

**4-30-2013 draft**

# **Lakewood Green Infrastructure Plan**

**Village of Lakewood, Illinois  
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## **INTRODUCTION**

### **Lakewood's Natural Heritage**

Crystal Lake: “The history of Lakewood is tied indelibly to the body of water known as Crystal Lake. The community came into being along the wooded shoreline of the lake, and without such a natural feature, would probably have never been created. Indeed, the name “Lakewood” was a natural choice, as it perfectly described the setting.” *Lakewood Comprehensive Plan Update, 2005*

The Village has cooperated with the City of Crystal Lake on efforts to protect Crystal Lake. It recognizes that the health of Crystal Lake is important and honors the intent of the Crystal Lake's watershed management ordinance by such actions as requiring any new home construction along the lakeshore to consult with the Crystal Lake Watershed Management and Lake Ecology Agency on issues such as seawall installation, well construction, and the like; and disseminating information to the public on proper lawn chemical use.

Open Space: Going back to its incorporation in 1933, the Village has proactively emphasized open space and protection of the natural environment. The Comprehensive Plan notes: “With its many lakes, natural areas and wetlands preserved as permanent open space, two golf courses, parks, and other areas that will not be developed, there is presently approximately 1 acre of open space for every household in the Village. While this ratio may not be able to be sustained at such a high level into the future, the Village strives to be a relatively low-density community with open neighborhoods connected to open space.” The most notable natural open space in the Village is the 220-acre Lussy Marsh owned by the McHenry County Conservation District (MCCD). Also in the planning area is the 2000+ acre Pleasant Valley Preserve, an MCCD macro-site just to the west of the village.

Rivers and Streams: Most of the Lakewood planning area lies on the eastern edge of the Kishwaukee River basin. The Kishwaukee River “Headwaters” flows from the City of Crystal Lake through Lakewood. While some of the headwaters has been straightened or channelized, the Kishwaukee has been identified as a Biologically Significant Stream and portions of it are rated a “Class A” stream, the highest level achievable, supporting a high level of mussel and fish diversity and other aquatic life. The northwestern part of the village's planning area drains to Laughing Creek. Both the Kishwaukee headwaters and Laughing Creek converge in the Pleasant Valley Preserve of the MCCD. The Village sees opportunities to protect and restore river and stream corridors and also ensure that new development does not harm the watershed, particularly with regard to stormwater runoff and the potentially harmful effects on water quality and natural stream flows.

Wetlands: The Village of Lakewood has considerable wetland resources. The most notable is the Kishwaukee Fen which is protected as an Illinois Nature Preserve. Other significant wetlands in the area include the Briarwood Wetland on Redtail Drive, the Lussy Wetland north and east of Turnberry Country Club, which is owned by the McHenry County Conservation District, and the Haligus Wetland. In addition, there are also numerous small wetlands throughout the community. The Village promotes wetland protection to the fullest practical extent during the development process.

Woodlands: Prior to European settlement, oak woodlands covered roughly one-third of McHenry County, and an even higher percentage of the Lakewood planning area. Since that time the county has lost nearly 80 percent of these historic woodlands. Today, Lakewood still contains numerous significant stands of trees, most of which lie north of Conley Road. While most of these woodlands are located in undeveloped areas, the Village has provided for the retention of several significant tree stands in and around developed areas. The Village has also enacted a strict tree preservation ordinance. In order to continue to maintain and expand these tree stands as significant assets to the community, tree preservation will be a community priority.

Recent Efforts: recently, the Village has taken actions to better protect Crystal Lake and its outlet, Crystal Creek. It now requires that any development exceeding 500 square feet meet criteria for the treatment and infiltration of stormwater runoff. It requires practices such as preserving depressional storage, permeable paving, downspout and sump pump disconnection, native landscaping, rain gardens, and rain barrels.

### **Why a Green Infrastructure Plan?**

This Plan provides a clear demonstration of the Village's ongoing commitment to its natural resources. Its purpose is to inventory and map open space and natural resources in and around the Village and to show how they are interconnected. The inventory is intended to be used to identify the location of those areas that should be protected and managed as public or private open space, how to connect existing and future open space parcels, and how natural resources relate to future land use and development within Lakewood and its planning jurisdiction.

The Plan allows residents, property owners, and prospective developers to become informed of the existence of green infrastructure in the vicinity of their property and how their land can be managed to protect and enhance adjoining green areas. The Plan also is intended as framework for engaging other agencies and neighboring local governments in collaborative efforts to protect natural areas and establish future greenway and trail connections. Plan recommendations identify actions, guidelines, and resources for the preservation, restoration, and linking of natural features which comprise green infrastructure.

# **DEFINING GREEN INFRASTRUCTURE**

## **What is Green Infrastructure?**

Both nationally and regionally, the term “green infrastructure” has a range of meanings. That range is simplified here into three categories.

### **1. Landscape-based green infrastructure**

This is perhaps the meaning most commonly applied to green infrastructure. It is based in the idea that certain lands have an inherent value that can be made even greater when a part of a network. The Conservation Fund defines it this way:

*Strategically planned and managed networks of natural lands, working landscapes and other open spaces that conserve ecosystem values and functions and provide associated benefits to human populations.*

Under this definition, the foundation of green infrastructure networks are the natural elements – woodlands, wetlands, rivers, grasslands – that work together as a whole to sustain ecological values and functions. But green infrastructure also can include working lands, trails and other recreational features, and cultural and historic sites.

### **2. Biodiversity-based green infrastructure**

In its definition, Chicago Wilderness’ *Green Infrastructure Vision* adopts a related meaning for green infrastructure—one which focuses on the goal of supporting biodiversity. Chicago Wilderness defines green infrastructure as:

*The interconnected network of land and water that supports biodiversity and provides habitat for diverse communities of native flora and fauna at the regional scale. It includes large complexes of remnant woodlands, savannas, prairies, wetlands, lakes, stream corridors and related natural communities. Green infrastructure may also include areas adjacent to and connecting these remnant natural communities that provide both buffers and opportunities for ecosystem restoration.*

This definition reflects both existing green infrastructure – conservation district holdings, state parks, and designated natural areas – as well as opportunities for expansion, restoration, and connection.

### **3. Nature-based alternatives to gray infrastructure**

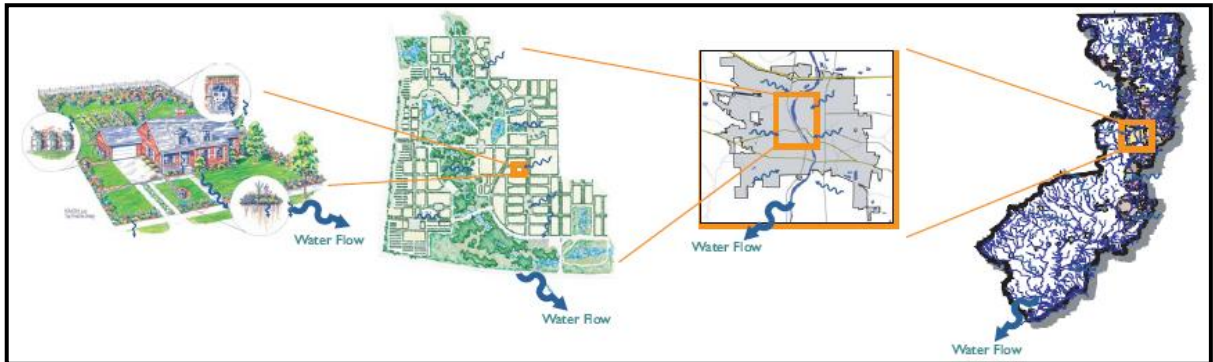
This definition of green infrastructure focuses on nature-based alternatives to conventional “gray infrastructure” technology and engineering. In this context, green infrastructure can be used to describe products, technologies, and practices that use natural systems – or engineered systems that mimic natural processes – to enhance overall environmental quality and provide utility services. The U.S. Environmental Protection Agency identifies green infrastructure techniques, such as green roofs, porous pavement, rain gardens, and vegetated swales, which use soils and vegetation to infiltrate, evapotranspire, and/or recycle stormwater run-off. In addition to effectively retaining and infiltrating rainfall, these technologies also can filter air pollutants, reduce energy demands, mitigate urban heat islands, and sequester carbon.

This plan integrates each of these meanings into a single comprehensive view of green infrastructure. It encourages not only sustainable land use and open space protection but also innovative, green technology to better protect water and other natural resources.

## **Green Infrastructure Examples**

While this plan emphasizes mapping and protection of green infrastructure at the municipal level, it also recognizes that implementation of green infrastructure plans and policies should be undertaken at multiple spatial scales, from small sites to large regions. The figure below highlights the range of scales.

It also recognizes that effective green infrastructure implementation requires coordination and involvement by local governments, other government agencies, private organizations, businesses, and private landowners in order to maximize the benefits.



The following are some examples of green infrastructure planning and implementation at various geographic scales.

### **At the Regional Scale**

The Chicago Wilderness *Green Infrastructure Vision* provides a regional framework for green infrastructure mapping and planning. The McHenry County Green Infrastructure Plan includes a *Green Infrastructure Network Map* and *Green Infrastructure Trails Map*. These exemplify regional-scale green infrastructure planning. Another regional green infrastructure example is the recently approved Hackmatack National Wildlife Refuge which will be implemented at a multi-county scale crossing the Illinois-Wisconsin border. Another example of regional GI implementation is the work of McHenry County Conservation District that spans numerous municipalities and townships across the county.

*Insert GIV 2.0 Map*

### **At the Community Scale**

At the community level, efforts can be made to incorporate GI maps and recommendations into municipal, county, and park district land use plans and maps. GI principles can be used to shape land use and zoning maps and provide a framework for more sustainable zoning, subdivision, stormwater, and landscaping codes as well as conservation design ordinances. GI principles also can influence land acquisition and trail priorities of local park and open space agencies. With the assistance of the Chicago Wilderness Strategic Watershed Action Team (SWAT), the Cities of Crystal Lake and Woodstock and the Village of Lakewood have all developed green infrastructure maps and plans.

### **At the Neighborhood Scale**

Neighborhoods, both existing and new, can be transformed to incorporate conservation design principles. This means the subdivision review process includes open space protection, natural landscaping, and stormwater best management practices that preserve biodiversity and natural resource functions in the design of the neighborhood. Not only does this preserve and enhance the natural environment, it also brings nature closer to families and children.

