Growing with Green Infrastructure

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Introduction

From the ancient aqueducts of the Roman Empire to the soaring skyscrapers of modern times, man has responded to the needs and desires of society by creating, adapting and reshaping the infrastructure of his world.

Infrastructure, defined as "the substructure or underlying foundation, especially the basic installations and facilities on which the continuance and growth of a community depends," reflects the social priorities of diverse cultures around the world.

In the United States, a burgeoning population concentrated in major metropolitan areas necessitated the installation and refinement of basic utility systems over the last three centuries. Economic growth and continental expansion fueled the rapid development of complex communication, transportation and energy networks extending nationwide.

Basic human services originally satisfied by individuals or small groups were eventually centralized within larger governmental and economic systems. For example, clergymen in Revolutionary times not only provided spiritual leadership but also delivered the mail in the community. Today's complex society now relies upon a network of communication services satisfied by the mass media, Internet and mail delivery organizations.

Technological advancements and societal shifts have shaped other forms of infrastructure. Outhouses on individual properties have been replaced by septic systems or regional sewage collection and treatment facilities. Dirt roads once used by wagons in the wilderness are now major highways. Table #1 summarizes in a broad manner the growth issues within American society that prompted a variety of infrastructure improvements from which we benefit today.

Table #1
Advances in the History of American Infrastructure

Era	Growth Issue	Infrastructure Solution
Mid-Late 1800's	Public Health and Welfare Communication Industrialization Energy Transportation	Sanitation, Hospitals, Parks, Schools Telegraph Planned Communities, Company Towns Coal, Oil, Gas, Electricity Canals, Railways
Early 1900's	Automobiles Food Production (Dust Bowl) Communication	Roads Crop Rotation, Agricultural Practices Radio, Telephone
Mid 1900's	Energy Nuisances Pollution Transportation Mass Communication	Hydro & Nuclear Power Community Zoning and Planning Air/Water/Sewage Treatment Interstate System, Airports Television
Late 1900's	Garbage Traffic Congestion Flooding Information Management	Recycling Mass Transit, Alternative Transportation Stormwater Management, Detention Computers/Internet
2000+	Sprawl, Globalization Sustainability	Sound Land Use, Smart Growth Green Infrastructure

"What a country chooses to save is what a country chooses to say about itself."

— Mollie Beatty
Director, US Fish & Wildlife Service
1993-1996

The Industrial Revolution created new spheres of influence and unprecedented concentrations of wealth. Fortunately, leaders in a variety of fields not only invested in the technological advances that enabled society to evolve, but also had the foresight to use their public stature and/or the financial proceeds from their success to support philanthropic efforts to address the social consequences of such advancement. Influential figures included Teddy Roosevelt, who guided the construction of the Panama Canal and fostered the development of our National Park System, and Andrew Carnegie, a leader in the steel industry that built many of our infrastructure systems and a patron of higher education and scientific research programs.

As the 20th Century unfolded, the adverse effects of many infrastructure systems on the environment became apparent. In her groundbreaking book, *Silent Spring*, Rachel Carson spotlighted the dangers of chemicals in our world, prompting the reversal of some previously accepted practices and stimulating the development of innovative solutions to other environmental impacts. The banning of the pesticide DDT, the enactment of auto emission control standards and the establishment of recycling programs reflected an increasing awareness of the stresses being placed on the environment by society. This awareness was matched by a growing interest and participation in land and water conservation efforts to protect important natural resources.

At the same time, the public was discovering that environmental issues were crossing geopolitical boundaries, not only at the local and state level but nationally and internationally. Acid rain was a problem for both the United States and Canada, since industrial pollutants carried by prevailing winds did not recognize national borders, and the burning of South American rain forests had implications for global warming. The rapid pace at which an exploding world population was consuming land and natural resources inevitably raised the question of a finite limit to the environment's capacity to support human life.

Sustainability and Green Infrastructure

In 1983, the United Nations' World Commission on Environment and Development brought together representatives of 21 countries, including the United States, to discuss sustainable development – how to promote economic development throughout the world without adversely impacting the environment and depleting natural resources needed by future generations. The Commission stressed that sustainable development could "only be pursued *if population size and growth are in harmony with the changing productive potential of the ecosystem*" – the ecosystem being the collection of living organisms and the physical environment upon which they depend for survival.

