CHICAGO WILDERNESS GREEN INFRASTRUCTURE VISION: CHALLENGES AND OPPORTUNITIES FOR THE BUILT ENVIRONMENT

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INTRODUCTION

The Chicago Wilderness Biodiversity Recovery Plan has won state and national awards for its farsighted approach to regional biodiversity protection. Inspired by Daniel Burnham's Plan of Chicago, the Green Infrastructure Vision takes a step beyond the Recovery Plan by mapping an on-the-ground vision of what could and should be protected in the regional landscape. This Green Infrastructure Vision (GIV) identifies 1.8 million acres of macro-scale resource protection areas that span a region that includes southeastern Wisconsin, northeastern Illinois, and northwestern Indiana. This ambitious vision will require an integrated array of land protection techniques, including acquisition, conservation easements, greenway connections, restoration, and conservation development. Its implementation is being pursued at a range of spatial scales, including regional comprehensive plans, county and municipal plans and ordinances, and at the neighborhood and individual development level. The Vision presents unique opportunities and challenges for both the development community and local governments as progressive new approaches to sustainable land use and conservation development are considered and implemented.

HISTORY AND PURPOSE OF THE GREEN INFRASTRUCTURE VISION

Chicago Wilderness is a unique collaboration of over 240 conservation agencies and organizations in a three-state region wrapping around the southern end of Lake Michigan. Its mission, broadly stated, is to protect nature and enrich quality of life in a region that ranges from intensely urban to rural and agricultural.

The core principles of Chicago Wilderness are written into its Biodiversity Recovery Plan (Chicago Region Biodiversity Council 1999). The Biodiversity Recovery Plan begins with this vision statement:

> *Imagine a region...filled with life...*
>
> *Where the evening air is rich with bird calls and the scent of flowers...*
>
> *Where children splash and play in clean creeks, and peer below the surface of the water at fish and other aquatic creatures...*
>
> *Where people learn to gently and respectfully enter back into a positive relationship with the nature that surrounds them...*
>
> *And where rare plants, animals, and natural communities are nurtured back to health and offered a permanent home next to our own—to the benefit of our health and our economy—in preserves large enough to sustain them forever.*

FIGURE 1. County forest preserves and local park districts maintain an extensive, inter-connected trail system.

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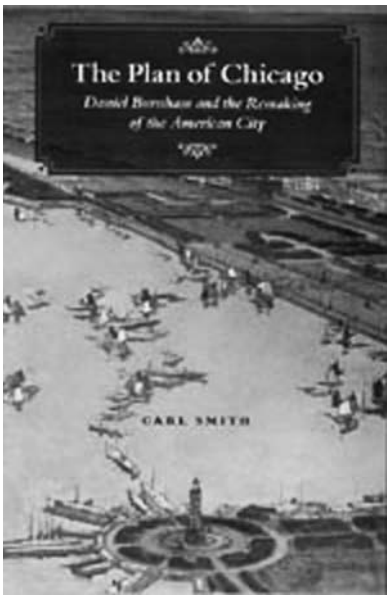
The Biodiversity Recovery Plan contains an ambitious and far-ranging series of recommendations to achieve this vision through protecting, restoring, and managing highly valued natural areas. It also lays the framework for more sustainable development in a metropolitan area that is predicted to grow substantially in the coming decades. Recognizing its unique collaborative approach to regional conservation, the American Planning Association honored the Plan in 2001 with its Outstanding Planning Award for demonstrating how metropolitan regions can address protection of natural heritage and biological diversity when planning for future growth and development. This plan, said the awards jury, "opens up a new area of planning for the natural and built environments."

Several years after the adoption of the BRP, Chicago Wilderness leaders were approached by a civic group called Chicago Metropolis 2020. Metropolis 2020, a nonprofit organization created by the business-led Commercial Club of Chicago, desired to create a "conservation" scenario in its development of a new land use plan for the Chicago region. Chicago Wilderness agreed to participate, thereby planting the seeds for a new "green infrastructure vision" for the region.

The principles of Chicago Wilderness can be traced back 100 years to Daniel Burnham and Edward Bennett who collaborated in 1909 with the Commercial Club of Chicago and others to create a new plan for the greater Chicago region. Celebrating the 100-year anniversary of The Plan of Chicago, regional leaders and planners are looking back and appreciating the big dreams that led to Chicago's sweeping lakefront, the "emerald necklace" of County Forest Preserves, and a tradition of thinking comprehensively about the region's development, always looking to the future. Some have called the Green Infrastructure Vision "the Burnham Plan for the next century." The Green Infrastructure Vision and The Plan of Chicago both recognize the need to act boldly to make the Chicago region one of the best places to live and work. They also share a focus on the physical environment with an emphasis on open space, natural beauty, and centers of community and recreation for the benefit of all the region's residents.

The central purpose of the Green Infrastructure Vision was to move beyond the Biodiversity Recovery Plan by creating a regional-scale map that identifies on-the-ground opportunities for biodiversity conservation. More specifically, the Green Infrastructure Vision (GIV) reflects both existing green infrastructure—forest preserve holdings, state parks, and designated natural areas—as well as opportunities for expansion, restoration, and connection.

FIGURE 2. The 1909 Plan of Chicago



The mapping of green infrastructure through a series of connected large "resource protection areas" was clearly not intended to suggest precise plans for acquisition or restoration areas. However, it was thought that this mapping could stimulate the many ongoing local conservation efforts at the community and watershed scale by offering the implicit support of the Chicago Wilderness for regional and local conservation actions.