Local governments, including the county, Woodstock, Crystal Lake, and Algonquin, are regional leaders in developing conservation design ordinances for new development on sensitive sites. Several residential developments, including the Sanctuary of Bull Valley in Woodstock and McAndrew's Glen in Bull Valley, incorporate conservation design themes.

### **At the Site Scale**

Small sites, including residential yards, businesses, school grounds, and parks can incorporate practices that treat stormwater as a resource and provide habitat for native species. This is accomplished through practices like bioswales, rain gardens, permeable paving, and natural landscaping. Some McHenry County examples are MCCD's Lost Valley Visitor Center, Other World Computing in Woodstock, and several rain garden installations in Crystal Lake and Algonquin.

### **The Importance of Green Infrastructure**

Green infrastructure helps protect existing ecological and water resource systems and their associated social and economic functions. More specifically, preserving green infrastructure and managing it properly can provide numerous benefits, such as:

- Improved water quality.
- Enhanced groundwater recharge.
- Reduced flood damage.
- Enhanced aquatic and terrestrial habitat and biodiversity.
- Connected trails, greenways, and open space amenities.
- Enhanced recreational activities.
- Ecotourism opportunities.
- Reduced costs for installing and servicing conventional infrastructure.
- Improved health of children and families.
- Mitigation of climate change impacts.

Green infrastructure also benefits the community by:

- Contributing to the Village's identity and sense of place.
- Enhancing property values.
- Expediting the development planning process by identifying resource areas and corridors before development is proposed.
- Creating a vision of the future to guide the Village's long-term planning goals and objectives.
- Providing a better means of evaluating economic and environmental factors when making land use decisions.
- Ensuring that development and open space activity are encouraged and established in appropriate and compatible locations.



## **VILLAGE PLANNING POLICIES RELATED TO GREEN INFRASTRUCTURE**

Lakewood, as noted in the introduction, has traditionally supported the protection and preservation of natural resources and open space. This is demonstrated through its planning policies and land use regulations, including those pertaining to cluster development, tree preservation, park dedication, and stormwater management. Planning policies from Lakewood's Comprehensive Plan that are relevant to green infrastructure are summarized below.

### **Lakewood Comprehensive Plan Update, April 2005**

The Plan's Vision Statement is:

*The Village of Lakewood will remain a friendly community providing families with quality living in a natural setting.*

Its Mission Statement includes:

- *Provide responsible growth through controlled, acceptable residential and commercial development.*
- *Maintain and enhance the natural beauty of the Village.*

### **Environment and Natural Resources:**

Goal: A balanced approach to growth which integrates new development into the natural environment.

Relevant Objectives:

- Preserve the natural beauty and integrity of Crystal Lake, the Kishwaukee River, and all other surface waters, including streams and wetlands. Work with other local and regional governments to develop and implement habitat protection standards to assure the maintenance of the high water quality of the Kishwaukee River.
- Preserve and enhance the Crystal Lake shoreline, the Kishwaukee Fen Nature Preserve, other lakes and wetlands, and other natural areas for leisure, passive recreation, education and research. Provide appropriate buffers around these resources to protect the quality of these natural resources.
- Respect the natural topography, soils, and geology through appropriate subdivision design which blends new construction into the natural landscape and minimizes earthwork.
- Conserve groundwater supplies and protect underground aquifers from contamination, overuse, and misuse; encourage groundwater recharge.
- Establish sustainable development principles that would include best management practices (BMPs) for stormwater in regard to both quantity and water quality so as to protect the high environmental integrity of the Kishwaukee River and associated high-quality habitats.
- Conserve and enhance native trees and plants, and other compatible vegetative cover, especially woodlands and prairies. In particular, preserve existing woodlands and wetlands north of Conley Road and west of Haligus Road to serve as a buffer between different types of development.

The Plan also encourages clustering of lots in residential subdivisions. In a cluster development, individual homes are “clustered” on lots which are smaller than would normally be permitted. The surplus land is utilized for common open space, generally located in areas which are characterized by existing natural features, such as wetlands or wooded areas. The cluster approach allows developers to build the same number of units as under conventional development, but the homes are sited on smaller lots in order to preserve open space elsewhere. Such open space is reserved via covenant to be permanent so that it cannot later be developed.

The Plan specifically encourages open drainage systems for stormwater management, recommending native landscaping, grassy swales, wet ponds and wetlands to detain water, remove a certain amount of water pollutants, and promote a valuable natural habitat.

### Community Facilities and Services

Relevant Objective:

- Provide active and passive recreation facilities and programs to serve all ages and a variety of interests in concert with area Park Districts, conservation groups, and school districts.

The Plan recommends a four-step framework to address park and open space needs in Lakewood. To provide pedestrian and bicycle access to existing and future parks, a system of community trails is outlined in the Plan. This trail system will also provide a linkage between parks, and promote bicycling as an alternative mode of travel to work, school and recreation.

The Plan includes a category of Open Space/Special Use Parks. It recommends these where property provides a connection or link between open spaces, parks, or other public facilities, on sites with natural amenities, and/or where wetlands larger than one acre exist. It recommends facilities such as nature trails, nature centers and preserves, and viewing areas with interpretive signage. The Plan recommends that site design should be sensitive to the natural environment, limiting access as needed to preserve fragile areas.

The Plan recommends the development of four new parks, including one in the vicinity of Kishwaukee Fen Nature Preserve. It recommends potential acquisition of unique natural areas in cooperation with M CCD and the connection of parks via a future trail system.

### Transportation

Relevant Objective:

- Establish a pedestrian/bicycle path system that separates pedestrian and bicycle traffic from automotive traffic and links residential areas with key community facilities. A priority should be placed on working with the McHenry County Conservation District to establish a trail along the Kishwaukee River.

The Plan elaborates on pedestrian and bicycle trails. It notes that the 1999 Comprehensive Plan proposed an extensive new trail system for the Village of Lakewood. It notes that the trail system can provide residents with safe pedestrian and bicycle access to community facilities while reducing dependency on the automobile. It recommends that trail site design should be sensitive to the natural environment, with routes that avoid existing trees and maximize views of adjacent natural landscapes. It recommends that off-road and on-road trail alignments and connections be based upon the facility network shown in the McHenry County Subregional

Bicycle Plan and plans of other municipalities, park districts, and the McHenry County Conservation District.

The Plan includes a map (Map 3) of existing and proposed off-road and on-road trails. This system would provide convenient north-south and east-west access to adjacent neighborhoods and communities, as well as recreational and open space amenities. The proposed on-road trail system is predominantly assigned to local access and collector roads, including North Avenue, Briarwood Road, Bard Road, Union Road, Hamilton Road, and Dean Street. The designation of on-road trails along these streets will provide convenient north-south access to adjacent communities. An on-road trail is also shown along Lake Avenue, to reflect the fact that Lake Avenue is a main route to Kamijima Park (formerly Edgewater Park) and West Beach from Main Beach and points east.

### Housing

Relevant Objective:

- Build on the unique character of both original Lakewood and the Turnberry area by maintaining the focus on regulating overall project density while providing flexibility in lot size and housing type. Environmentally sensitive design solutions should be promoted to maintain the Village's natural setting.

### Economic Development

Relevant Objective:

- Encourage an attractive business climate while also upholding appropriate environmental protection standards.

### Future Land Use

The Future Land Use chapter embraces many of the preceding green infrastructure objectives and principles in its recommendations and guidelines for new development, particularly residential land uses.

Goal: A range of compatible land use activities that are respectful of the natural environment, coordinated with supporting infrastructure, and provide a fiscally balanced pattern of development.

Relevant Objectives:

- Establish a pattern, character, and intensity of land uses organized around accessibility, environmental conditions, community facilities, public utility capacity, traffic impact, and public safety.
- Provide open space and recreation areas to meet the needs and demand of the population.

The Plan contains extensive guidelines for residential design. It notes that existing natural features are not only important to the ecological health of the Village, but also help to create a uniqueness to Lakewood. By promoting the preservation of the existing natural features, new development can preserve the very characteristics that have drawn new residents to the Village. However, protection efforts must also take into account the quality of the features proposed for preservation. By considering the particular species, size and health of features and minimizing the amount of invasive species that may thrive, the Village and future developers can insure that

the preserved natural features will be an asset to the community. By focusing efforts on those natural features that add to the quality of the Village, natural feature preservation can be seen as a partner and not a barrier to economic development.

Natural feature preservation guidelines include:

- Protect existing on-site woodlands and significant trees of the highest quality as defined in the Village's ordinances.
- Protect existing wetlands in accordance with all McHenry County ordinances and provide a 100-foot minimum buffer around significant wetlands.
- Promote the preservation of steep slopes.
- Prohibit development within all floodplains.
- Promote the preservation of natural views to the greatest extent feasible.
- Require the use of building envelopes on residential lots to minimize the amount of land clearing needed for the positioning of a new residence.
- Promote the preservation of tree/hedge rows along public right-of-ways to maintain the natural feel along roadways.

The Plan also contains recommendations for residential infrastructure that embrace green infrastructure principles. It specifically recommends allowing for narrower road pavement and considering narrower lot widths that can reduce the overall amount of pavement used for roads, thereby reducing installation and maintenance costs. Additional infrastructure guidelines are intended to promote creativity during site design as new tools, techniques and innovations develop.

- Allow for flexibility in the engineering of a site for techniques that have been proven to be a cost savings and in no way detrimental to the Village.
- Allow for the use of Best Management Practices in the engineering and maintenance of storm water management issues.
- Allow for a reduction in pavement width up to 20 feet curb-to-curb when compatible with vehicular traffic volumes.
- Promote a more efficient location of water and sewer services lines, such as in rear yards.

Finally, the Future Land Use chapter contains recommendations for open space. It notes that land within the open space future land use category includes the McHenry County Conservation District site and existing significant natural features. The significant natural features include wetlands, floodplains, woodlands, rivers, lakes and ponds. These areas provide the Village with such natural functions as flood conveyance, pollution control, groundwater recharge and wildlife habitat. In addition, the proximity of the open spaces to existing and planned residential land uses enhances the overall character of those particular residences. By planning for the preservation of existing significant natural features, the Village intends to maintain the natural character to the greatest extent possible while improving the opportunities for creating residences with their own unique environments.

The Plan notes that amenities that offer recreational opportunities for residents have been proven to add value to a development, as well as providing health benefits for users. It recommends the development of a detailed trail plan that includes destinations within the Village and the surrounding region that will assist in creating a system that is both beneficial for recreational purposes and a pedestrian alternative to vehicular travel.