However, the development of land for agricultural, residential, commercial, industrial and institutional uses and the associated man-made infrastructure needed to support these uses has reduced, fragmented and degraded nature's ecosystems.
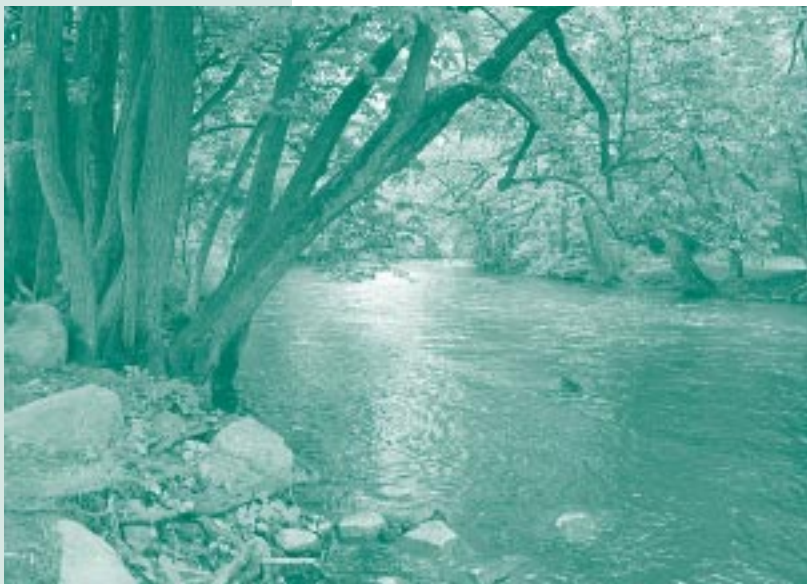
In *Who Sprawls Most? How Growth Patterns Differ Across the U.S.*, the Brookings Institution reported on dramatic levels of urban sprawl across the United States. The study reported a nationwide rise in land development of 47% compared to an increase in the U.S. population of only 17% in a 15-year period (1982 -1997). These imbalances are evident in the Philadelphia Region, as documented by the Delaware Valley Regional Planning Commission in its publication, *Horizons: The Year 2050 Plan for the Delaware Valley – Report #3: The Preliminary Land Use Plan, A Vision of Renewal for the 21st Century*. A comparison of population and land use statistics from 1930 to 1990 reveals that the amount of developed land has increased five times faster than the total population over this 60-year period. From 1970 to 1990 alone, land was consumed at a rate of nearly an acre every hour every day for 20 years.

The impact of such growth has decreased nature's ability to respond to both short-term changes, such as flooding and drought, and long-term environmental trends, such as the spread of invasive species and global warming. Because changes in land use happen gradually, the increasing fragmentation of natural systems may not be immediately obvious.

Man and nature, both in constant motion, are often at odds. The infrastructure improvements that facilitate the movement of people, goods and information have created an ever-growing network of barriers to our natural systems. In conflict with the natural landscape, these barriers foster a patchwork distribution of land uses and isolate open space areas.

The competing elements of this man-made infrastructure have also impeded natural processes that involve the migration of animals, the flow and filtration of water and the parachuting of seeds and spores upon the wind. The social consequences of this spatial fragmentation include a decline in the productivity of the environment to support human activities and the alienation of man from nature.

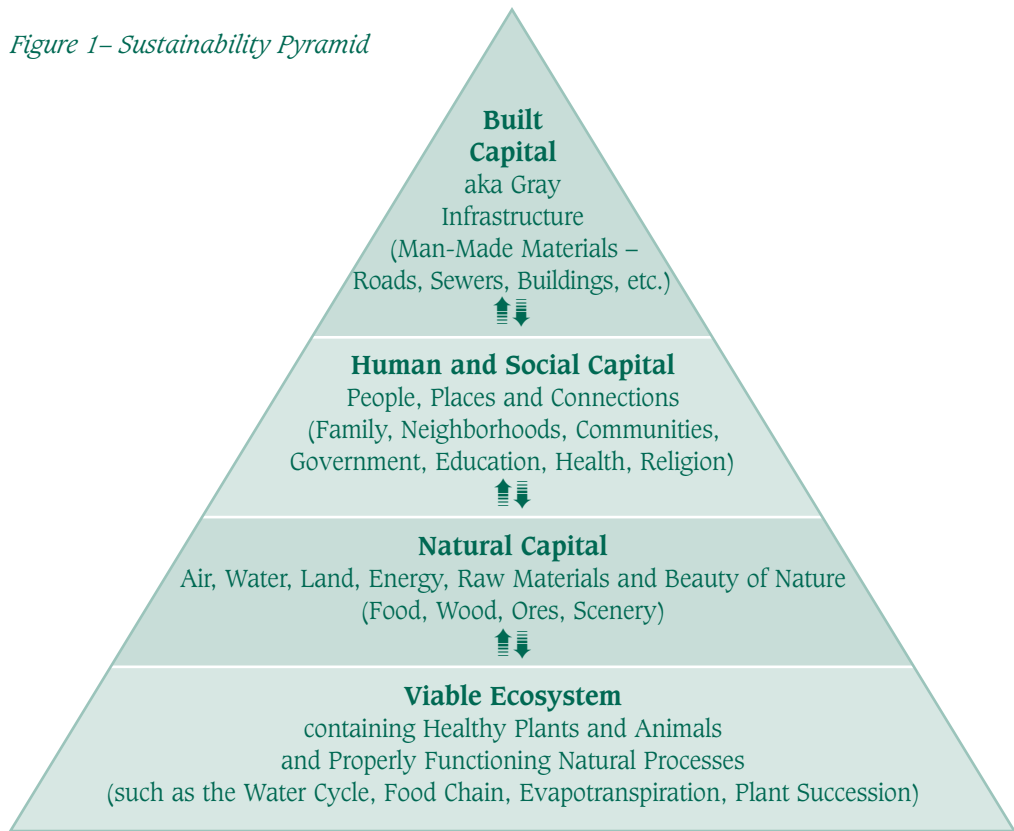Fortunately, there is an alternative that can provide a better balance.