DEFINING GREEN INFRASTRUCTURE

Green infrastructure has a range of accepted definitions. One definition is landscape-based and is endorsed by national conservation groups like The Conservation Fund. In this context, green infrastructure is "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." The foundation of green infrastructure networks consists of 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 (The Conservation Fund 2006).

The Green Infrastructure Vision embraced a similar approach in arriving at its biodiversity-based definition.

> *"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."*

Other definitions of green infrastructure focus on nature-based alternatives to conventional 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, that use soils and vegetation to infiltrate, evapotranspirate, and/or recycle stormwater runoff. 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.

As will be discussed below, achieving the Green Infrastructure Vision will require an integrated approach that emphasizes not only sustainable land use and open space protection but also innovative, green technology to better protect water and other natural resources.

FIGURE 3. Oak savanna, on one of the major pre-settlement natural landscape communities of the Chicago region.

GREEN INFRASTRUCTURE VISION PROJECT RESULTS

The Green Infrastructure Vision produced three principal products:

1. A three-state, regional *map* that identified macro-scale opportunities for biodiversity protection and restoration. These opportunities were mapped as recommended "resource protection areas."
2. Recommendations for specific *protection techniques* for each resource protection area, including: acquisition, conservation easements, restoration, greenway connection, and conservation development.
3. Simple *guidelines for conservation development,* recognizing that urban/suburban development inevitably will occur in or adjacent to many of the recommended resource protection areas.

One of the first considerations in developing the GIV was the determination of appropriate study boundaries. The recommended boundaries followed "bio-geographic" (versus "political") considerations. The "political" boundaries previously recognized by Chicago Wilderness generally followed the six-county northeastern Illinois region, and extended only minimally into Wisconsin and Indiana. The recommended "bio-geographic" boundaries, in contrast, extended several counties into Wisconsin and Indiana, following watersheds and related natural features rather than political lines.

The maps and specific recommendations of the GIV were developed through a series of workshops conducted throughout the three-state region. For each of the workshops, appropriate representatives of Chicago Wilderness member organizations (e.g., those with a good knowledge of on-the-ground biodiversity resources) were invited to participate. In total, approximately 80 individuals were involved.

The workshop methodology utilized very large maps developed using geographic information system (GIS) databases. Natural resource data layers included wetlands, floodplains, streams, rivers, lakes, woodlands, grasslands, natural areas, watersheds, publicly owned natural lands, major roads, and county boundaries, as well as those specific GIS coverages available in individual states that added useful knowledge.

Based on this information, the workshop participants identified biodiversity protection and restoration opportunities, at the macro scale, consistent with the recommendations of the Biodiversity Recovery Plan. In particular, high priority was given to identifying and preserving important but unprotected natural communities, especially those threatened by development, and to protecting areas that can function as large blocks of natural habitat through restoration and management. More specifically, the GIV mapping recommendations emphasized:

1. Creation of large preserves.
2. Creation of ecological community mosaics. In particular, an emphasis was placed on assemblages of wetlands, prairies, savannas, and woodlands.
3. Protection of priority areas, especially remaining high-quality sites. Many of these areas have been identified in state and local natural area inventories.
4. Protection of any large sites with some remnant communities.
5. Protection of land that connects or expands existing natural areas, including agricultural lands.

In this macro-scale context, the resultant recommendations for resource protection areas focused on landscape complexes and corridors of at least 500–1000 acres.

Based on the workshop process described above, recommended resource protection areas were identified in a broad swath extending from southeast Wisconsin, through northeastern Illinois and encompassing northwest Indiana. The GIV for the whole region is shown in Figure 5. In total, over 140 recommended resource protection areas totaling over 1.8 million acres were identified and mapped within the broader

FIGURE 4. Indiana Dunes National Lakeshore, one of the region's signature landscapes. Photo courtesy of John Rogner, U.S. Fish & Wildlife Service

FIGURE 5. The three-state Green Infrastructure Vision, comprising 1.8 million acres of recommended resource protection areas.

6+ million acre "Chicago Wilderness" assessment area. It is notable that over 360,000 acres of protected "natural" public lands currently exist within this region.

Maps of the GIV for the entire Chicago Wilderness region as well as for the individual states may be found at the following links:

Entire region:

http://www.nipc.cog.il.us/green_vision/RRPA_FINAL_Chicago.pdf;

Northeastern Illinois:

http://www.nipc.cog.il.us/green_vision/IL_RRPA_FINAL_Chicago.pdf,

Northwestern Indiana:

http://www.nipc.cog.il.us/green_vision/IN_RRPA_FINAL_Chicago.pdf

Southeastern Wisconsin:

http://www.nipc.cog.il.us/green_vision/WI_RRPA_FINAL_Chicago.pdf

For each of the identified resource protection areas, special natural features were identified. Also identified were recommended conservation approaches, including: acquisition, conservation easements, greenway connections, and restoration. Recommendations also were made regarding appropriate development within resource protection areas, ranging from no new development to limited conservation development. These conservation techniques are described in more detail below, and specific recommendations for each resource protection area are detailed in the full report.

To give some flavor for the types of resource protection areas identified, and the recommended conservation strategies, several representative areas are summarized below.