- Promote the creation of pedestrian trails throughout developments.
- Promote the connection of existing pedestrian trails to future trail systems.

## Plan Implementation Tools

The Comprehensive Plan concludes with recommended Plan Implementation Initiatives. Recommendations that are relevant to green infrastructure include the following.

*Update the Village's Development Standards, Regulations and Policies.* The intent of this initiative is to put the policies of this Plan into ordinance and map form and begin to implement these policies through ordinance enforcement. One of the primary areas to review will be in the area of residential zoning and subdivision controls to promote *clustering and conservation design*. Other issues include review of the entire zoning and subdivision codes, water and wastewater standards, engineering standards, site plan standards, sign regulations, the architectural review and landscaping codes, building codes, property and landscape maintenance codes, and natural resource preservation and management standards and practices.

# **GREEN INFRASTRUCTURE MAPPING PROCESS**

## **Mapping of Natural Resources and Open Spaces**

The McHenry County Department of Planning and Development has engaged in extensive mapping and compiled relevant data pertaining to the county's natural resource features. This information was gathered in the County's geographic information system and includes the following.

- Watershed boundaries
- Streams and lakes
- Floodplains
- Wetlands
- Illinois Natural Area Inventory (INAI) sites
- Existing public open space
- Woodland and grassland cover

These data sources were supplemented and enhanced with additional and more current local information, where appropriate. For example, wetlands data from the McHenry County ADID study replaced regional wetland data and oak woodlands mapping from the MCCD replaced the state woodland cover data.

After initial data was assembled, the County asked for input from regional and local conservation organizations. These included:

- Illinois Nature Preserves Commission
- Illinois Department of Natural Resources
- McHenry County Conservation District
- United States Natural Resources Conservation Service
- McHenry County Soil and Water Conservation District
- The Land Conservancy of McHenry County
- Environmental Defenders of McHenry County
- Openlands
- Several watershed planning groups

Based on the response from these groups, the most important resource layers were identified as core green infrastructure for mapping purposes and for the delineation of interconnected networks and the clustering of ecologically important areas. These areas include already protected and/or regulated locations, as well as unprotected resources. The information gathered and evaluated during this effort, was used as the basis for generating Woodstock's green infrastructure inventory and is the foundation for the green infrastructure planning map (GIPM) prepared by the County for the Woodstock area. This map is included as part of this Plan.

## **Principles of Green Infrastructure Mapping**

An overriding principle or assumption when mapping green infrastructure is that the size of resource areas and how they connect is [are?] extremely important. Elements of this approach include:

- Preserving large core areas.
- Protecting complexes of adjacent resource areas, such as wetlands, woodlands, and prairies.
- Connecting core areas with corridor, trail, or landscape linkages.
- Buffering critical areas from conflicting or harmful activities and land uses.

When green infrastructure mapping is done at a large scale, such as for an entire county, small or isolated resource areas may not always be included. While such areas may be important for long-term protection, their exclusion from the map lessens map "clutter" and creates an opportunity to examine resources as large-scale,

interconnected network. Never the less, the mapping prepared for Woodstock includes all publicly owned parks and existing natural areas regardless of size.

In order to acknowledge the elements listed above, the following specific core natural resource features were identified in the mapping effort.

- Waterways (lakes, ponds, rivers, creeks).
- Wetlands (NRCS and ADID surveys).
- McHenry County Natural Areas Inventory Sites (MCNAI).
- Illinois Natural Inventory Sites.
- IDNR Nature Preserves.
- IDNR Land and Water Reserves.
- Remnant oak woodlands from 2005 MCCD inventory.
- MCCD and IDNR sites and trails.
- 200-foot buffer (applied to each of the features above)
- FEMA 100-year flood hazard areas.
- TLC holdings and conservation easements.
- Threatened and endangered species locations.
- Class III groundwater protection areas.
- Open space mapping (McHenry County 2030 Comprehensive Plan).
- HA Series Flood of Record
- Resource conservation and conservation corridors (Woodstock Comprehensive Plan 2008).

The 200-foot buffer referenced above signifies the importance of protecting critical resources and the need to be sensitive to activities and land uses which adjoin them. It also is used to provide mapping “connectivity” for adjacent natural resource areas that may appear separate on a map but actually function as an interconnected complex. The buffers serve as a means of using natural resource areas to maintain Lakewood’s identity.

The use of a 200 foot buffer is intended for general planning purposes and not necessarily as a regulatory device. For comparison, the McHenry County Stormwater Management Ordinance, which was adopted and is enforced by the City, contains stream and wetland buffer requirements ranging from 30 to 100 feet, depending on resource quality and size. Recommended habitat buffers, however, may often exceed 300 feet for wetland habitats or sites containing endangered or threatened species.

Besides core natural resource features, additional mapping of supporting green infrastructure was conducted and used with the core natural resource features to finalize the core green infrastructure mapping. The following supporting natural resource information was collected:

- Hydric soils.
- Organic soils (includes peat and muck areas that may be suitable for wetland restoration).
- Highly erodible soils.
- Sensitive aquifer recharge areas.
- Watersheds and sub-watershed boundaries.
- Chicago Wilderness Green Infrastructure Vision Resource Protection Areas.

### **Lakewood Green Infrastructure Mapping Procedures**

Using the McHenry County GI mapping data and standards discussed above, a green infrastructure planning map of Lakewood and its surrounding planning jurisdiction was created. The map was coded with the referenced core natural resource and open space layers and used to depict interconnected green infrastructure systems. As part of this task, a number of questions were considered in order to refine and tailor the map content for Lakewood. The resultant recommendations, or mapping rules, follow.

- Following the McHenry County procedures, if adjacent resource areas were within 200 feet of each other consideration was given to establishing a connection or linkage between them.

- Isolated resource complexes of 10 or more acres, including adjoining protective buffer areas, should be retained on the map as core green infrastructure. Smaller polygons, primarily wetlands and woodlands, were highlighted with appropriate symbology.
- All public open spaces and parks were retained on the map, regardless of size.
- Class III groundwater protection boundaries were depicted as overlays on the final mapping network.
- The Commonwealth Edison powerline rights of way (ROW) were added as core GI coverages.

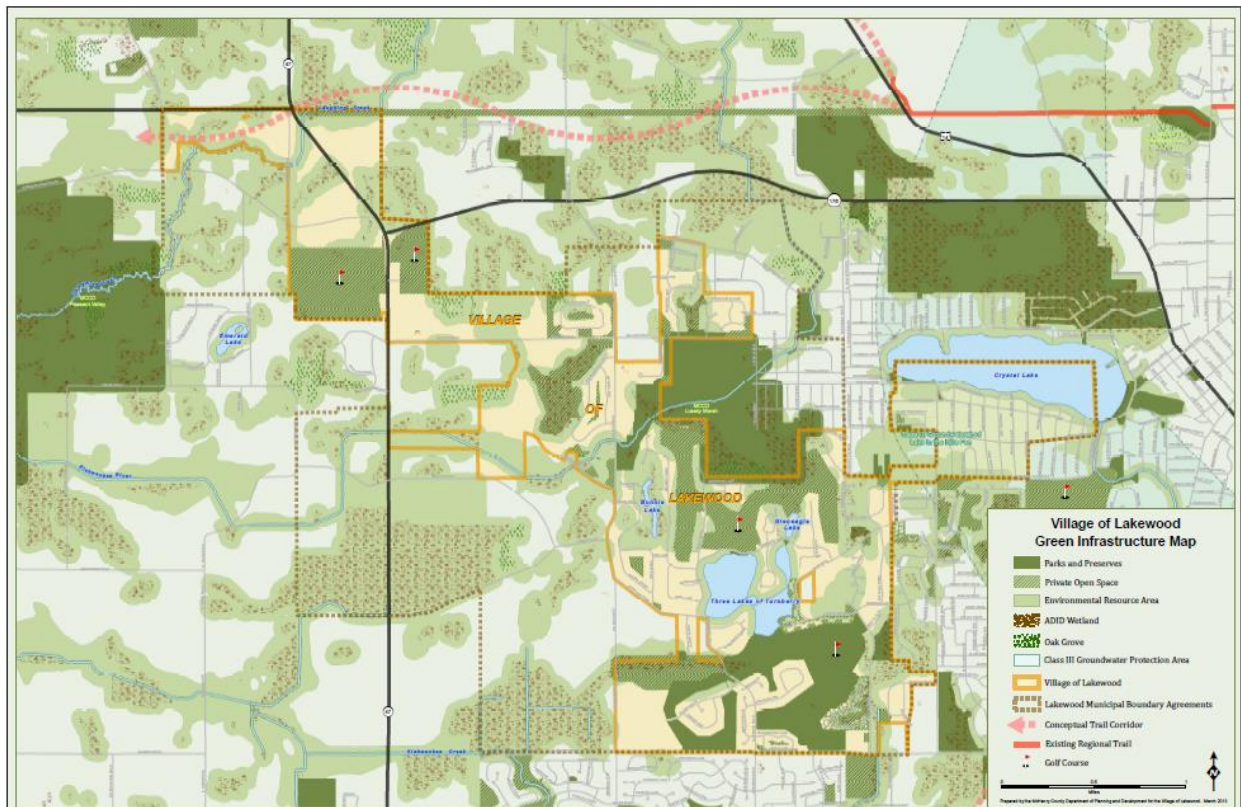
The green infrastructure planning map was presented to several local conservation organizations, including the MCCD, TLC, SWCD, Openlands, and the Environmental Defenders of McHenry County, for their review and input. Based on this input, several additions, refinements, and changes were made to the draft map.

Based on this input and the mapping rules highlighted above, a green infrastructure network map was prepared.



## **Green Infrastructure Network Map**

The green infrastructure mapping process (described in the previous section) resulted in the creation of the *Green Infrastructure Network Map*. It is a goal of this plan that these maps provide a foundation for green infrastructure throughout the county. This map depicts networks of green infrastructure and includes environmental transitional areas and buffer zones that connect natural resource and protect significant open space amenities. It includes regional trails and conceptual trail corridors. The green infrastructure network map is intended to be used for general planning purposes. Along with other planning documents of the Village, it will serve as a basis for providing direction and establishing specific land use policies, standards, and guidelines concerning the preservation and linking of natural resource features.