A sustainability pyramid illustrates how a viable ecosystem serves as the foundation for our society by providing the natural resources we need to support our human systems and man-made surroundings. A variety of natural processes interact to create a healthy environment, allowing us to harvest the food we eat and obtain the raw materials to build our communities. (See Figure 1).

Biodiversity is the web of life. The sustainability concept recognizes the need for mankind to tap into natural systems in order to improve the quality of life, but it encourages us to do so in a manner that enhances, not destroys, the natural processes we rely on for our very existence.

"How long can we go on and safely pretend that the environment is not the economy, is not health, is not the prerequisite to development, is not recreation?"

— Charles Caccia, Member of Parliament, House of Commons, 1996

Figure 1– Sustainability Pyramid

**Built
Capital**
aka Gray
Infrastructure
(Man-Made Materials –
Roads, Sewers, Buildings, etc.)

Human and Social Capital
People, Places and Connections
(Family, Neighborhoods, Communities,
Government, Education, Health, Religion)

Natural Capital
Air, Water, Land, Energy, Raw Materials and Beauty of Nature
(Food, Wood, Ores, Scenery)

Viable Ecosystem
containing Healthy Plants and Animals
and Properly Functioning Natural Processes
(such as the Water Cycle, Food Chain, Evapotranspiration, Plant Succession)

The President's Council on Sustainable Development initiated efforts to apply the concept of sustainable development in the United States and identified "Green Infrastructure" as one of several key strategies for achieving sustainability in its May 1999 report, *Towards a Sustainable America – Advancing Prosperity, Opportunity and a Healthy Environment for the 21st Century.*

Green infrastructure is defined as:

"Our nation's natural life support system – an interconnected network of protected land and water that supports native species, maintains natural ecological processes, sustains air and water resources and contributes to the health and quality of life for America's communities and people."

What constitutes Green Infrastructure?

Green infrastructure consists of several components that work together to maintain a network of natural processes. These components range in size and shape depending upon the type and the scale of the resource being protected. The rarity or ecological importance of the natural features within each component determines the level of conservation required to protect these resources, while the sensitivity of the environment to human activity determines how much interaction between man and nature is appropriate.

Hubs: Act as an "anchor" for a variety of natural processes and provide an origin or destination for wildlife. Hubs include:

Less Human Interaction

Reserves: Lands that protect significant ecological sites, including wildlife areas typically in their pristine state, such as the John Heinz National Wildlife Refuge.

Managed Native Landscapes: Large publicly owned lands, such as the Allegheny National Forest, managed for resource extraction as well as natural and recreational values.

Working Lands: Private working lands, including farmland, forests, and ranch lands.

Parks and Open Space Areas: Landscapes at the national, state, regional, county, municipal and private level that may protect natural resources and/or provide recreational opportunities. Examples include public parks, natural areas, playgrounds, and golf courses.

More Human Interaction

Recycled Lands: Lands that were previously damaged by intense public or private use and that have since been restored or reclaimed. Mined lands, landfills or brownfields that have been improved in total or in part to provide an environmental function are examples of recycled lands.

Links: Interconnect the hubs, facilitating the flow of ecological processes. Links include:

Less Human Interaction

Conservation Corridors: Linear areas, such as river and stream corridors that serve primarily as biological conduits for wildlife and may provide recreational opportunities. Greenways and riparian buffer areas are examples of conservation corridors.

Greenbelts: Protected natural lands or working landscapes that serve as a framework for development while also preserving native ecosystems and/or farms or ranchlands. They often act as partitions within a community – a form of visual and physical relief in the landscape – separating adjacent land uses and buffering the impacts of these uses. Farmland preservation areas can be considered greenbelts.

Landscape Linkages: Open spaces that connect wildlife reserves, parks, managed and working lands and provide sufficient space for native plants and animals to flourish. In addition to protecting the local ecology, these linkages may contain cultural elements, such as historic resources, provide recreational opportunities and preserve scenic views that enhance the quality of life in a community or region. Landscape linkages may include streetscapes and recreational trail corridors.