Kettle Moraine, Southern Unit—Walworth, Jefferson, and Waukesha Counties, Wisconsin

At over 30,000 acres, this recommended resource protection area contains one of the largest public open spaces in the Chicago Wilderness region. Kettle Moraine is a designated Wisconsin State Legacy Place containing a remarkable variety of large woodland, savanna, prairie, and wetland habitats. It contains numerous designated natural areas, critical species habitat sites, and hosts several ongoing large-scale restoration efforts. The recommended conservation approaches include additional acquisition, conservation easements, continued restoration, and implementation of conservation development approaches for any development happening around the periphery of the protected public lands.

Boone Creek Complex—McHenry County, Illinois

This recommended resource protection area is largely private land, but contains some of the most biodiverse landscapes in northeastern Illinois. It contains a large woodland/savanna complex, high quality fens and sedge meadows, and a high quality cold-water stream with silt intolerant fish. While there has been some recent public acquisition of natural lands, this area is unique for its high concentration of conservation easements and dedicated nature preserves on private land. The recommended conservation approaches include additional acquisition and conservation easements, wetland restoration in large drained hydric soil zones, and identification and protection of ground water recharge zones for fens and sedge meadows. Recommended

FIGURE 6. An oak savanna and wetland complex in the Boone Creek watershed.

development controls call for low intensity, conservation-designed residential development only, with no development in hydric soil zones. These recommendations are being promoted through a recently adopted watershed plan.

Lake Calumet Region—Cook County, Illinois

This recommended resource protection area contains a complex mix of natural areas hosting threatened and endangered species, highly degraded habitats, and adjacent industrial land in the midst of a large urban complex. It has been the subject of a comprehensive, long-term planning process spearheaded by the City of Chicago and other Chicago Wilderness members. Conservation recommendations emphasize wetland and prairie restoration, greenway connections along the Calumet and Grand Calumet Rivers and to Wolf Lake, and additional public land acquisition. The recommendations also call for industrial redevelopment utilizing conservation design approaches that fully mitigate hydrologic and water quality impacts.

Kankakee River/LaSalle Fish and Wildlife Area—Western Lake and Newton Counties, Indiana

This is one of numerous identified sections of the Kankakee River corridor that cumulatively form the southern boundary of the Chicago Wilderness region. This largely rural area contains numerous sensitive species sites and threatened or endangered species within its river corridor, wetland, prairie, savanna, and floodplain forest communities. Recommended conservation approaches include additional public land acquisition, conservation easements, restoration, and greenway connections to the Kankakee Sands complex and to upstream and downstream reaches of the river.

GREEN INFRASTRUCTURE VISION RECOMMENDATIONS

As noted above, protection techniques were recommended for each of the identified resource protection areas. At the core of this approach is the understanding that traditional land acquisition alone will be insufficient to achieve the goals of the vision. The Chicago Wilderness region has historically been very supportive of open space protection. In the last 10+ years, voters in northeastern Illinois alone have supported referenda totaling over 1.3 billion dollars to purchase natural land. However, achieving protection for an additional 1.4 million acres—on top of the 360,000 acres already protected—is probably beyond the means of local open space agencies.

Therefore, a comprehensive menu of resource protection techniques was identified. These techniques start with the belief that the most important regional strategy for achieving the GIV is to promote compact and contiguous land use patterns for newly forecasted development. This is in sharp contrast to the "sprawl" development patterns that have consumed large amounts of open land in recent decades.

Specific protection techniques for resource protection areas are described briefly below.

Acquisition: The primary protectors of natural open space in the region are county forest preserve and conservation districts and state agencies. To a lesser extent, federal agencies and local park districts have participated in natural area protection. Many of these agencies have developed strategic plans for future open space protection and these plans are generally reflected in the GIV.

Conservation easements: Private landowners control many high quality natural areas in the region. There has been a growing trend to set aside these lands within permanently protected conservation easements. Cumulatively, such protection—especially when coordinated with public open space protection—can be a key element of this regional vision.

Conservation development: Recognizing that development will continue to occur within many of the recommended resource protection areas, recommendations were developed for "conservation development" techniques that would be compatible with biodiversity protection and restoration. These are based on the premise that, in order to be truly sustainable, development must not only protect the natural environment but must improve systems degraded by past disturbances. Subsequent to the development of the GIV, Chicago Wilderness developed a guidebook,

Conservation Development in Practice,* to describe a series of practical conservation design practices for the region.

Greenway connections: There are a number of opportunities to preserve local connections between natural areas and protected open space. These include rail corridors, greenways within conservation developments, and stream buffers on private land, among others.

Landscape retrofitting: Many of the recommended resource protection areas are largely surrounded by development. In these areas, there are opportunities to enhance the integrity of the core natural area by retrofitting the developed landscapes. Specific techniques include rain gardens, natural landscaping, green roofs, permeable paving, and bioswales.

Ecological restoration: Throughout the Chicago Wilderness region there is a need for ecological restoration and long-term stewardship. Virtually every identified resource protection area will benefit from these practices.

Farmland protection: While agricultural activities have historically degraded much of the natural landscape in this region, it is arguable that agricultural lands retain more natural "integrity" than built landscapes. This is particularly true as it relates to preserving historical hydrology and water quality, which is critical to maintaining high quality stream and wetland resources. Farmed landscapes also have been identified as critical habitats for certain bird species, such as the endangered Swainson's hawk. Therefore, farmland preservation may be the best option for biodiversity conservation in many areas of the region and also offers a viable economic option to the premature conversion of land for suburban development.

