape are important, e.g. watershed plans
- A part of our obligation – to protect and preserve our ecosystems. It is important to put some rigour and importance in the protection of our ecosystems. Watch and steward the landscape.”
- Economic arguments for use of nature is important in local government, i.e. trail networks on unopened road allowances, use of abandoned rail links.
- Implementability is extremely difficult. . . Need a model to structure - "the art of the possible of the moment". Land acquisition and land stewardship need to work together within an integration framework.

Question 7 – Attendance at recap meeting? - maybe
Key Informant Interview with Jack Imhoff, Director of Conservation Ecology, Trout Unlimited – March 15, 2017

General Description - Trout Unlimited Canada is an environmental NGO with national headquarters in Calgary, Alberta and Guelph, Ontario. It is affiliated with US-based Trout Unlimited and has been registered as a not-for-profit organization since 1972. Its primary mission is “to conserve, protect and restore Canada’s freshwater ecosystems and their coldwater resources for current and future generations”.

TUC has 22 chapters across Canada and runs two major programs: conservation and education. Most of their effort goes to in-the-field conservation work that includes fish rescue, river clean up, in stream restoration, culvert removals and riparian zone tree plantings. In terms of education efforts this includes school education programs concerning proper use of storm drains and water science, stream restoration training, stream temperature and harmful algae monitoring. The organization’s 2016 Annual Report indicated that they assisted in 7,500 fish being rescued through restocking measures, planted over 3,500 trees and repaired over 30 kilometers of streams and rivers. They completed their work primarily with volunteers from over 150 groups and organization in 300 communities across the country.

In 2016 TUC had revenue totalling over $1.7 million, with most of its funding coming from government, business and individual donations. TUC has 10 staff working for it.

Information Sources: Trout Unlimited Canada general website information, including 2016 Annual Report; Personal Communications December 1, 2016 and March 15, 2017.

Interview followed ‘Organization’ Questionnaire Script

Question 1 – do you have any general comments/questions for clarification before we get into the more detailed discussion on the topic?

-As an ecologist, he understands the conceptual framework of the goods and services of nature assisting humankind.

-in the GI conceptual framework supportive of healthy natural and human communities should be the specific inclusion of: clean water supplies; safe environments through hazard area definition to protect humans and reduce property damage.

-On the strategic ‘grey’ and ‘green’ infrastructure elements chart should be the inclusion of water supply. Green infrastructure elements should also have ‘soil sustainability’ as a criteria (building up humus, organic contact, and water retention).

Question 2 – Does the outlined diagram depicting the community building blocks of ‘grey’ and ‘green’ infrastructure make any sense to you? Why or why not?

-The ‘outline’ diagram with some modifications holds promise to assist in planning resilient rural places. The inclusion of GI planning with grey infrastructure can be useful. GI is particularly useful for providing water storage on the landscape.
Question 3 – In consideration of your organization’s work, can you envisage the utility of a GI strategic planning system at work in Ontario rural communities? Why or why not? Do you have any examples of the use of GI elements in your organization’s work?

- There is utility in a GI strategic planning mechanism to assist rural communities. A useful planning framework to guide actions; essential to adopt a system in rural Ontario as the majority of landowners are not managing the land sustainability; significant damage caused by industrial farming (lack of buffer strips, cover crops, etc.).

- In the warm water river areas with silts and clays... impacts are occurring on the Great Lakes which are a water supply for many people. “Everyone lives downstream from where you are now”. Poor joke “flush your toilet in Kitchener; Brantford needs the water”. Inter-connectiveness of places is understood in the Mississauga area.

- Trout Unlimited promotes the use of buffers along riverine systems, land management practices to protect waterways, and mechanisms to build soil stability. Attempting to get to 6 – 8% minimum organic component but currently in industrial agricultural areas, organic content reduced to less than 3%. More organic material can retain nitrogen for plant growth. (PEI down to 2% organic content- “a terrestrial cod fishery story”. “Illustrative of lack of proper management of GI”.

Question 4 – In consideration of your answer in 3), if you believed there is utility in a GI planning system for rural Ontario, how would you go about assisting its full potential being realized?

- Trout Unlimited can assist in educating others. . . farming is the management of commodities; “why don’t you farm water – if water is managed more effectively and sustainably, then downstream landowners benefit.”

- Trying to do a ‘yellow fish rural’ program – Tracey Ryan with GRCA has rural water quality program knowledge. Program was intended to give information to individual landowners to assess the practices they were using to improve land management and associated water management improvements.

- Organizations can assist GI planning by demonstrating the benefits individual elements provide within the overall system. Rural farming operations need to consider ‘water farming’ in addition to crop and land farming activities.

- Organizations can assist in implementation of GI planning efforts. Individual actions can be identified within a land management system to assist in improving water management.

- Need to assist landowners to build agricultural lands in a more sustainable fashion; work with various organizations – soil sustainability is important.

“Need to convince those who are in authority that we need to change to improve our circumstances – a challenge and opportunity for the GI planning system” – with understanding, comes actions to help oneself, and thereby helping others (downstream beneficiaries, e.g. Mennonite communities in Grey County).
Questions 5 - In consideration of your answer in 3), if you believed there is no or limited utility in formulating a GI planning system in Ontario, what would you identify as useful existing planning mechanism(s) to address rural community and natural system resiliency challenges?

n/a

Question 6 – Other comments?

-Great opportunities are available in the use of ‘natural’ infrastructure to build resilient places; the use of a GI management approach is essential if we are to have a sustainable landscape. As the landscape becomes more sick, then it will affect our health as well. Technological fixes can address issues, but at tremendous cost. We can manage the landscape differently at the source. We don’t necessarily need a healthy environment, because we can design systems to offset the negative impacts. But this is aligned with the ‘shrinking bubble’ with technology addressing the impacts; however, in the end it will not save us from a collapse."

-The system can assist in defining priorities in conservation and development for specific locales.

-Integrated Watershed Management (IWM) creates the context and background to what GI planning can do. The watershed planning process for Ontario was developed by MNR and MOE in the early 1990s. IWM planning is the context tool that helps to let you know how your system functions, and to make suggested recommendations. How recommendations are implemented, is through the land use planning process. Build on the materials for other matters such as our ‘sense of place’, where do we want to recreate. A complementary process to land use planning is the IWM; it provides a context for understanding on how the land system functions, with some areas doing better, and some other areas not so well.

- We need to plan for healthy ecosystems - unhealthy ecosystems will lead to unhealthy settlements. Intent of GI should be to assist in moderating current ‘agricultural land practices’ to shave off peak water runoff events and waterway energy impacts. Healthy waterways are the capillaries of water supply for healthy landscapes. Additional opportunities to store water on agricultural lands needs to happen. With climate change, need additional mechanisms to store water on the land, e.g., California surface as well as deep groundwater replenishment. Water budget to provide water for all – humans as well as nature.

Question 7 – Attendance at recap meeting?

- yes