More Human Interaction

Pennsylvania's once-boundless forests are now divided into more than 377,000 fragments, 91% of which are smaller than 25 acres. More than half of the forests lie within 100 yards of fields, roads or some other non-wooded cover.
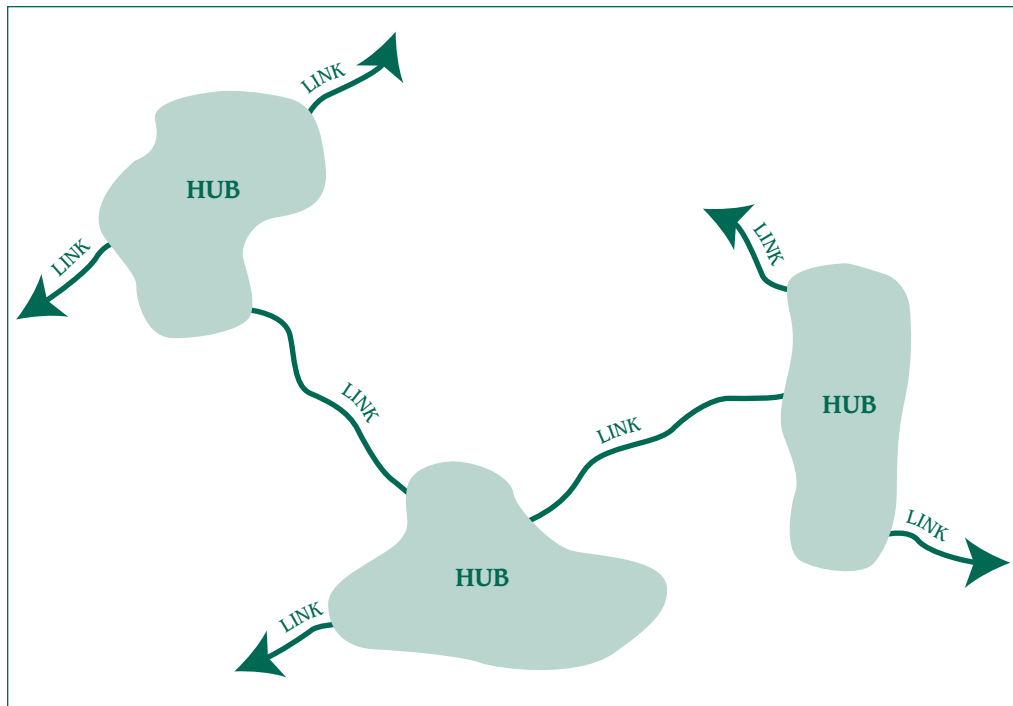
Figure 2– Conceptual Green Infrastructure System

The interconnection of hubs and links is critical in providing both landscape connectivity for ecological functions and for passage and dispersal of wildlife. (See Figure 2).

Creating a Green Infrastructure System

The procedure for establishing a green infrastructure system starts with a thorough understanding of two important aspects of a community:

- **The ecological forces at work in the area.**
  An analysis of the specific types, extents and qualities of the vegetation, wildlife, topography and resources of an area should be made to determine the role that each landscape feature plays in supporting natural processes. An assessment of their current condition will reveal which aspects of the landscape are at risk and how damage to these resources might adversely impact the sustainability of the region. To the greatest extent possible, scientific principles should be used to perform this analysis to substantiate the findings and conclusions.

- **The social fabric of the community and its relationship to the surrounding region.**
  Demographic information, historical research and economic data should be used to identify development patterns and trends and determine how these factors have shaped the community. An organized public participation process should encourage a range of individuals to work together to develop a vision for the future development of the community.

With this knowledge, the goals and objectives of the green infrastructure system can be determined and prioritized. These objectives should highlight:

- the specific ecological and social benefits that can be derived from the various green infrastructure components, and
- the land conservation and development principles that can be used to implement the system.

How does a Green Infrastructure System work?

The concept of green infrastructure is relatively new. Even though many municipalities already possess some key components, communities across the country are just beginning to apply green infrastructure principles to tie them together to form an integrated network of sustainable green spaces.

The following six-step process clearly defines how a community can develop and implement a green infrastructure system:

> 1 – **Develop an Approach**
> 2 – **Inventory Community Resources**
> 3 – **Envision the Future**
> 4 – **Find the Hubs and Links**
> 5 – **Create the Plan**
> 6 – **Build the System**

To more fully illustrate the process, the following hypothetical example tracks a fictitious community, Hope Township, and describes how its citizens combined their human resources and current land use planning tools to create a vibrant, workable green infrastructure system.

Background:

The talk was lively as a number of residents in Hope Township, population 11,703 and growing, gathered at the municipal building to attend the monthly planning commission meeting. Tonight's agenda included a presentation on the topic of green infrastructure, and curious neighbors wanted to know more about the commission's ideas on developing a new plan for the township's future.

Physically, the township consisted of a more densely populated village center with residential, commercial and institutional uses situated in a rural valley with agricultural lands extending several miles to the foot of a forested hill.

The township's population and economic vitality diminished when a local paint factory, a key employer, closed. But younger residents, who left the area for jobs, were gradually returning to care for aging parents and find new opportunities. Economic recovery was evident, with the new construction of a continuing care facility, a second elementary school, a new hospital wing and the scattering of residential developments outside the village.

The controversial Route 10 widening project, stalled for many years due to state budget constraints, was now rumored to be back on the drafting table, and land speculators were already tempting older farmers to "sell out" even though the specific highway improvements were not yet finalized.

Residents and business owners alike felt that the village was the cultural and economic center of the community and that future development along Route 10 might adversely impact its character. Residents also worried that new

development would worsen flooding, threaten water supplies, alter the farming community, and destroy the scenic views of the nearby hillside.

The audience at the planning commission meeting was anxious to hear how a new plan would help address existing concerns and accommodate future changes in the community. Different strategies were needed to resolve existing problems and manage change within various areas of the township.

Step 1 – Develop an Approach

The planning commission created a study committee with the sole purpose of recommending a new plan for Hope Township based upon the green infrastructure concept. The composition of the committee reflected the wide range of community interests, including some planning commission members in addition to the county extension agent and the community development director. A biologist, community planner, landscape architect, township engineer and the township solicitor were retained to provide technical expertise throughout the planning process.