*Conservation Development can be downloaded using the link: http://www.cmap.illinois.gov/template.aspx?id=326&LangType=1033&terms=conservation+development+in+practice It's also available from the Chicago Metropolitan Agency for Planning, Chicago, IL. 312/454-0400.

IMPLEMENTING THE VISION AT MULTIPLE SPATIAL SCALES

Beyond the specific protection techniques, there is a clear recognition that implementation of the GIV must occur at multiple spatial scales, ranging from regional to local. The following approaches have been identified in the evolving work plan for implementation of the GIV.

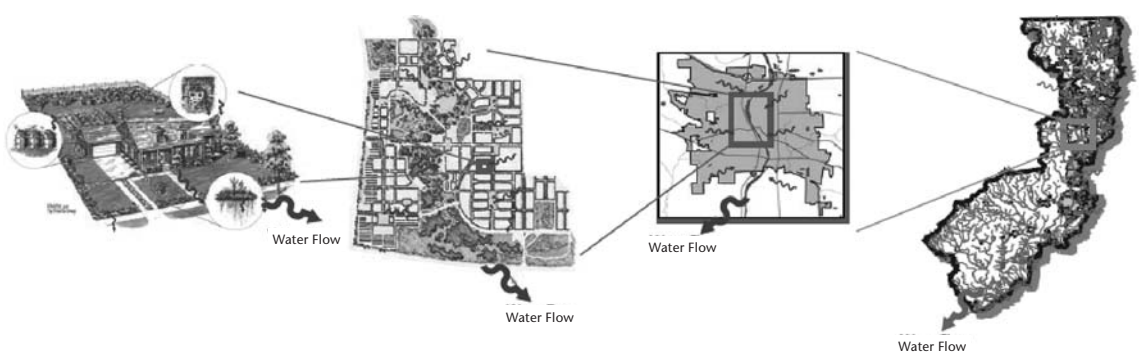
Regional

Chicago Wilderness is engaging the area's regional planning commissions to incorporate the GIV into new regional land use plans. Currently, coordination is occurring with the seven-county Chicago Metropolitan Agency for Planning and the three-county Northwestern Indiana Regional Planning Commission.

Community

At the community level, efforts are being made to incorporate the GIV maps and recommendations

FIGURE 7. Implementing the Green Infrastructure Vision at multiple spatial scales.



into municipal, county, and park district land use plans. In particular, the GIV can be used to shape land use and zoning maps and provide a framework for more sustainable subdivision and landscaping codes and conservation design ordinances. The GIV also can influence land acquisition priorities of local park and open space agencies.

Neighborhood

Neighborhoods, both existing and new, can be transformed to incorporate conservation design principles. Specifically, neighborhood design can incorporate open space protection, natural landscaping, and stormwater best management practices to preserve biodiversity and natural resource functions. This approach also brings nature closer to families and children and addresses the growing concerns over "nature deficit disorder."

Sites

Small sites, including residential yards, school grounds, and parks can incorporate habitat for native species through rain gardens and natural landscaping.

While the GIV focuses primarily on the 1.8 million acres within resource protection areas, it also addresses concerns related to projected new development within the remainder of the region. Beyond the resource protection areas, the GIV targets development within watershed of high quality streams or lakes and all other development in the region.

To address possible development within the recommended resource protection areas specific recommendations were made regarding whether and how development should be accommodated. Where conservation development is the recommendation, the principles and techniques outlined above were advised for implementation to the fullest extent practicable. In particular, development should be designed and tailored to the specific natural resource characteristics of the identified resource protection area.

For development within watersheds of high quality streams or lakes it was recommended that it be done following stringent conservation development principles. While all of the listed conservation development principles are important, several were emphasized in the protection of high quality aquatic systems. In particular, site design and stormwater management should be done in a manner that maximizes both natural recharge of rainfall and runoff and effective filtering of runoff pollutants. Construction site soil erosion and sediment control also are critical. Sustainable, alternative wastewater planning and treatment/discharge approaches, such as land application of treated wastewater, were prescribed for protecting high quality aquatic ecosystems. Protection and restoration of extensive naturally vegetated buffers of at least 100 feet along the periphery of stream, lake, and wetland edges also was recommended.

Throughout the broader Chicago Wilderness region, in urban, suburban, and rural edge settings, broad recommendations were made for conservation development. Depending on the intended land use and site characteristics and constraints, all developments were recommended to incorporate conservation design elements that are selectively tailored to each individual property.

A REGIONAL FRAMEWORK: CHICAGO WILDERNESS SUSTAINABLE DEVELOPMENT PRINCIPLES

During the course of the GIV project, Chicago Wilderness members embarked on a parallel project to identify broad sustainable development principles for the entire region. Modeled after similar efforts in places like the Chesapeake Bay region, Chicago Wilderness convened a regional roundtable of developers, local government officials, and conservation organizations. Their task was to develop a mutually agreeable set of principles that would guide sustainable development in the region. More specifically, these principles must be:

- Practical and cost effective for developers to implement;
- Consistent with local government standards for orderly and thriving communities;
- Protective of sensitive environmental resources and habitats.

This process led to the development of the *Sustainable Development Principles for Protecting Nature in the Chicago Wilderness Region* (Chicago Wilderness 2004).