Green Infrastructure Network Map For Lakewood, IL. Source: McHenry County Dept. of Planning & Development

This map is dominated by the three shades of green that represent the green infrastructure network. It also includes water, wetland, oak woodland, and regional trail information.

### **Parks and Preserves**

These areas are drawn in dark green. They are comprised of lands owned by public agencies, primarily Crystal Lake Park District and MCCD. These areas are typically open to the public. Included in this category is a 200-foot buffer around the outside edge of MCCD holdings.

### **Private Open Space**

These areas are drawn in hatched light and dark green. They are comprised of land that is privately owned but either precluded from development or is unlikely to be developed based on its current use. Private open space includes subdivision common areas, golf courses,

Commonwealth Edison ROWs, and camps as well as privately owned properties that are permanently preserved such as IDNR Nature Preserves, IDNR Land and Water Reserves, and conservation easements. These areas typically are not open to the general public. Included in this category is a 200-foot buffer around the outside edge of the sites designated as Illinois Nature Preserves and Land and Water Reserves.

### **Environmental Resource Area**

These areas are drawn in light green. They are comprised of lakes, ponds, rivers, creeks, wetlands, McHenry County Natural Areas Inventory (MCNAI) sites, Illinois Natural Areas Inventory (INAI) sites, oak woodlands, FEMA 100-year flood hazard areas, and Hydrologic Atlas floods of record. These areas were chosen to be included here because they provide, or have the potential to provide, valuable natural functions such as storm water management, aquifer recharge, water filtration, and flora and fauna habitat. Included in this category is a 200-foot buffer around the outside edge of the resource areas with the exception of flood hazard areas and floods of record.

### **ADID Wetland**

This category identifies areas of wetlands that were mapped in McHenry County's Advanced Identification (ADID) wetland survey. While most wetlands are found within the mapped green infrastructure network, some very small areas are not. This is not meant to diminish the local significance of these smaller wetlands and the need for their protection.

### **Oak Grove**

This category identifies areas of oaks woodlands and savannas that were mapped in a 2005 study by MCCD. These areas are the last remnants of the vast woodlands that predated European settlement in the county. While most woodlands are found within the mapped green infrastructure network, some very small areas are not. This is not meant to diminish the local significance of these woodlands and the need for their protection.

### **Class III Special Resource Groundwater Protection Area**

These areas are shaded in pale blue. Class III Special Resource Groundwater Protection areas are designated by the Illinois Pollution Control Board, in cooperation with the Illinois Nature Preserves Commission, for areas that are deemed to be demonstrably unique and irreplaceable groundwater sources. The mapped Class III area in this plan represents the groundwater recharge area for Crystal Lake and Lake in the Hills Fen. Class III areas are not included in the mapped green infrastructure network, but were included as an overlay because of the important environmental function they play.

### **Conceptual Trail Corridor**

This category is identified by pink dashed lines. The conceptual trail corridors were created for the County plan and included in this map to provide ideas for future regional trails. No exact route is being proposed and no agency is identified to create such trails.

### **Existing Regional Trail**

This category is identified by red lines. For the most part, regional trails are managed by MCCD. The most notable regional trail in the vicinity of Lakewood is the Ridgefield Trace Trail in Crystal Lake that will eventually connect Veterans Acres Park to McHenry County Community College and beyond.

## **Implementation Recommendations**

This section identifies recommended policies, strategies, and actions to achieve the green infrastructure purposes identified in the Green Infrastructure Background chapter. Where appropriate, it also identifies specific implementation tools, potential funding sources, and local examples.

### **COORDINATE IMPLEMENTATION**

Coordinated planning and implementation of green infrastructure are important because green infrastructure resources do not observe political boundaries. It is notable the Lakewood has a unique opportunity for green infrastructure implementation because of the recent adoption of similar plans by the County, Woodstock, and Crystal Lake and the strong engagement of MCCD in green infrastructure planning and implementation. A few examples of coordinated planning actions and opportunities follow:

- Protection of sensitive stream or lake resources is best achieved if all of the communities in a watershed work together to develop consistent stormwater and conservation design ordinances. Working with ordinances and education programs, local governments can maximize the opportunity for water to be treated with green infrastructure practices, such as rain gardens, before it moves offsite.
- Similarly, protection of groundwater aquifers requires the coordinated efforts of the county and local governments to identify and plan for the protection of critical recharge areas. And it also requires responsible actions of roadway maintenance agencies, as well as businesses and residents, to control the use of road salts and other potentially damaging chemicals. In McHenry County, such actions are catalogued into the recently adopted Water Resources Action Plan.
- McHenry County has a remarkable regional open space and trail system owned and managed by MCCD. This plan identifies opportunities for enhanced open space and greenway connectivity through the actions of municipalities, park districts, and MCCD. But, ultimately, connectivity will be optimized when new subdivisions, parks, businesses, and commercial developments incorporate local greenways, trail linkages, and bikeways where people live, work, recreate, and shop.

### **PROTECT CORE GREEN INFRASTRUCTURE**

As noted previously, there is an array of techniques that can be used to protect green infrastructure. These techniques may be applied not only to lands mapped in the green infrastructure network, but also to smaller areas that, though unmapped, have local importance and are deserving of protection (e.g., wetlands, woodlands, greenways, etc.).

Recommendations are provided for each of the following techniques.

- 
- Acquisition by public agencies
- Conservation easements on private land
- Targeted land use planning and zoning
- Conservation development
- Greenway connections
- Trails
- Landscape retrofitting of previously developed land
- Ecological restoration of degraded landscapes
- Farmland protection

### **Acquisition by Public Agencies**

Open space and natural area acquisition is one of the principal methods recommended for protection of areas identified in the green infrastructure network map. It is a method that has been used with great success by MCCD, Crystal Lake Park District, and other open space agencies in protecting over 33,000 acres of open space in the county.

### *Recommendations*

- The McHenry County Conservation District (MCCD), The Crystal Lake and Huntley Park Districts, and the Village should continue to acquire natural open space with a priority placed on areas identified in the green infrastructure network map. Cumulatively, these agencies should strive for a goal of 15 percent open space as recommended in the *McHenry County 2030 Plan*.
- The Crystal Lake and Huntley Park Districts should identify green infrastructure priorities in their master plans. Similarly, the Village should incorporate this Plan and the green infrastructure network map in an updated Comprehensive Plan. In particular, these entities should identify and implement opportunities for protecting local natural areas that are part of the green infrastructure network and educate their constituents about the value of natural resources.
- Where appropriate, the Village should strive for intergovernmental partnerships with open space entities to leverage resources and to create macrosites of natural communities for protection of plants and animals that require large tracts of land to survive. In particular, assemblages of wetlands, stream corridors, prairies, savannas, and woodlands should be targeted. The Pleasant Valley Conservation Area is a good example of macrosite preservation
- The Village should coordinate with MCCD, local park districts, and other local agencies to promote ecotourism resources, such as parks, natural resources, and similar points-of interest.

### **Resources**

The Illinois Department of Natural Resources (IDNR) can provide resources and assistance to communities interested in preserving natural areas as public open space. IDNR has a long history of working with communities and park districts through its Open Space Lands Acquisition and Development (OSLAD) Program and the federally funded Land & Water Conservation Fund program (LAWCON).

### **Local Examples**

Crystal Lake Park District: The Crystal Lake Park District has been acquiring and managing natural areas since it was formed by voters in 1921 for the purpose of preserving Crystal Lake. Among its important natural areas, Veteran Acres Park and Sterne's Woods and Fen are remarkable glacially formed landscapes that total 341 acres. Within Veteran Acres, Wingate Prairie is an Illinois Nature Preserve that accounts for 85% of the rare gravel hill prairie that is protected in the entire state of Illinois. Sterne's Fen, also an Illinois Nature Preserve, supports several rare and endangered wildlife species. In 1968, the 109 acre Lippold farm tract directly north of the lake was purchased with the aid of a state grant. After purchasing the adjacent 200-acre sod farm, the park district developed plans that include a 60 acre wetland system. Urban and agricultural runoff from over 1,300 acres in the Crystal Lake watershed flows through these wetlands before entering Crystal Lake. Today, with over 1,400 acres of park land, the Park District continues a commitment to preserve and protect the land and water areas over which it has stewardship.

### **Conservation Easements on Private Land**

Privately owned natural areas and open spaces can be voluntarily dedicated for long-term protection under a conservation easement provision. Under this provision, these areas remain in private ownership, but the rights to change the use are given to a controlling agency, usually an entity whose mission includes the protection of open spaces. Conservation easements provide an effective method to preserve open space for future generations. As of 2011, The Land Conservancy of McHenry County owns or controls easements on roughly 1,920 acres of open space that includes 511 acres of MCNAIs and nearly 500 acres of farmland.

Another option for private landowners is protection of land through the Illinois Nature Preserves Commission (INPC). Land enrolled in the Illinois Nature Preserves System (either dedicated as an Illinois Nature Preserve or registered as an Illinois Land and Water Reserve) confers the highest level of protection for land in Illinois. The landowner retains title to the property and neither program provides public access to the land. The INPC partners with landowners to protect land that has been recognized for its high ecological value or otherwise serves to buffer or protect such land. Land with high ecological value could include a prairie, woodland, or wetland that has largely survived undisturbed or supports populations of 1 or more of the State's list of endangered and threatened species. The two land-protection programs available through the INPC provide flexibility in working with landowners who wish to voluntarily protect their land. To date, the Illinois Nature Preserves Commission has enrolled 3,678 acres of land in McHenry County into the Illinois Nature Preserves System. Of that total, approximately 819.6 acres have been protected by 21 different private landowners.

### *Recommendations*

- The Land Conservancy of McHenry County, the Illinois Nature Preserves Commission, and related organizations should continue to identify private land opportunities for protecting critical natural areas, buffers, and connections within and supporting the mapped green infrastructure network.
- Lakewood should work with conservation organizations to continue to educate private landowners and developers about opportunities to set aside land for conservation as well as farmland protection purposes.

### **Resources**

The Land Conservancy provides guidance to landowners who may be interested in land protection options. Its website addresses conservation easements, land donations, other land protection options, and financial benefits and funding options. There are several financial benefits for landowners who choose to permanently preserve their land with a conservation easement or a State Nature Preserve dedication.