The county extension agent and community development director explained how the concept of green infrastructure could be used as the framework for preparing a long-term land use plan for Hope Township. In essence, the committee would work with the consultants to identify the unique natural processes and cultural features in the township, and then use existing land use tools to protect and maintain these elements as part of a green infrastructure system that would enhance the quality of life. The decision-making process would be based upon an understanding of ecology and a desire to strike a balance between protecting natural resources and supporting community development.

Everyone understood that change was inevitable and that preventing further development of any kind was not only unrealistic, but also undesirable. However, the participants in the planning process would have to learn more about the scientific principles that were at work in the environment in order to make wise choices about the future growth of their community.

Step 2 – Inventory Community Resources

The study committee recruited students from the planning department at the nearby community college to prepare Geographic Information System maps showing a variety of existing features in the township and its surrounding region, such as topography, geology, soils, water resources, vegetation, zoning districts, land uses, wildlife habitat, public parks and farmlands. The drawings enabled the committee to visualize these features during meetings and facilitate discussion.

The biologist explained how plants and animals coexist in various combinations in the environment based upon the physical characteristics of the landscape. The amount of space that different

plants and animals need to live and breed varies with the species, depending upon migration and settlement patterns. Some species are "generalists" and adapt to a range of landscape conditions while others are "specialists", requiring a habitat composed of very specific elements. Large patches of vegetation in the landscape support more wildlife than smaller ones, and certain plants and animals make their home in the interior of the patch while other species prefer the edge. Wildlife movement occurs when favorable habitat areas are physically connected or are in close proximity.

There were three basic landscape types in Hope Township – the forested hills, cultivated farmlands, and disturbed village. (See Figure 3). Each landscape type not only created different habitats for wildlife but also different resources for man's use. For example, hillsides supported woodlands harvested for timber and critical habitat for rare wildlife. Lowland areas lacking a drainage outlet contain wetlands that not only provide a habitat for wildlife but also filter and absorb rainfall, keeping ground water supplies clean. Cultivated lands provided a source of food and acted as a transition between the village environment and the forested hillside.

Even though some committee members had lived in the township for years, many of them were pleasantly surprised by what they learned from the inventory. So far, the green infrastructure planning process had been a valuable educational experience.
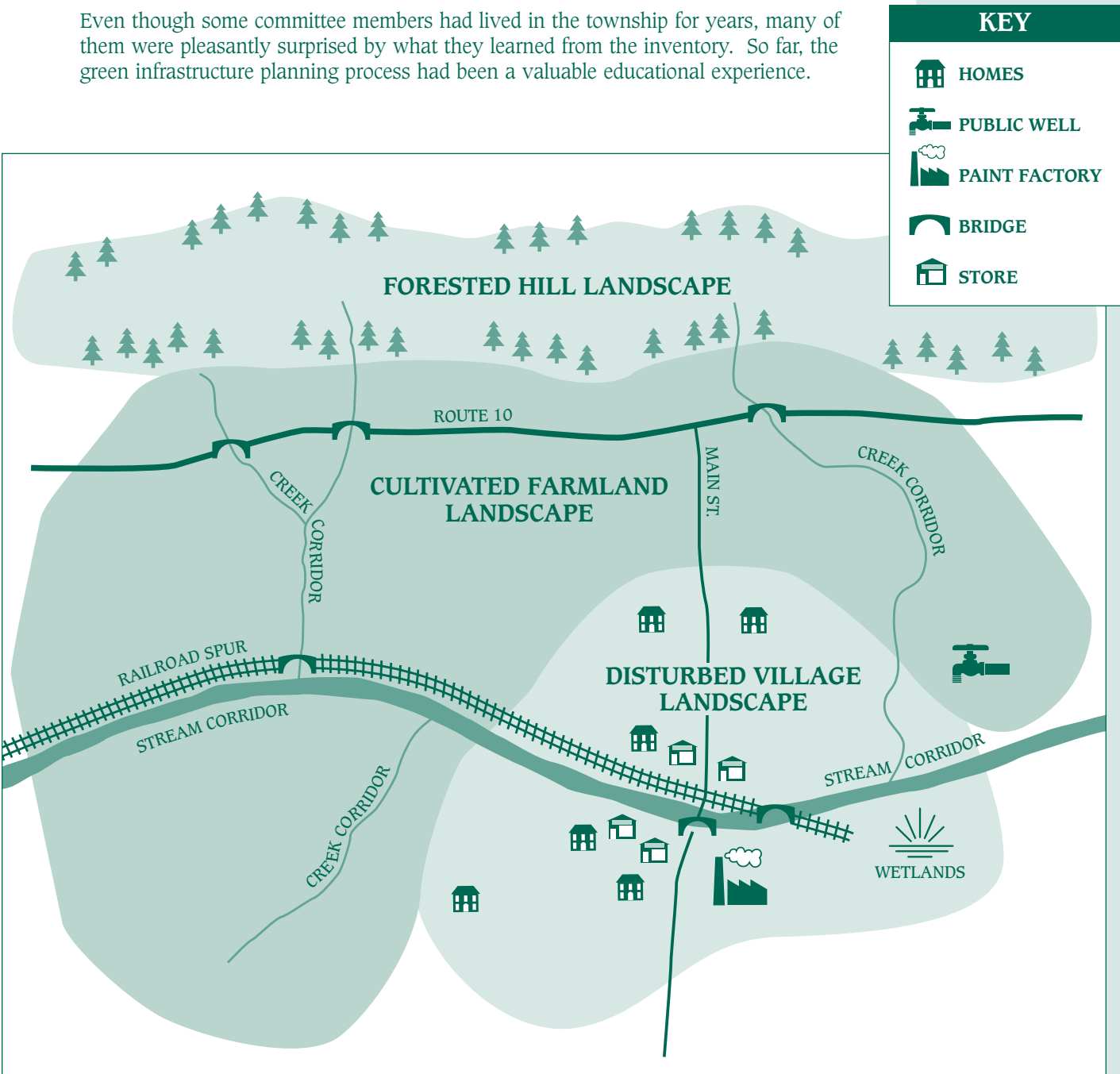