1. Encourage development that is compact and contiguous to existing community infrastructure and

promote infill development and redevelopment where transportation facilities and utilities already exist.
2. Locate and plan new development in ways that protect natural resources and habitat and provide buffers between sensitive natural areas and intensive use areas.
3. Use the development process to enhance and restore streams, wetlands, and lakes, and to enhance their potential as recreational and aesthetic amenities.
4. Preserve permanent open space and greenway connections as an integral part of new development to both protect critical natural areas and to provide opportunities for recreation and environmental education.
5. Recognize the value of water as a resource and manage it to protect downstream waterbodies and wetlands, prevent increased flooding, preserve groundwater resources, and maintain natural hydrology.
6. Minimize changes to natural topography, soils, and vegetation to preserve land, water, and soil relationships that are essential for sustaining plant and animal habitat. Where sites have been previously altered, attempt to restore natural conditions to the extent possible.
7. Establish procedures that assure the ongoing ecological management of natural areas within developments as part of an overall strategy for achieving sustainability.
8. Design development to achieve the broader sustainability of human and natural communities, including the social and economic dimensions of sustainability.

CHALLENGES AND OPPORTUNITIES FOR THE DEVELOPMENT COMMUNITY

The Chicago Wilderness GIV and its sustainable development principles provide both challenges and opportunities for the region's development community. On the one hand, the recommended sustainability principles provide a framework for alternative land use and development patterns that could lead to healthier, more flexible, and more cost-effective development. On the other hand, some developers may not be comfortable with land use and development approaches that change, to varying degrees, the very product that they market to their customers and clients. For purposes of clarity, it is useful to separate this discussion into issues of sustainable land use and conservation-based land development.

Sustainable Land Use

Municipal and county land use and zoning codes throughout the Chicago land region have, over time, required larger and larger lot sizes for residential development. Codes also typically segregate land uses, requiring clear separations between residential and commercial uses and commonly segregating residential densities as well. Consequences of such land use patterns, according to some planners and those who espouse a "smart growth" or "new urbanist" viewpoint, include:

- inefficient use of land (i.e., sprawl);
- higher costs of transportation, infrastructure, and associated property taxes;
- higher travel times;
- loss of community identity, farmland, open space, and natural resources.

An alternative view calls for more compact, mixed-use communities that take advantage of existing roads and infrastructure. Modeled after older urban and inner suburban communities, new urbanist communities are more walkable and interconnected, and they provide a clear alternative to more conventional suburban residential development patterns.

The National Association of Home Builders (NAHB), while it opposes top-down regulations and growth boundaries, generally favors community-based smart growth principles. In particular, in its Smart Growth Policy Statement the NAHB supports using land more efficiently by allowing higher density development and innovative land use policies and encouraging mixed-use and pedestrian-friendly developments with access to open space and mass transit (NAHB 2007). It also supports revitalizing older suburban and inner-city markets and encouraging infill development.

Conservation-Based Land Development

Conservation development employs a combination of creative land planning and innovative stormwater management practices to protect water and natural

resources, preserve open space, and enhance wildlife habitat. Conservation development starts with a thorough review of a development site to evaluate potential construction constraints, such as wetlands, streams, woodlands, and steep slopes. But where the traditional land planning process may search for ways to minimize and build through these natural areas, a 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. The results are less land grading and associated infrastructure construction, and more functional open space. Preserved open spaces often are enhanced with trail systems that connect to adjacent developments with public trails and open spaces.

Sustainable water management is another key element of conservation development. To counter concerns about groundwater supplies, water quality, and flooding, conservation design provides the tools to put clean water back into the ground rather than flushing it offsite in storm sewers and wastewater pipes. These tools include:

- "Bioswales" in lieu of costly storm sewers.
- Natural landscaping—the use of native prairie and wetland grasses and flowers—instead of conventional turf grass.
- Permeable paving instead of conventional asphalt or concrete.
- Naturalized detention ponds designed to resemble wetlands and natural lakes.
- Land application of treated wastewater.

FIGURE 8. Permeable paving and bioswale at the Morton Arboretum, Lisle, IL.

FIGURE 9. Naturalized stormwater detention at Sears Prairie Stone, Hoffman Estates, IL.

Another emerging element of good conservation development is planning for the long-term. Local land conservancies and park districts are working with the developers to manage protected open spaces for the long-term. As a tradeoff for smaller lawns to mow, homeowners are asked to provide a revenue stream for this management, which often includes controlled burning as Native Americans did for centuries before.

BENEFITS OF CONSERVATION DEVELOPMENT

While the intended focus of conservation development is natural resource protection, it also can provide a great deal of flexibility to developers who may be looking to do something other than the traditional "cookie cutter" subdivision design.

In fact, conservation development can offer a number of potential advantages to developers.

- Conservation development can save money. The National Association of Home Builders and the Chicago Wilderness consortium have identified substantial savings in infrastructure costs associated with residential lot clustering and other conservation development techniques (Conservation Research Institute 2005). These savings are associated, in part, with reduced mass grading and shorter, more compact road and utility networks. Cost savings are more problematic for commercial development, and site-specific analyses are required. In some cases, ultimate costs are determined by the flexibility afforded

by local governments in allowing innovative "naturalized" designs in lieu of traditional hard infrastructure such as storm sewers.
- Open space within a conservation development can provide a significant marketing advantage and generates the potential for lot premiums.
- Conservation designs can reduce permitting hurdles for wetlands and floodplains, significantly reducing approval times and costs. Notably, in the Chicago Wilderness region the Chicago District Corps of Engineers strongly emphasizes conservation design, particularly runoff infiltration and water quality best management practices, as a condition for wetland mitigation permits.
- Some communities offer density bonuses as a reward for additional open space and other conservation design elements.
- Conservation development projects can reduce conflicts and opposition from local environmental and watershed groups. In ideal circumstances, these groups can become allies in promoting innovative, win-win project designs to local governments and permitting agencies.