- **Income tax benefit:** Landowners qualify for an income tax deduction equal to the difference between the value of their property with an easement and without an easement. This is treated by the IRS like other non-cash donations to charity, and the landowner can deduct up to 30% of Adjusted Gross Income in non-cash donations and they can carry any unused portion of the deduction forward for 5 years.
- **Property tax benefit:** Land that is dedicated as an Illinois Nature Preserve or Nature Preserve Buffer is taxed at a rate of \$1 per acre per year. Land that is dedicated as an Illinois Land & Water Reserve, or that has a conservation easement that qualifies for a Certificate of Public Benefit from the state, can apply to have the assessed valuation on the land (not the buildings) reduced by about 75%.
- **Estate tax benefit:** Land that is protected with a conservation easement when valued as part of an estate will be reduced in value by 40% (up to \$500,000) for purposes of determining any estate taxes owed.

Illinois Nature Preserves Commission staff is available to meet with McHenry County landowners to describe the land protection programs in greater detail, help landowners assess the ecological value of their land and determine whether their land qualifies for these programs, and help the landowner implement a land-protection program. More information about the State-wide mission of the INPC, its authority to protect land under State statute, management of land, the land protection programs, and its defense programs are available at its website.

### **Local Examples**

In 2009, three of the projects that TLC completed with private landowners were conservation easements that provide buffers to MCHCD's Glacial Park. The properties together preserve 30 acres of land that will remain undeveloped and in private hands forever. The landowners continue to use the properties (for hunting and/or nature enjoyment) and also pay property taxes on the lands, but know that they will never be developed, even when they no longer live there.

In 2011, TLC accepted a 56 acre conservation easement on property that adjoins MCHCD's Brookdale Conservation Area as well as the Illinois Natural Area Inventory Site known as Lakota Wetlands, providing an important natural



buffer to these resources that are already recognized as important at the local and state level. The easement allows the landowners to continue to restore the property, hunt the land and to build a small home in the future.

In September 2009, the Illinois Nature Preserves Commission approved registration of a 437.4 acre tract of land located adjacent to McHenry County Conservation District's Brookdale Conservation Area as an Illinois Land and Water Reserve. This site lies within the upper reaches of the Kishwaukee River watershed (the river is known State-wide for its high water quality and diversity and richness of aquatic life). It supports several species of wildlife considered by the Illinois Department of Natural Resources (IDNR) as: "...species in greatest need of conservation", provides critical habitat for the State-endangered Blanding's turtle, and provides protection for important wetland and woodland habitat. The landowners retained the right to implement an approved forest management plan by the IDNR and provide for artistic and educational venues designed to introduce the region's citizens to conservation and the values associated with the county's open spaces.

### **Targeted Land Use Planning and Zoning**

Several of the core goals of the Lakewood Comprehensive Plan Update are focused on making wise land use and development decisions that protect green infrastructure. These goals specifically focus on protection of natural resources and the environment, preserving environmentally sensitive areas, and providing connected open spaces.

Further, the Plan identifies and maps key elements of green infrastructure, including:

- Lakes
- Wetlands
- Streams and floodplains
- Watersheds
- Woodlands
- Open space
- Trails

Proposed open space and recreation areas are two of the principal underpinnings of the Village's Future Land Use map. The Plan notes that by "promoting the preservation of existing natural features, new development can preserve the very characteristics that have drawn new residents to the Village".

One of the primary ways to implement land use policy is through zoning and other ordinances. In that vein, the Comprehensive Plan calls for an update of the Village's development standards, regulations, and policies. It targets residential zoning and subdivision controls to promote clustering and conservation design. Other relevant issues include review of the entire zoning and subdivision codes, water and wastewater standards, engineering standards, site plan standards, landscaping codes, building codes, property maintenance codes, and natural resource preservation and management standards and practices.

### *Recommendations*

- The Village should incorporate this green infrastructure plan and maps into an updated Comprehensive Plan and zoning maps, with a priority on protection of critical natural resources, open space, and linked greenways.
- The Village should link development priorities to natural resource constraints and opportunities, particularly streams, lakes, wetlands, and their respective watersheds and recharge areas. Development should be avoided in the most sensitive natural resource areas as mapped on the green infrastructure network map.

- Tools such as overlay protection districts should be implemented to clearly identify sensitive areas where development intensities should be limited. Overlay districts can be structured to provide advance knowledge of site constraints to developers as well as identifying creative design techniques such as lot clustering.
- The Village should coordinate with the McHenry County Soil and Water Conservation District (SWCD) in the use of the green infrastructure network map as it advises other local governments, private land owners, and agricultural producers on natural resource issues. In particular, the SWCD should incorporate the Village's green infrastructure maps in its Natural Resource Information reports for all zoning and land use changes that it reviews.

### Resources

Chicago Wilderness, in cooperation with its partners, has developed several guides that would be useful to the Village including *Sustainable Development Principles for Protecting Nature in the Chicago Wilderness Region*, *Protecting Nature in Your Community*, and the *Building Sustainable Communities*<sup>6</sup> series of fact sheets.

### Local Examples

As noted, McHenry County, Woodstock, and Crystal Lake have all developed green infrastructure plans and are incorporating green infrastructure principles, to varying degrees, into their land use and development policies and regulations.

### Conservation Development

Conservation development employs a combination of creative land planning and innovative stormwater management practices to protect water and natural resources, preserve natural areas and open space, and enhance wildlife habitat. McHenry County and several local municipalities have adopted conservation design ordinances to:

- protect natural areas and sensitive resources
- better protect water quality and groundwater
- establish greenway and trail connections; and
- provide for long-term enhancement and stewardship of ecologically important lands.

These ordinances require conservation design for all development sites that have significant areas of sensitive natural resources and allow conservation development as a right for all other subdivisions. Conservation development entails a thorough review of a development site to evaluate potential green infrastructure elements – such as wetlands, streams, woodlands, and steep slopes. But where the traditional land planning process may search for ways to build through these natural areas – resulting in loss and fragmentation of natural resources – conservation design seeks out creative approaches to preserve and enhance them. A core tool of residential conservation design is "clustering" – i.e., accommodating the same number of houses onto smaller lots. This results in less fragmentation of natural areas, reduced land grading and associated infrastructure construction, and more functional open space. Preserved open spaces can be enhanced with trail systems that connect to adjacent developments and public trails and open spaces. Effective conservation design also incorporates legal, financial, and ecological management provisions for the long-term protection and stewardship of natural areas within a conservation development.

Another critical aspect of conservation development is to incorporate design elements that minimize increases in stormwater runoff and degradation of runoff quality. Low impact development (LID) designs feature narrower streets, permeable paving, and stormwater best management practices such as bio-swales and rain gardens. Their goal is to maintain natural recharge of rainfall and runoff, thereby protecting groundwater aquifers and providing clean, healthy baseflows to streams and wetlands.

## Recommendations

- The Village should amend its zoning, subdivision, and landscaping ordinances to allow or encourage cluster development and other conservation design techniques by right without requiring a planned unit development.
- Conservation development should be targeted to all development parcels that include areas mapped in the green infrastructure network.
- Conservation design ordinances should build upon the successful ordinances adopted by the county and several municipalities by incorporating provisions for:
  - A minimum percentage of open space (the county requirement ranges from 40 to 70 percent, depending on the underlying zoning). Generally, open space should be preserved or restored to a natural condition.
  - An open space management plan that includes a permanent legal mechanism and includes the identification of long-term ownership and funding options. It also should specify clear performance criteria for short- and long-term management of open space natural areas.
  - A land planning approach, such as the clustering of residential lots, to avoid sensitive natural areas and minimize land disturbance and grading.
  - Protection of significant native tree groupings on the site, particularly native oaks and hickories.
- Conservation developments should incorporate provisions to restore native vegetation in buffers adjacent to water bodies and wetlands to filter out damaging pollutants, preserve aquatic habitat, and protect stream banks from erosion.
- The Village should encourage the dedication of open space within conservation developments to qualified conservation organizations, land trusts, or public land agencies to ensure their long-term protection and stewardship as part of the green infrastructure network.
- The Village should investigate and promote additional flexibility in a conservation design ordinance to allow for mixed densities and uses within new subdivisions such as through neo-traditional development and traditional neighborhood development.

## Resources

A number of excellent resources have been developed for Northeastern Illinois by the Northeastern Illinois Planning Commission, Chicago Wilderness, and others. An overview of conservation design techniques is provided in *Conservation Development in Practice*. A more detailed discussion of conservation design ordinance considerations, including subdivision and zoning codes, can be found in *Conservation Design Resource Manual*. For specific ordinance language, it is recommended that the Village consider the following conservation design ordinances adopted by the county and three municipalities .

## Local Examples

**Conservation Design Ordinances:** The City of Woodstock was the first community in McHenry County to adopt conservation design standards as part of its Unified Development Ordinance. The county subsequently adopted a conservation design ordinance based, in part, on the approach taken by Woodstock. More recently, the Village of Algonquin and City of Crystal Lake have incorporated conservation design requirements into their ordinances, largely modeled after the county ordinance.

**Sanctuary of Bull Valley:** The Sanctuary of Bull Valley is a 300-acre conservation designed development in Woodstock, Illinois, with plans for 282 homes. Approximately 50 percent of the land is set aside as open space. Both pre-existing and restored natural areas are interspersed throughout the homesteads. Walking trails allow access to



the prairie in the center of the development, with scattered glacial depressions called “kettles” acting as natural stormwater detention. The development also has oak-hickory savannas, woods, and wetlands. Natural areas in the Sanctuary are critical groundwater recharge areas within the Boone Creek Class III Groundwater Protection Area. The use of “green” engineering practices – such as minimizing mass grading, reducing road widths, and eliminating curbs and storm sewers in many places – protects groundwater and water quality, and the development saved over 28 percent in land development costs as a consequence. In addition, by maximizing the natural areas and minimizing the manicured landscapes the master operators association (MOA) is seeing a significant savings in maintenance fees and costs. Typical maintenance costs for mowed and fertilized areas range from \$2500-5000/acre depending on level of maintenance. By keeping much of the common areas in a restored natural state, the MOA has seen its overall cost to maintain reduced from a high of around \$1500/ac per year in 2005 to less than \$900/acre in 2010 which should stabilize going forward.

### **Greenway Connections**

A greenway refers to public or private open space that is concentrated in a linear manner along a natural or artificial corridor. Greenways can provide connectivity between adjacent natural areas, provide buffers for linear features such as streams, and sometimes serve as corridors for recreational trails. Once greenway opportunities are identified, their protection can be achieved by a variety of mechanisms including public acquisition, conservation easements, developer donations, natural landscaping, and ecological stewardship.