Figure 3 – Landscape Types – Hope Township

Step 3 – Envision the Future

The community development director suggested that the study committee establish some overriding principles that would act as a framework for building the green infrastructure system. Several meetings were held to discuss those aspects of Hope Township that made it a desirable place to live and that were vital to its long-term stability and success.

The committee members talked about their dreams for Hope Township and tried to visualize what the township could become. At the conclusion of this brainstorming process, they identified four green infrastructure goals that would both enhance the environment and support community values:

1. **Preserve critical resources** within each landscape type to provide for future population growth while maintaining the natural systems and character of the community.

2. **Maintain important ecological processes** that are required for long-term sustainability.

3. **Reclaim lands** that have been adversely affected by human activity.

4. **Create connections** that will allow for the movement of wildlife and provide opportunities for people to interact with nature.

Step 4 – Find the Hubs and Links

The committee identified the elements or hubs within each landscape type that contributed to the rich natural fabric of the community and determined ways to interconnect the various hubs. (See Figure 4).

Forested Hill Landscape:

State Game Lands Hub:
The biologist and landscape architect explained that the state game lands along the hills not only provided a large forested habitat for a variety of plants and animals but was also a scenic backdrop for the community.

Unique and Endangered Species Hubs:
Representatives of the Audubon Society and local sportsman's club identified two unprotected sites near the state game lands that contained unique or endangered species. The study committee agreed that these two sites should be protected.

Cultivated Farmland Landscape:

Prime Agricultural Soils Hub:
Farming was and always should be an integral part of the community. The most productive soils were identified for farmland use and protection.

Clean Water Hub:
The township engineer noted that the community's future depended upon a clean water supply that came from three wells located along the border with a neighboring municipality to the east. The wells were located in a specific geological area of the township that could provide additional well water as the population grew. Collaboration with the adjacent municipality and with farm owners was needed to protect the existing water supply from possible contamination.
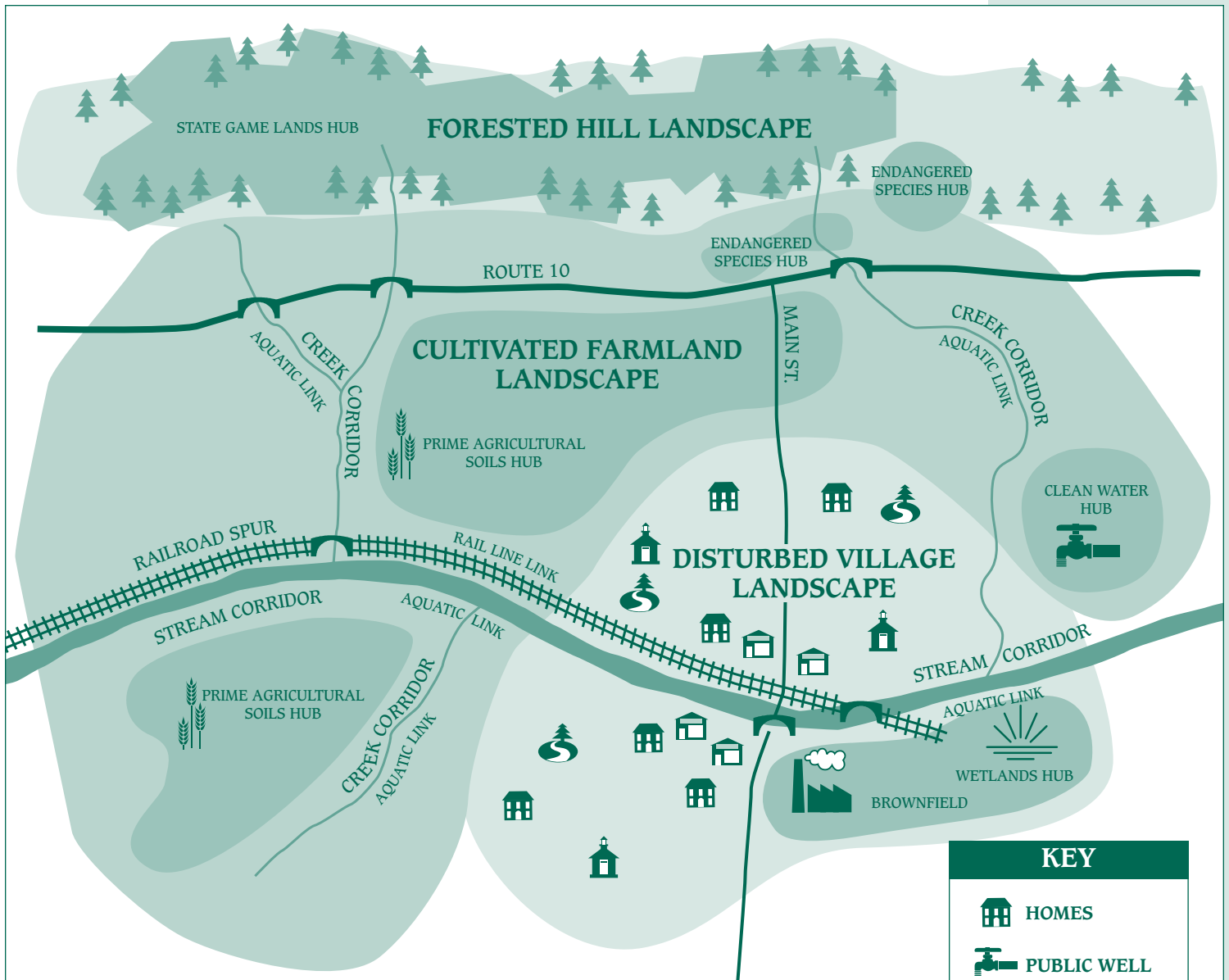
Figure 4 – Hubs and Links – Hope Township