An additional benefit relates to the evolving market for new housing. Some housing experts have identified growing markets for age-targeted and empty-nester categories. These buyers often prefer a smaller, low maintenance lawn but appreciate the amenities and views of adjacent open space. Even traditional home-buying families are seeing the benefits of reduced time mowing lawns and greater opportunities for their children to explore the nature just beyond their backyards.

FIGURE 10. Common open space at Strawberry Creek Subdivision, Kenosha, Wisconsin.

CONSERVATION DEVELOPMENT CASE STUDIES

There is no absolute prescription for an ideal conservation development. Depending on the site characteristics and local ordinances and political sentiment, a range of conservation design techniques may be feasible. Following are descriptions of local conservation development projects that have received acknowledgement from regional conservation organizations and regulators.

Settler's Ridge

Settler's Ridge is a 500+ acre lifestyle community in the Village of Sugar Grove, approximately 40 miles west of Chicago. While Sugar Grove doesn't mandate conservation design in its ordinances, negotiations for this project led to a conservation-oriented plan. The motivation was based, in part, on the recommendations of a watershed study for Blackberry Creek, which flows nearby the property, and the desire of the developer and land planner to create a distinctive community. It is notable that the Blackberry Creek corridor is one of the regionally significant resource protection areas identified in the Green Infrastructure Vision.

FIGURE 11. Settler's Ridge, Sugar Grove, Illinois. Land Plan prepared by Land Vision, Inc.

Starting with a concept plan designed with national award-winning conservation land planner Randall Arendt, the project team hired by Kimball Hill Homes fleshed out the design details. Critical to the success of this project was the composition and coordination of the multi-disciplinary design team. Team members included:

Land Vision, Inc.: land planning

Cowhey Gudmundson Leder, Ltd.: engineering and natural resources

Hitchcock Design Group: landscape architecture

Pizzo & Associates: natural landscaping and ecological restoration

Each of these firms is a recognized regional leader in conservation design and/or new urbanist principles.

FIGURE 12. Settler's Ridge, Sugar Grove, Illinois. (Photo courtesy of Hitchcock Design Group.)

The existing site was almost entirely cropland with few natural habitat remnants, except for some small, degraded wetlands. However, site investigations showed that much of the property was hydric soils, i.e., former wetlands, that were drained with large agricultural field tiles. The resultant land development plan identified such areas as proposed open space. In total, over 40 percent of the site was preserved as open space, the bulk of it in restored or created wetland and prairie zones. Stormwater facilities were designed as naturalized lakes and wetlands, surrounded by prairie buffers. While the local subdivision ordinance generally requires storm sewer drainage, flexibility was provided to allow for the use of swales and bioswales in several neighborhood locations.

In recognition of its progressive design approach, Settler's Ridge received a 2007 regional conservation design award from Chicago Wilderness and the U.S. Environmental Protection Agency.

Pancor Commercial Center

Situated at the intersection of an Interstate and a major state highway in Kane County, Illinois is a 357 acre parcel slated for commercial development. The site contains sensitive wetlands, remnant oak savannas, and the headwaters of the Kishwaukee River, one of the region's higher quality rivers identified in the Green Infrastructure Vision. The land

FIGURE 13. An extensive trail system at Settler's Ridge connects residents to internal open space and to regional trails. (Photo courtesy of Hitchcock Design Group.)

FIGURE 14. Existing wetlands and oak savannas at proposed Pancor Commercial Center, Kane County, IL.

plan incorporates a remarkable conservation development theme that evolved from negotiations with regulatory agencies over the matter of several acres of unavoidable wetland impacts.

The developer, Pancor Construction and Development L.L.C., was familiar with the concepts of conservation design. In the construction of its headquarters several years ago Pancor worked closely with the Fox Valley Land Foundation to protect a sensitive wooded ravine and provide for its long-term ecological management.

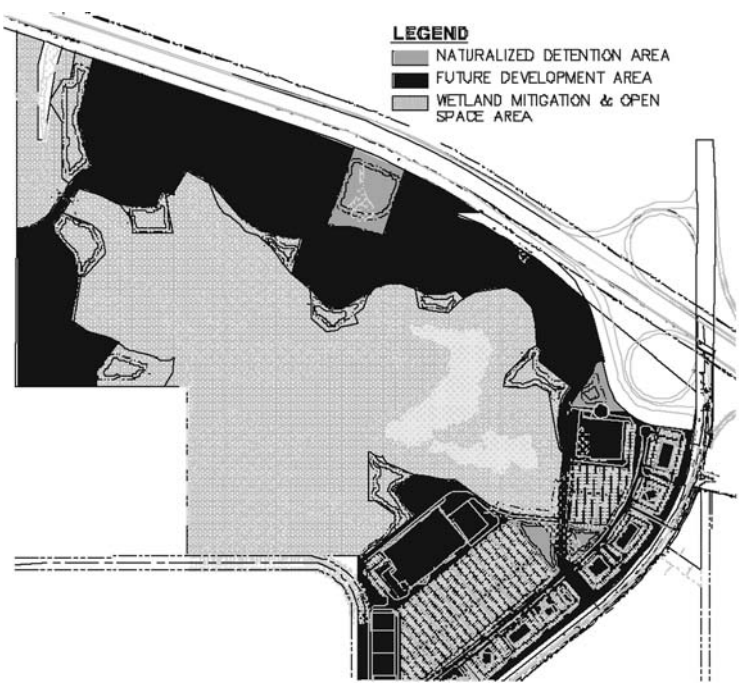
The experience and recognition associated with that project led to the developer's understanding that the most expeditious path to wetland permitting approval was to work proactively with regulatory and conservation organizations to find a practical and mutually agreeable solution.