#### *Recommendations*

- The Village should collaborate with local park districts, MCCD, The Land Conservancy, and other open space organizations to link local parks and open spaces to existing and planned portions of Village and countywide green infrastructure and open space networks.
- MCCD and local park districts and departments should be leaders in establishing new public greenways, particularly along the Kishwaukee River and linking to Pleasant Valley Conservation Area.
- The Village should identify and utilize a suite of creative greenway preservation tools such as intergovernmental agreements conservation developments. More specifically, the Village should encourage the interconnection of open space and greenways during the subdivision approval process. They should work with land owners and developers to encourage the permanent preservation of greenway connections to provide opportunities for habitat enhancement, recreation, and environmental education.
- The Village and The Land Conservancy should identify and offer incentives for private landowners to donate lands (or cash in lieu of land) or conservation easements to protect important greenways such as stream corridors.
- Greenway planning and preservation entities should promote public awareness and provide technical assistance regarding greenway protection to private landowners and homeowners associations.

#### **Resources**

The *Northeastern Illinois Regional Greenways and Trails Plan* was developed by CMAP. CMAP provides assistance to local governments on planning and implementing local greenways.

#### **Local Examples**

As previously noted, several municipalities have taken a proactive approach to green infrastructure protection in their land use plans. Notably, the *Spring Grove Comprehensive Land Use Plan* contains an Open Space and Greenway Plan. The *Woodstock Comprehensive Plan* includes mapping of recommended resource conservation areas and resource conservation corridors.

## **Trails and Bikeways**

Trails are strongly supported in the Comprehensive Plan. They provide a means of promoting community walkability, providing recreation, linking neighborhoods and open spaces, and connecting residents to schools, jobs, and commercial centers. Good trail planning encourages access for a variety of users, including pedestrians, bicyclists, as well as equestrians and snowmobilers, where appropriate.

Much like greenways, successful trail planning and implementation requires extensive coordination between local governments, open space agencies, transportation agencies, and private land owners and developers.

### *Recommendations*

- The Village should coordinate with other local governments, McHenry County Division of Transportation (MCDOT), MCCD, Chicago Metropolitan Agency for Planning (CMAP), and Openlands in planning and implementing trail corridors and circuits throughout its planning area to provide clear, safe connections to adjacent communities and existing and future open space areas.
- The Village should promote the interconnection of trails and improved walkability between adjacent subdivisions and with local and regional trails during the subdivision approval process.
- In the identification of priority trail corridors, the Village should identify additional multiple-use riparian (i.e., streamside) greenway opportunities to accommodate trails, wildlife corridors, and vegetative buffers.

### **Resources**

Many local communities have benefitted from the trail planning advice and financial assistance of IDNR's Illinois Trail Grant Programs. Openlands also is a good source of information on trail planning.

### **Local Examples**

Most of the municipalities in McHenry County have developed trail plans or maps and may be good sources of information on trail implementation and funding approaches..

## **Landscape Retrofitting of Previously Developed Land**

While much of the mapped green infrastructure network exists in undeveloped areas, significant green infrastructure occurs in and adjacent to lands developed in residential, commercial, and other urban land uses. These "developed" lands often exist on existing or former wetlands, floodplains, stream corridors, or woodlands. While they may be considered degraded in an ecological sense, they often provide significant opportunities for retrofitting and enhancement.

There have been numerous examples of successful retrofits of such urban lands that can benefit green infrastructure. For example, stormwater detention basins can be retrofitted by planting native vegetation in lieu of turf grass or riprap edges. Stream buffers can be enhanced via the removal of invasive brush and weeds and replaced with native riparian vegetation. Rain gardens and bio-swales can be installed adjacent to wetlands, lakes, and streams. Individually, these actions may not have a substantial impact but their cumulative effect, if done over a larger area, can be quite dramatic.

### *Recommendations*

- The Village should identify stormwater best management practice (BMP) retrofit opportunities to preserve and restore natural baseflows to Crystal Lake and local streams to protect their ecology and quality.
- The Village and landowners should prioritize retrofit opportunities on sites where natural conditions have been previously altered and where there is good potential for restoration of natural ecosystem and hydrologic functions. In particular, the Village should target retrofit and restoration opportunities in neighborhoods in the Crystal Lake watershed.
- The Village should strictly limit development and restore native vegetation in buffers adjacent to water bodies to filter out damaging pollutants, preserve aquatic habitat, and protect stream banks from erosion.
- The Village should continue to engage with watershed groups to protect, restore, and manage water resources with effective and consistent regulations, leadership, and public education.

### **Resources**

Nationally there are excellent references on retrofitting techniques from organizations such as the Center for Watershed Protection. In Illinois, the Environmental Protection Agency has two relevant grant programs: Section 319 of the Clean Water Act provides funds for nonpoint source pollution control projects. The Illinois Green Infrastructure Grant<sup>23</sup> (IGIG) program provides funding for green infrastructure practices to control stormwater runoff to improve water quality.

### **Local Examples**

**Algonquin:** The Village of Algonquin won a regional conservation award for its efforts to restore a detention area and woodland in a residential neighborhood near the Fox River. The Yellowstone Natural Area was an existing 4-acre turf detention basin. In spring 2007 it was retrofitted and planted with native vegetation. The basin is now a well-established natural landscape that infiltrates and cleans stormwater from the surrounding residential development. The adjacent 3-acre oak woodland was highly degraded. Intensive brush cutting, controlled burning, and over seeding has greatly enhanced the oak woodland. The entire project site is now a low maintenance native landscape which provides beautiful aesthetics, wildlife habitat, and overall water quality benefits.

**Burnsville, Minnesota:** In the City of Burnsville, Minnesota, most of the lots in a residential neighborhood were retrofitted by installing excavated rain gardens in front yards behind curb cuts. The purpose was to reduce stormwater runoff and pollutant loads in nearby Crystal Lake. In a paired watershed study, the retrofitted neighborhood and an adjacent neighborhood that was not treated were monitored for over a year. Results from the comparison were remarkable. In the neighborhood with the rain gardens, runoff volumes were reduced by almost 90 percent.

### **Ecological Restoration of Degraded Landscapes**

The landscapes and natural areas of McHenry County have been greatly altered since the beginning of settlement by Euro/Americans in the 1840s. Notably, large areas of former wetlands have been drained, largely to facilitate agricultural production and urban development. Similarly, the county has lost over 85 percent of its original oak-hickory woodlands and savannas. Only a tiny fraction, less than 1 percent, of the original prairie grasslands have survived intact.

While these losses are a cause of concern, they also present opportunities for restoration and expansion of existing green infrastructure. With respect to wetland restoration, there have been a number of very successful projects involving the removal of subsurface drainage tiles and closing of drainage ditches in altered “hydric soils”. These actions restore the hydrology, or natural water saturation and inundation conditions, thereby allowing native wetland vegetation and wildlife to return. These situations can present good opportunities for the restoration of “basin marshes” and “sedge meadows” that can attract waterfowl and enhance the storage and

cleansing of runoff. Similarly, the green infrastructure network identifies hundreds of acres of altered floodplains and stream and wetland buffers that present an important opportunity for the reintroduction of native vegetation to cleanse water and enhance wildlife habitat.

Woodland/savanna restoration can be a more challenging task, and it can take many years to reestablish a woodland that has been cut down. Nonetheless, woodland replanting and restoration are being aggressively pursued in many locations in the county. This can have substantial benefits if undertaken in the vicinity of remnant woodlands that are in good ecological condition. For example, planting oaks in a residential neighborhood or open space that borders an oak-hickory woods can effectively expand the habitat for certain bird and mammal species that need extensive native tree cover and travel corridors between wooded remnants.

### *Recommendations*

- The Village should coordinate with MCCD and local park districts to target opportunities for ecological restoration of degraded landscapes, with a particular focus on areas within the green infrastructure network and within identified greenway corridors.
- MCCD, The Land Conservancy, relevant state and federal agencies, and watershed groups should provide technical and policy assistance to the Village and land owners to identify and implement opportunities for landscape restoration.

### **Resources**

Landowners desiring to undertake ecological restoration projects should make sure they have a firm grasp of effective practices. For example, clearing invasive brush without proper attention to brush re-sprouts, herbaceous weeds, and the need to re-seed cleared areas can actually worsen the problem over time. Chicago Wilderness has developed several policy papers on ecological restoration and management, addressing the following topics: conservation of woodlands, controlled burning, and deer management.

The Illinois Nature Preserves Commission has developed detailed management guidelines for natural area restoration and stewardship, including recommended control techniques for various invasive species.

A good source of information on stream corridor restoration is *Restoring and Managing Stream Greenways: A Landowner's Handbook*.

There also are a number of qualified contractors that can assist in designing and conducting restoration projects. The Land Conservancy identifies local natural area contractors on its website. The Natural Resources Conservation Service provides a more extensive contractor list for northeastern Illinois.

There are a number of financial incentive and grant programs for ecological restoration projects.

### **Local Examples**

**The Land Conservancy:** With the leadership of The Land Conservancy, a consortium of public and private groups has formed Project Quercus to begin replanting oaks throughout the county. This effort brings together residents, schools, and local governments who are engaged in the restoration of shrinking natural ecosystems and in providing a platform for coordinated restoration and environmental education programs in the future.

**The Village of Lakewood:** The Village has established a strong relationship with The Land Conservancy. Greater municipal responsibility for preservation of oak woods during the development process is one of the goals of Project Quercus. Not only does the Village have an excellent tree preservation ordinance that requires the planting of replacement nut-producing native trees like oaks and hickories, but it also sits on the Project Quercus steering committee and was one of the pilot sites for the oak reforestation program. The Village Board passed a resolution to indicate its support for the reforestation program, and its commitment to maintain the trees that were planted on Village property for a period of at least 99 years.