STATE GAME LANDS HUB

FORESTED HILL LANDSCAPE

ENDANGERED SPECIES HUB

ENDANGERED SPECIES HUB

ROUTE 10

CREEK CORRIDOR AQUATIC LINK

CULTIVATED FARMLAND LANDSCAPE

MAIN ST.

CREEK CORRIDOR AQUATIC LINK

PRIME AGRICULTURAL SOILS HUB

CLEAN WATER HUB

RAILROAD SPUR

RAIL LINE LINK

DISTURBED VILLAGE LANDSCAPE

STREAM CORRIDOR

AQUATIC LINK

STREAM CORRIDOR

PRIME AGRICULTURAL SOILS HUB

CREEK CORRIDOR

AQUATIC LINK

AQUATIC LINK

WETLANDS HUB

BROWNFIELD

KEY

	HOMES
	PUBLIC WELL
	PAINT FACTORY
	BRIDGE
	STORE
	SCHOOL
	PARK

Disturbed Village Landscape:

Wetland Hub:
There was a large wetland on the abandoned paint factory property. The redevelopment of this brownfield site presented an opportunity for restoration of the wetland and integration of this open space into the village community.

Park and School Hubs:
The junior high school and two elementary schools provided public spaces in the township for residents to socialize and enjoy the outdoors. Three small community parks were also identified as important green spaces accessible to residents.

With the green infrastructure hubs identified, the committee next considered how best to *link* the hubs to provide connections for ecological processes as well as for interaction between the residents and the nearby natural areas.

Rail Line Link:
Raw materials and finished products were once transported to and from the paint factory via a railroad spur that went through the village and included a bridge across the stream. The spur connected to the abandoned railroad right-of-way that had recently been purchase by the county for future use as a recreational trail. The committee agreed that converting the spur to a rail-trail should be considered, in light of the potential for this route to link the township with natural and recreational areas elsewhere in the region.

Aquatic Link:
The creeks and the stream could be used to link a number of green infrastructure components, since these watercourses crossed through each of the landscapes and provided links to several of the hubs.

Pedestrian Link:
Linking parks and schools to each other and to the natural areas of the community would expand access and provide healthy recreation for residents.

Step 5 – Create the Plan

The hubs and links were added to the collection of drawings prepared by the community college students for the study committee. With each layer of information, a pattern in the distribution of natural and cultural resources began to take shape. The committee could now see how the railroad spur and watercourses could connect the different hubs and landscape types within the community and link the township's green infrastructure system to other municipalities in the county.

The study committee divided its members into four smaller groups, with each responsible for recommending the specific steps needed to achieve one of the principles for building the green infrastructure system. Each group presented a preliminary list of recommendations for critique and coordination. The committee refined these ideas into a coherent action plan and map of the green infrastructure system.

The results were compiled into a draft report that included a proposed timetable, cost estimate and funding options for completing the recommendations. The study committee and the commission jointly presented the final report at a public meeting before the Hope Township's Board of Supervisors, who adopted the green infrastructure plan and agreed to budget funds each year for implementing the plan's recommendations. (See Figure 5).

KEY
- HOMES
- PUBLIC WELL
- PAINT FACTORY
- BRIDGE
- STORE
- SCHOOL
- PARK
- STREET TREES

FORESTED HILL LANDSCAPE

STATE GAME LANDS HUB

ROUTE 10

ACQUIRE LAND OR CONSERVATION EASEMENT TO PROTECT WILDLIFE

ENDANGERED SPECIES HUB

ENDANGERED SPECIES HUB

MAIN ST.