Through a series of meetings with local conservation groups and state and federal regulators, Pancor worked with Cowhey Gudmundson Leder, Ltd. to revise the initial site plan in the direction of reduced wetland impacts and enhanced conservation design strategies. While the project is still awaiting final regulatory approval, it is arguably one of the most unique commercial conservation design projects in the region.

Some of the key conservation development elements include:

Creative mitigation of impacted wetlands: Approximately 4 acres of wetland impacts are being mitigated via the restoration and enhancement of nearly 100 acres of onsite wetlands and uplands and required wetland buffers.

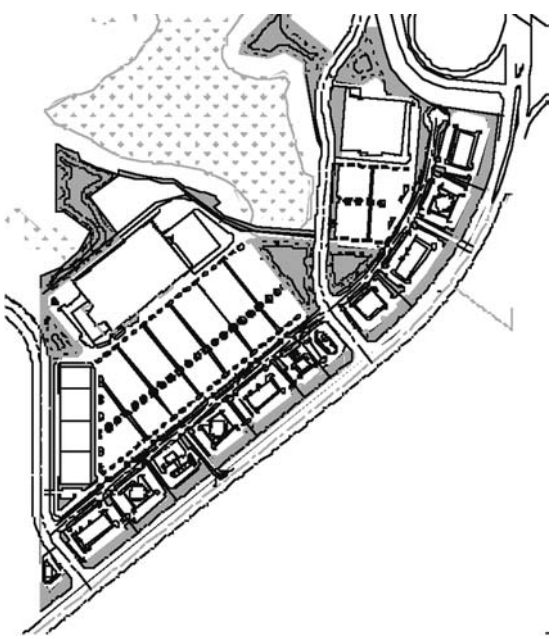
FIGURE 15. Wetland mitigation and open space plan for Pancor Commercial Center.



Preservation and enhancement of additional open space: Well beyond the requirements for wetland mitigation, Pancor is proposing to restore and donate an additional 70 acres of open space for long-term conservation purposes. Significant portions of this acreage are potentially developable, although they are located in the interior of the property and away from the most economically desirable road frontage.

Creative stormwater best management practices (BMPs): At the urging of federal regulatory agencies, an elaborate plan for innovative stormwater BMPs was developed. This plan includes an array of bioswales, naturalized swales, rain gardens, and natural landscaping designed to capture much of the rainfall and runoff from proposed buildings, roads, and parking lots. These BMPs are designed to naturally cleanse and infiltrate site runoff. Numerous wetland detention ponds are placed around the periphery of the natural wetlands, providing further opportunities to filter and attenuate runoff. The goal of these BMP designs is to reproduce the natural runoff patterns that are currently sustaining the onsite wetlands.

FIGURE 16. Shaded areas indicate stormwater BMPs in Phase 1 at Pancor Commercial Center.



Donation of wetland mitigation and open space areas to the public: Pancor has offered to donate approximately 170 acres of restored open space to the county forest preserve district. While substantial in its own right, the proposed donation parcel can be expanded in the future to encompass adjacent wetland parcels and be linked via trails and greenways to parcels that are planned for future residential development.

Long-term ecological management: Pancor has agreed to provide long-term funding for critical ecological management of the open space reserve. Funding is proposed to come from a property owners' association and will be used to conduct controlled burns and manage invasive weeds in perpetuity. Considering that existing onsite wetlands are rapidly degrading due to the effects of invasive weeds and brush, such long-term management is an invaluable private contribution to regional biodiversity.

LOCAL GOVERNMENT ROLE

Despite the obvious environmental benefits and potential cost savings and marketing advantages, conservation development is clearly not the norm for new residential and commercial projects in northeastern Illinois. One reason is that conventional "cookie-cutter" designs are still identified as the standard in most communities' subdivision and zoning ordinances. Municipal engineers, planners, zoning boards, and plan commissions have developed a comfort level with the familiar. So, while conservation development can create cost savings and some unique marketing advantages, most developers may be reluctant to "fight city hall".

However, there are some emerging policies that are pushing for more conservation development. Progressive countywide stormwater ordinances in most northeastern Illinois collar counties are now requiring evaluation of innovative land planning and stormwater designs. A growing number of local governments are giving preference to conservation design and even offering incentives like density bonuses. For example, Kane County, Illinois has embraced conservation-based and traditional neighborhood design principles in its critical growth area and has approved conservation development projects like the 1600+ unit Mill Creek development. The City of Aurora, Illinois is promoting conservation

development through its award winning *Countryside Vision Plan* and related ordinances. And Illinois communities like Woodstock, Homer Glen, and Schaumburg have recently adopted conservation development ordinances that mandate designs that incorporate natural landscaping, innovative stormwater best management practices, and preservation of open space.