MCCD Wetland Restoration: Careful planning can allow the re-creation of former wetlands in areas where drained hydric soils occur and where no negative impacts to private lands will result. This requires identifying former wetland communities, protecting adequate lands to prevent undesired off site impacts and careful research to determine the ecological criteria necessary for a successful restoration effort. Lost Valley Marsh, in MCCD's Glacial Park site, is one example of such a project. Composed of very poorly drained muck soils, this basin marsh was converted to row crop production about 1940 through the use of subsurface drain tile and conversion of a meandering headwater stream to a drainage ditch. Crop success was sporadic and early spring flooding hampered agricultural field work until late in the season. In 1993, District biologists studied the area to insure no tile lines extended off site and that the local watershed of the marsh would facilitate a return to the site's original hydrology. In 1994, drain tiles were removed from the site, a water control structure was installed on the downstream portion of the drainage ditch and the entire area was replanted in native vegetation. Nearly two decades later, Lost Valley Marsh supports a diverse wet prairie and basin marsh wetland community. It provides an important migratory staging area for shorebirds, waterfowl and wading birds. Since 2006, portions of the eastern whooping crane flock have utilized the marsh in both spring and fall. In this case the impacts to local agricultural interests were minor and with proper planning a rich natural community and important wildlife area was created. The area is popular with regional bird watchers and provides park users with a recreational amenity. Similar wetland restoration work is ongoing at Pleasant Valley Conservation Area.

### **Farmland Protection**

While this Plan is not specifically focused on the protection of farmland, it is recognized that farmland protection can be valuable to the conservation of green infrastructure and water resources. Sustainable farming operations intentionally provide wildlife habitat and natural areas within their land holdings. These areas serve a vital function in maintaining the populations of wildlife such as deer and fowl and as links between larger areas of open space that connect different wildlife populations. Agricultural areas also help protect the county's water supply and can provide recreational opportunities such as bird watching, bicycling, scenic walks and drives, hunting, snowmobiling, horseback riding, and cross-country skiing.

Two programs, operated by the US Department of Agriculture's Natural Resources Conservation Service, are particularly valuable in ensuring the protection of natural resources in agricultural areas. The Conservation Security Program (CSP) provides financial and technical assistance toward the conservation and enhancement of soil, water, air, energy, plant life, and wildlife on private working lands. The Conservation Reserve Program (CRP) is utilized by producers within the county to minimize soil erosion and reduce surface water sedimentation and contamination.

The Environmental Quality Incentives Program (EQIP) is another important program for conservation in agricultural areas. Conducted by the Natural Resources Conservation Service (NRCS), it is a voluntary program that provides financial and technical assistance to agricultural producers through contracts up to a maximum term of ten years in length. These contracts provide financial assistance to help plan and implement conservation practices that address natural resource concerns and for opportunities to improve soil, water, plant, animal, air and related resources on agricultural land and non-industrial private forestland.

### *Recommendations*

- Farmers with property within or nearby the green infrastructure network are encouraged to implement natural resource conservation and restoration programs and seek assistance from initiatives such as the USDA Conservation Security Program, Conservation Reserve Program, and the NRCS Environmental Quality Incentives Program.
  
- The USDA Natural Resources Conservation Service and McHenry County Soil and Water Conservation District are encouraged to continue offering educational programs regarding best soil conservation practices, habitat protection, and improving rural water quality.

□ Farmers are encouraged to apply best management practices to minimize soil disturbance and compaction and to help maintain biodiversity.

#### **Resources**

In an effort to provide farmers with new options for the preservation of family farms, the McHenry County Board established the Agricultural Conservation Easement and Farmland Protection (ACE) Commission in 2006. Its mission is to preserve the agricultural heritage, landscape, and economy of McHenry County through a viable farmland protection program.

## **ADDITIONAL STEPS: Protect Supporting Green Infrastructure**

While this plan is focused primarily on the protection and stewardship of “core” green infrastructure, it is widely acknowledged that actions outside of the geographical boundaries of the mapped network can have substantial consequences – both positive and negative – on these resources. The McHenry County *Green Infrastructure Plan* recognized this by identifying important natural resources that underlie much of the county. These include sensitive aquifer recharge areas (SARA) and hydric soils, both of which are considered “supporting” green infrastructure in this Plan.

**Sensitive Aquifer Recharge Areas (SARA):** Recharge is the process by which precipitation reaches and resupplies the groundwater and also supplies natural baseflows to streams and wetlands. Areas that have conditions that favor rapid recharge are the main areas where the groundwater is replenished. McHenry County has developed the SARA map to depict the relative potential of aquifers within 100 feet of land surface (i.e., shallow groundwater) to become contaminated from pollution sources at or near the ground surface. Areas mapped as SARA comprise roughly 57 percent of the entire county. In late 2012, the County Board adopted the Water Resources Action Plan (WRAP). This plan has extensive recommendations on recharge area protection, with a specific focus on the SARA map.

**Class III Special Resource Groundwater Protection Areas:** The county *Green Infrastructure Plan* also recognizes Class III Special Resource Groundwater Protection Areas as important resource areas deserving special consideration. The Class III is an official designation that applies to demonstrably unique and irreplaceable groundwater sources suitable for application of a water quality standard more stringent than otherwise applicable. It applies to groundwater that is vital for a particularly sensitive ecological system; or groundwater contributing to an officially dedicated Illinois Nature Preserve. Class III areas are mapped as over-lays on the green infrastructure network map. Currently, there are mapped Class III groundwater protection areas in the county for the following natural areas: Elizabeth Lake, Boone Creek Fen, Parker Fen, and Lake in the Hills Fen.

*The SARA map. Image taken from the 2030 Plan. Class III Groundwater Protection Areas in Bull Valley as shown on the Green Infrastructure Map.*

**Hydric Soils:** A hydric soil is one that was formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Most drained hydric soils were formerly wetlands. In total, wetlands and hydric soils, including open water bodies, comprise 30 percent of the county’s land area. Hydric soils provide important stormwater functions, acting as a sponge to temporarily store runoff. Organic soils, a



subset of hydric soils, include peat and muck areas that provide prime opportunities for wetland restoration.

*Hydric Soils and Wetlands map from the 2030 Plan.*

### *Recommendations*

- The Village should prohibit intensive uses with high-impervious surface areas or high-pollution potential, such as shopping centers, office/research/industrial facilities, and high-density housing developments, in sensitive aquifers recharge areas, including areas identified on the SARA map.
- The Village and land developers should minimize impervious area coverage and maximize implementation of conservation design practices in sensitive aquifer recharge areas, including areas identified on the SARA map.
- The Village should protect Class III Special Resource Groundwater Protection Areas from inappropriate development. In particular, strictly control land use and development in such areas via the following measures:
  - Preserve natural open space, including sensitive natural areas.
  - Avoid commercial and high-density residential uses.
  - Protect groundwater recharge functions to the maximum extent practicable.
  - Minimize wastewater impacts by utilizing innovative technologies that maximize the filtering of discharged wastewater.
- The county and the should investigate the designation of other potential Class III Resource Groundwater Protection Areas in McHenry County.
- On sites that contain hydric soils, the Village and land developers should minimize development activities in hydric soil zones.
- The Village should adopt and implement relevant policies and strategies of the McHenry County Water Resources Action Plan.

## **ADDITIONAL STEPS: Green Infrastructure at a Local Scale**

Another important green infrastructure consideration is the opportunity to work with residents, landowners, and businesses – at a very local scale – to incorporate green infrastructure practices in yards, subdivisions, businesses, and school grounds. Such practices can provide water quality, flood reduction, groundwater recharge, and local habitat benefits. These green infrastructure designs also can be applied by developers at a neighborhood scale, as described previously under the topic of conservation development, or low impact development (LID).

Recommended local green infrastructure best management practices (BMPs) include:

- permeable paving instead of conventional asphalt or concrete
- green roofs
- rain barrels
- bioswales and rain gardens in lieu of costly storm sewers
- natural landscaping instead of conventional turf grass

- naturalized detention basins designed to resemble wetlands and natural lakes

**Permeable paving:** Permeable paver systems, or porous concrete or asphalt, are paving systems with spaces that allow water to move through the driving surface rather than running off. Runoff is temporarily stored in the underlying stone base for infiltration into the soil and/or slow release to the storm drain system. Common applications for permeable paving include parking lots and driveways.

*Diagram of permeable paving.*

**Green roofs:** Green roofs are vegetated roof systems designed to retain and slow rainwater runoff from the tops of buildings. Green roofs are commonly planted with drought and wind tolerant vegetation.

**Rain barrels:** A rain barrel collects and stores rainwater from a roof that would otherwise be lost to runoff and diverted to storm drains and streams. Often a rain barrel is composed of a 55 gallon drum that sits conveniently under a residential gutter down spout. Like cisterns, water stored in rain barrels can be used to irrigate lawns, gardens, and potted plants.

**Bioswales and rain gardens:** Bioswales and rain gardens are vegetated swale systems that have an infiltration trench designed to retain and store stormwater. Bioswales and rain gardens are planted with native grasses and wildflowers that enhance filtration, cooling, and cleansing of water.

*Photos of parking lot bioswale and a rain garden.*

**Natural landscaping:** This refers to the use of native prairie and wetland grasses, flowers, and shrubs instead of conventional turf grass. Typical applications range from large corporate, residential, or institutional open space areas to small residential gardening projects. Native landscaping is often a component of other BMPs, such as detention basins, filter strips, bioswales, and rain gardens.

*Entrance to the Sanctuary of Bull Valley featuring natural landscaping.*

**Naturalized detention basins:** Naturalized basins utilize native wetland and prairie vegetation in basin bottoms, shorelines, and side slopes. They improve water quality, discourage nuisance Canada goose populations, and provide habitat benefits. Naturalizing also may be done as a retrofit to improve water quality functions, reduce shoreline erosion, and lower maintenance costs of existing basins.

*A naturalized detention basin at Montgomery Village Hall.*

### *Recommendations*

- The Village, through its ordinances and programs, should promote the infiltration of clean runoff in developed areas utilizing techniques such as bioswales, filter strips, permeable paving, and natural landscaping.
- The Village should amend its zoning, subdivision, and landscaping ordinances to allow or encourage green infrastructure BMPs for new development and redevelopment.
- The Village should collaborate with the county and other municipalities in the development of a comprehensive groundwater protection ordinance, which may include zoning and subdivision provisions, for recharge area and wellhead protection.



□ The Village should identify and implement measures that will provide financial incentives for green infrastructure BMPs. For example, providing credit for stormwater storage under permeable paving can reduce detention requirements and storm sewer sizing, thereby lowering development costs.

### **Resources**

As an extension of its homeowner education and watershed protection efforts, The Conservation Foundation formed the Conservation@Home program to encourage and recognize property owners that protect and/or create yards that are environmentally friendly and conserve water.

An excellent resource for conservation development best management practices is Conservation Development in Practice a document produced by Chicago Wilderness.