CULTIVATED FARMLAND LANDSCAPE

PRIME AGRICULTURAL SOILS HUB

CREEK CORRIDOR

ACQUIRE CONSERVATION EASEMENTS AND IMPROVE CREEK BANKS

CREATE RAIL TRAIL

CONNECT TO COUNTY TRAIL

STREAM CORRIDOR

CREEK CORRIDOR

PRIME AGRICULTURAL SOILS HUB

TRANSFER DEVELOPMENT RIGHTS

GREEN

TRANSFER DEVELOPMENT RIGHTS

BELT

LINK PARKS AND SCHOOLS WITH TRAIL AND CREEK TO CREATE A GREENWAY

CONVERT VACANT LOTS TO POCKET PARKS

ESTABLISH BACKYARD WILDLIFE PROGRAM

DISTURBED VILLAGE LANDSCAPE

IMPROVE STREETSCAPES

STREAM CORRIDOR

BROWNFIELD

CLEAN UP HAZARDOUS WASTE TO ALLOW FOR REDEVELOPMENT

WETLANDS HUB

RESTORE WETLANDS

CREEK CORRIDOR

CLEAN WATER HUB

ESTABLISH WELLHEAD PROTECTION AREA

Figure 5 – Green Infrastructure Plan – Hope Township

Step 6 – Build the System

The township then formed an environmental advisory council, as permitted by law, from the study committee's members, to work with the board of supervisors on implementing the recommendations in the action plan. Over the next five years, Hope Township was able to achieve a number of its goals using a variety of land planning techniques and working with a wide range of partners:

Green Infrastructure Investments and Accomplishments:

1. Protected both properties containing species of interest. Acquired one using grant funds from the state and a donation from a local sportsman's club. Partnered with a land trust to obtain a conservation easement on the other tract.

2. Created an overlay district to the zoning ordinance to allow for the transfer of development rights from prime agricultural lands to the residential zone surrounding the village in order to preserve the existing agricultural greenbelt and concentrate population growth near existing businesses to stimulate the economy. Added standards permitting planned residential developments to encourage natural resource protection, promote open space preservation and minimize the future expense of constructing and maintaining the gray infrastructure needed to serve new residential developments.

3. Developed a wellhead protection plan, identifying the area around the wells where contaminants could travel over the surface or underground to reach the water supply, with funding from a state grant. Amended the existing ordinances to included provisions for protecting the wells.

4. Monitored and assessed the quality of the creeks and stream with volunteer assistance from the High School Science Club. Developed a watershed management plan that recommended solutions to the existing storm drainage, flooding and water pollution problems. Completed a storm sewer upgrade project and revised the stormwater management ordinance to encourage plantings in detention basins to filter runoff. Obtained conservation easements and restored eroded creek banks with assistance from the land trust and garden club.

5. Worked with factory owner to develop a plan for remediating the environmental hazards and marketing the property for reuse with a combination of low-interest loans and grant funding from the state. Restored wetlands that were dedicated to the township with a surrounding buffer area and the spur route.

6. Planted street trees with Community Development Block Grant funds to reduce air pollution and the temperature of stormwater runoff reaching the stream. Encouraged residents to participate in the garden club's program to attract wildlife to backyard settings.

7. Collaborated with the land trust to acquire land and conservation easements along a creek, which would connect the existing parks and schools with the railroad spur and creek/stream corridors.

8. Teamed up with the County to prepare a master plan for an interconnected rail-trail, coordinating development efforts. Selectively cleared vegetation from the overgrown right-of-way, paved the trail with help from the Boy Scouts and Public Works Department and installed benches, trash receptacles and signage. Repaired the railroad bridge, providing a pedestrian link to the redeveloped paint factory site.

Conclusion

The example of Hope Township reinforces several important principles that, when implemented properly, contribute to a successful green infrastructure plan:

Use a comprehensive approach to planning. The goal of a green infrastructure system is to establish a framework for coordinating conservation efforts. Keep an open mind about what should be included in this system.

Plan ahead. It easier and more cost effective to protect the environment before land development happens than to restore natural processes after they are impaired.

Learn as much as you can. There is often no single source for information about the natural ecology of your area and the latest land planning techniques. Get the professional expertise you need to make sure the green infrastructure plan is based upon accepted scientific knowledge and sound land use practices. (See also References).

Encourage public participation. Identify potential partners and finds ways to include a variety of stakeholders in the planning and implementation process.

Promote biodiversity. Create variation in the landscape by protecting natural resources that differ in size and type and then find a way to link these resources. Think beyond municipal boundaries to connect with landscape features in the surrounding region.

Incorporate the human element. Green infrastructure is not intended to isolate people from nature by creating a separate network of open spaces just for wildlife. Its purpose is to weave nature back into the community in a way that facilitates various levels of human interaction with the environment based upon the resiliency of the natural resources being protected.

Make the tough choice. Building a green infrastructure system is an investment in your future. Promote the hidden value of green infrastructure and commit the time and money to bring the plan to fruition.

As civilization progresses, so does our understanding of the environment and our appreciation of its contribution to the quality of life. Great strides have been made to protect precious natural resources. Take the next step in the conservation process by using green infrastructure to care for the natural processes that sustain us.

Green Infrastructure...Let natural systems work for you...

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