LOCAL GOVERNMENT CASE STUDY

One notable example of evolving local government attitudes to conservation design is McHenry County, Illinois. Lying approximately 55 miles northwest of Chicago, McHenry County sits on the edge of a metropolitan region that is forecasted to grow substantially over the next 20 years. County leaders are proud of their conservative, pragmatic approach to land use and development. However, while economic development is clearly desirable, officials have become concerned over the potential downside of traditional development on groundwater supplies, quality of life, and rural viewsheds.

These concerns led to the recent formation of a "Land First" initiative and the development of a new conservation design ordinance. In a significant departure from the county's long-standing zoning and subdivision codes, the new ordinance requires conservation design for all development sites that have significant areas of sensitive natural resources and allows conservation development as a right for all other subdivisions.

In passing the new ordinance, the county board endorsed four broad purposes:

- Preserve the integrity of the land and its natural functions.
- Protect water resources.
- Enhance community character and connectivity.
- Provide greater design flexibility and affordability.

The ordinance achieves these purposes through the following provisions:

Open space requirement: The ordinance requires a minimum percentage of open space ranging from 40 to 70 percent that varies with the underlying zoning. Generally, open space is to be preserved or restored to a natural condition. Open space can be provided in a common outlot, or as deed-restricted open space on individual lots.

Open space management plan: The ordinance requires a permanent legal mechanism governing open space, but provides considerable flexibility in identifying ownership and funding options. It also specifies clear performance criteria for short- and long-term management of open space natural areas.

Cluster design: Clustering of residential lots is encouraged, but not required. Clustering provides considerable flexibility in locating neighborhoods and lots around sensitive natural areas and also offers significant savings in grading and infrastructure costs. However, for marketing reasons some developers prefer large lot approaches. These also are allowed.

Streets and trails: Street width requirements are slightly narrower than the standard identified in the subdivision ordinance. The ordinance also encourages street networks and trail systems that optimize connectivity both within the subdivision and to adjacent subdivisions, roads, and trails.

Stormwater management: Low-tech, naturalized stormwater drainage and detention designs are strongly recommended. These techniques do a better job of filtering and infiltrating runoff and cost less than traditional structural solutions like storm sewers.

Natural landscaping: The use of native prairie grasses, wildflowers, trees, and shrubs is required for most open space areas. In addition to being more environmentally friendly, natural landscaping can substantially reduce maintenance costs over turf grass designs.

Tree protection: The ordinance requires protection or replacement of significant native tree groupings on the site. Where replacement isn't feasible, contribution to a tree replacement fund is an option.

Density bonuses: If the proposed project significantly exceeds the minimum requirements of the ordinance, a density bonus of up to 20 percent is offered.

RELATED CHICAGO WILDERNESS INITIATIVES

Incorporating green infrastructure into our region and its communities and neighborhoods is directly linked to several other initiatives of Chicago Wilderness.

The Leave No Child Inside initiative is promoting a culture in which children enjoy and are encouraged to be outside in nature, and as a result are healthier, have a sense of connection to their place, and become supporters and stewards of local nature. Participation in outdoor activities in natural settings has been shown to increase self-esteem, decrease Attention-Deficit Disorder symptoms, and contribute to the emotional and physical development of children across the United States. Green infrastructure is supportive of the goals of Leave No Child Inside because it literally brings nature into closer proximity to children and families. This can happen through conservation design subdivisions, integrating natural landscaping into local parks, school grounds, and backyards, and incorporating nature trails and greenways into our communities.

In 2007 Chicago Wilderness launched a Climate Change Task Force to study and make recommendations on adaptation strategies and models for mitigation in order to address the local impact of climate change. It is apparent that the green infrastructure vision supports climate change mitigation in a number of ways. First, green infrastructure and related smart growth strategies can directly reduce demands for energy and water consumption. For example, natural landscapes reduce energy demands associated with lawn mowing and fertilizer application. Natural landscapes implemented at a regional scale also can effectively sequester carbon and partially offset the effects of the region's fossil fuel consumption. Further, by protecting open spaces and natural areas, we provide places and travel corridors in which native plants and wildlife can live, migrate, and survive to adapt to the changing environment.

FIGURE 17. The Chicago Wilderness Leave No Child Inside initiative encourages the preservation and creation of natural play spaces accessible to every neighborhood.

CONCLUSIONS AND NEXT STEPS

The nearly 360,000 acres of protected natural areas and the 1.8 million acres of prospective protection and restoration areas identified in the Green Infrastructure Vision are as critical to the people in the Chicago Wilderness region as the built environment and transportation systems. Like the 100-year old *Plan of Chicago*, the Vision embraces the notion that strategically protecting natural resources and open space will improve sustainability, economic vitality, and quality of life.

The Vision identifies and maps an ambitious framework for regional open space protection and sustainable land use. The Vision also calls for greatly expanded implementation of conservation-based land development. To implement the Vision, the Chicago Wilderness consortium is presently working to disseminate maps and outreach materials to regional decision makers, local governments, and the development community.

It is hoped that astute developers will be willing to take up the challenge of implementing conservation designs as the norm for most new development projects. Prospective benefits include expedited permitting, new marketing opportunities, and potentially reduced infrastructure costs. To achieve these benefits, land planners must work in concert with engineers, landscape architects, and ecologists to thoroughly evaluate a development site's natural resource constraints and opportunities. And communities should reevaluate their ordinances to provide more flexibility and encouragement for conservation development. The end product can not only be profitable to developers but can also make a positive contribution to healthy ecosystems and more livable communities.

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