### **Implementation Opportunities for the County**

Making a village-wide green infrastructure network a reality will be dependent upon the cooperation and collaboration with of the county, adjacent municipalities, Crystal Lake and Huntley Park Districts, land conservation agencies, developers, and residents. This plan has identified recommendations that can be implemented by each of these entities. However, as the creator of this plan, the Village has a responsibility to take a leadership role in its implementation.

The first step is to continue to lead by example. One of the most important challenges will be the evaluation and updating of the Village's subdivision and subdivision codes to encourage or require green infrastructure designs for new development and redevelopment. A related challenge is to develop and adopt a conservation development ordinance, building on the successful efforts of the county and several neighboring municipalities.

The next step is to organize the effort. The success of this plan will depend upon its subsequent acceptance and adoption, either in whole or in part, by as many related government agencies (e.g., park districts), developers, and citizens as possible. This will entail efforts by the Village to promote the plan and educate residents on its goals and concepts. Furthermore, the Village should collaborate with other local governments that developed their own green infrastructure plans, namely McHenry County, Crystal Lake, and Woodstock, to discuss challenges and successes.

## **REFERENCES & RESOURCES**

A number of resources are available which provide additional information relative to green infrastructure. Many of these include specific guidelines and directions for utilizing green infrastructure techniques and achieving improved environmental resource protection. These include:

*Sustainable Development Principles*

[http://www.chicagowilderness.org/pdf/Sustainable\\_Development\\_Principles.pdf](http://www.chicagowilderness.org/pdf/Sustainable_Development_Principles.pdf) .

*The Better Site Design Handbook*

The Center for Watershed Protection

[http://www.cwp.org/Resource\\_Library/Better\\_Site\\_Design/](http://www.cwp.org/Resource_Library/Better_Site_Design/).

*Protecting Nature in Your Community* guidebook

[http://www.chicagowilderness.org/sustainable/biodiversity\\_community.php](http://www.chicagowilderness.org/sustainable/biodiversity_community.php) .

“Building Sustainable Communities” fact sheets

[http://www.chicagowilderness.org/sustainable/development\\_guidebook.php](http://www.chicagowilderness.org/sustainable/development_guidebook.php) .

*Conservation Development in Practice*, The Nature Conservancy and Chicago Wilderness

[http://www.chicagowilderness.org/sustainable/conservation\\_dev\\_practice.php](http://www.chicagowilderness.org/sustainable/conservation_dev_practice.php) .

*Banking on Green: A Look at How Green Infrastructure Can Save Municipalities Money and Provide Economic Benefits Community-wide*. A Joint Report by American Rivers, the Water Environment Federation, the American Society of Landscape Architects, and ECONorthwest.

[http://actrees.org/site/resources/research/banking\\_on\\_green\\_a\\_look\\_at\\_how\\_green\\_infrastr.php](http://actrees.org/site/resources/research/banking_on_green_a_look_at_how_green_infrastr.php)

*The Green Streets Municipal Handbook*, U. S. Environmental Protection Agency. 2008.

[http://www.epa.gov/npdes/pubs/gi\\_munichandbook\\_green\\_streets.pdf](http://www.epa.gov/npdes/pubs/gi_munichandbook_green_streets.pdf)

A more detailed discussion of conservation design ordinance considerations, including subdivision and zoning codes, can be found in the following items:

*Conservation Design Resource Manual*

[http://www.chicagowilderness.org/sustainable/conservationdesign/Manual/Conservation\\_DesignResource\\_Manual.pdf](http://www.chicagowilderness.org/sustainable/conservationdesign/Manual/Conservation_DesignResource_Manual.pdf) .

*Conservation Development in Practice*

<http://www.chicagowilderness.org/index.php/what-we-do/protecting-green-infrastructure/epdd-resources/>

Links to the conservation development ordinances of Woodstock, McHenry County, Algonquin, and Crystal Lake follow:

<http://www.woodstockil.gov/vertical/Sites/%7B7B45EC48-D164-43E3-ACA3-CC6ED948AFB%7D/uploads/%7BFC05A7EF-B519-4E91-A597-53A7ABAF7E7%7D.PDF>

<http://www.co.mchenry.il.us/departments/planninganddevelopment/Documents/Ordinances/Conservation%20Design%20Addendum.pdf>

[http://www.algonquin.org/egov/docs/1317742754\\_727294.pdf](http://www.algonquin.org/egov/docs/1317742754_727294.pdf)

<http://www.crystallake.org/Modules/ShowDocument.aspx?documentid=3731>

Greenway and trail resources can be found at:

*The Northeastern Illinois Regional Greenways and Trails Plan*, developed by CMAP which provides assistance to local governments on planning and implementing local greenways  
<http://www.cmap.illinois.gov/bike-ped/greenways-and-trails>

*IDNR's Illinois Trail Grant Programs* (trail planning advice and financial assistance)  
<http://dnr.state.il.us/ocd/newtrail2.htm> .

Nationally there are several references on retrofitting techniques from organizations such as

Center for Watershed Protection  
[http://www.cwp.org/documents/cat\\_view/68-urban-subwatershed-restoration-manual-series/89-manual-3-urban-stormwater-retrofit-practices-manual.html](http://www.cwp.org/documents/cat_view/68-urban-subwatershed-restoration-manual-series/89-manual-3-urban-stormwater-retrofit-practices-manual.html) ).

Illinois Environmental Protection Agency  
Section 319 of the Clean Water Act provides funds for nonpoint source pollution control projects  
<http://www.epa.state.il.us/water/financial-assistance/non-point.html>.

The Illinois Green Infrastructure Grant (IGIG) program provides funding for green infrastructure practices to control stormwater runoff to improve water quality  
<http://www.epa.state.il.us/water/financial-assistance/igig.html>.

Communities and land owners engaging in ecological restoration projects should have a firm grasp of effective practices. Chicago Wilderness has developed several papers on ecological restoration and management, including:

Conservation of woodlands  
[http://chicagowilderness.org/members/downloads/General/CW\\_WoodlandHealthFinal20031125.pdf](http://chicagowilderness.org/members/downloads/General/CW_WoodlandHealthFinal20031125.pdf)

Controlled burning  
[http://chicagowilderness.org/members/downloads/General/CW\\_ControlledBurnFinal20031125.pdf](http://chicagowilderness.org/members/downloads/General/CW_ControlledBurnFinal20031125.pdf)

The Illinois Nature Preserves Commission also has a number of valuable publications for natural area restoration and stewardship, including recommended control techniques for various invasive species, which can be found at

Management guidelines  
[http://dnr.state.il.us/INPC/Management\\_guidelines.htm](http://dnr.state.il.us/INPC/Management_guidelines.htm).

Restoring and Managing Stream Greenways: A Landowner's Handbook:  
[http://www.chicagowilderness.org/sustainable/water\\_greenways.php](http://www.chicagowilderness.org/sustainable/water_greenways.php)

There are also several qualified contractors that can assist in designing and conducting restoration projects. The Land Conservancy identifies local natural area contractors on its website:

<http://www.conservemc.org/resources/contractors.html>.

The Natural Resources Conservation Service. There are a number of financial incentive and grant programs for ecological restoration projects. A comprehensive summary of grants for conservation projects can be found at:

[http://www.will-scookswcd.org/images/schema/resource/pdf\\_27.pdf](http://www.will-scookswcd.org/images/schema/resource/pdf_27.pdf)

There is a large amount of resources for conservation design and green infrastructure techniques. Applicable sources and links include.

*Conservation at Home*: <http://www.theconservationfoundation.org/conservation--home.html>

*Conservation Development in Practice*:

[http://www.chicagowilderness.org/sustainable/conservation\\_dev\\_practice.php](http://www.chicagowilderness.org/sustainable/conservation_dev_practice.php)

*Restoring and Managing Stream Greenways: A Landowner's Handbook*:  
[http://www.chicagowilderness.org/sustainable/water\\_greenways.php](http://www.chicagowilderness.org/sustainable/water_greenways.php)

*Protecting Nature in Your Community*:  
[http://www.chicagowilderness.org/sustainable/biodiversity\\_community.php](http://www.chicagowilderness.org/sustainable/biodiversity_community.php)

Source Book on Natural Landscaping for Local Officials:  
[http://www.chicagowilderness.org/sustainable/landscaping\\_sourcebook.php](http://www.chicagowilderness.org/sustainable/landscaping_sourcebook.php)

*Conservation Development in Practice*, The Nature Conservancy and Chicago Wilderness, 2004.  
[http://www.chicagowilderness.org/sustainable/conservation\\_dev\\_practice.php](http://www.chicagowilderness.org/sustainable/conservation_dev_practice.php)

*Ecological Planning and Design Directory*, Chicago Wilderness,  
[http://www.chicagowilderness.org/sustainable/directory\\_documents.php](http://www.chicagowilderness.org/sustainable/directory_documents.php)

Grand Illinois Trail, Openlands, <http://openlands.org/greenways/projects/biking-trails/the-grand-illinois-trail.html>

*Grant Information Summary for Conservation Projects in Illinois*, U.S. Department of Agriculture, Natural Resources Conservation Service, 2008.  
[http://www.will-scookswcd.org/images/schema/resource/pdf\\_27.pdf](http://www.will-scookswcd.org/images/schema/resource/pdf_27.pdf)

*Green Infrastructure: Linking Landscapes and Communities*, Benedict, M. A. and E.T. McMahon, The Conservation Fund, Washington, DC, 2006.

*Green Infrastructure Vision*, Northeastern Illinois Planning Commission and Chicago Wilderness, 2004.  
[http://www.cmap.illinois.gov/uploadedFiles/archives/nipc/environment/sustainable/Green\\_Infrastructure\\_Vision\\_Final\\_Report.pdf](http://www.cmap.illinois.gov/uploadedFiles/archives/nipc/environment/sustainable/Green_Infrastructure_Vision_Final_Report.pdf).

*Northeastern Illinois Regional Greenways and Trails Plan*, Chicago Metropolitan Agency for Planning, 2009, <http://www.cmap.illinois.gov/bike-ped/greenways-and-trails>

*Protecting Nature in Your Community*, Navota, J. and D. Dreher, Northeastern Illinois Planning Commission, 2000.

*Managing Wet Weather with Green Infrastructure*, U.S. Environmental Protection Agency,  
[http://cfpub.epa.gov/npdes/home.cfm?program\\_id=298](http://cfpub.epa.gov/npdes/home.cfm?program_id=298)

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