Green Infrastructure

Green infrastructure is strategically planned and managed networks of natural lands, parks, greenways and other open spaces that maintain natural ecological processes, sustain air and water resources, and contribute to the health and quality of life of people and communities. The foundation of green infrastructure networks are their natural elements (forestlands, wetlands, river, grasslands) that work together as a whole to sustain the natural environment. They complement and augment the services of “gray” infrastructure in a community such as roads, sewers, pipes and power grids. Some special types of “gray” infrastructure such as permeable pavement may also be considered green infrastructure when it is used to help the built urban environment function in a more natural way.

Green infrastructure planning should occur at all scales, from statewide, to the county, city, and parcel/site level. At the regional level, interconnected networks of park systems and wildlife corridors preserve ecological function and create a balance between the built and natural environments. At the urban level, parks and urban forestry are central to reducing energy usage costs and creating clean, temperate air. Green infrastructure retrofits of urbanized areas can help to reduce flooding or other water management problems.

This section describes the existing system of green infrastructure in Northwest Indiana that will form the basis of a more sustainable and ecologically sensitive approach to growth and development in Northwest Indiana in the future, including: managed lands, regional open space, forestlands, biodiversity and habitat areas, and prime agricultural lands.

Managed Lands

There are approximately 315 natural or recreational areas within Northwest Indiana that are owned or managed by local, state or federal agencies, and non-profit organizations (Figure III.9). Based on data obtained from INDR’s managed lands dataset, there are approximately 34,500 public and 1,600 private acres of managed open space in the entire NIRPC three-county region.

Figure III.9 Managed Lands-Ownership, Indiana Department of Natural Resources, 2010.
**Regional Open Space**

Northwest Indiana is renowned for its rich environmental diversity, based in large part to the region's proximity to Lake Michigan. Many areas have been opened to public access at every level of government, and through the strong efforts of several nonprofit land trusts. Thus, a unique variety of open space opportunities are afforded to Northwest Indiana residents at both the active and passive scale. From the local level, where active recreation fields are in demand, to the federal level, which has protected thousands of acres of the Indiana Dunes, open space access is vital to the quality of life of those living in the Calumet Region. In addition, a number of protected properties also exist that aim to preserve the delicate natural balance without human interference. The combination of both public and private open spaces forms the backbone of the region's vast ecological diversity, and subsequent enjoyment of these resources.

**Types of Open Space**

Throughout Northwest Indiana, a range of open spaces exist for both public and private enjoyment. These include:

- **Greenways:** Greenways are linear corridors of open space. They can vary greatly in scale, from narrow ribbons of open space that run through urban and suburban development to wide corridors that incorporate diverse natural and cultural features. Greenways can be land-based or water-based, and incorporate both public and private property. They always provide greater benefits because of linear continuity than they would if the continuity was broken. Some greenways are primarily recreational corridors, while others focus on environmental protection. Some greenways run along stream corridors, shorelines or wetlands; while others follow old railway tracks or other land-based features. Greenways differ in their location and function, but overall a greenway network will protect natural and cultural resources, provide private or public recreational opportunities, improve and sustain hydrological functions, and enhance the natural beauty and quality of life in neighborhoods and communities.

- **Active Open Space:** Active recreation involves playing fields and team participation activities such as baseball, soccer, lacrosse, etc. The greater share of facilities for active recreation is found within the management of cities and recreation districts. Open Space funding is allowable for active recreation facilities through a city’s attributable share of the sales tax fund, joint venture grants or regional sports facilities grants. Active spaces can include linear corridors such as multiuse trails, and are public and private in nature. However, the vast majority of active open spaces are held by governmental entities.

- **Passive Open Space:** Passive recreation generally involves trail-based walking or hiking, mountain biking, horseback riding, wildlife viewing, picnicking, or other individual or small group leisure activities. Passive recreation facilities are found primarily within unincorporated areas and are funded with the unincorporated share of the County sales tax fund. Many passive open spaces are set aside for wildlife and plant conservation. They range from public to private in ownership, with land trusts constituting ownership for the latter.
Regional Open Space Needs

Although there are many open space opportunities the Northwest Indiana region, significant deficiencies exist, especially in regards to public access and major open space acquisitions. There are also hundreds of acres of prime ecological lands brimming with a variety of native plants and high-quality habitat remnants. A number of these acres have been purchased over the last several years by aggressive non-profit land trusts, but much more progress is necessary, to both protect valuable landscapes and provide enjoyment for the region’s residents.

A detailed benchmarking assessment of public accessible facilities in the Lake Michigan Coastal areas was performed by the IDNR and released in 2009, and concluded that the region is:

- below average in the miles of multiuse walking and biking trails;
- below average in the number of public access launch points for personal watercraft;
- above average in miles of public beaches;
- the only region where beach fees are charged for residents;
- far above average in fishing access points;
- above the median in total park acres

In addition to the benchmarking assessment, a “gap analysis” was performed based on current conditions involving acreage and mileage values compared to defined Level of Service (LOS) standards to illustrate the state of public access land in the region. Both qualitative and quantitative measures were used.

The qualitative gap analysis concluded that there is:

- a need for additional public recreation lands and amenities in many communities;
- a need for improved signage and wayfinding to direct users to recreation sites;
- a need to improve trail connections to complete the fragmented trail system;
- a need for connectivity of natural resource lands throughout the region; and
- a need for the creation of “blueways” for non-motorized boats in many areas.

From the local level, where active recreation fields are in demand, to the federal level, which has protected thousands of acres of the Indiana Dunes, open space access is vital to the quality of life of those living in the Calumet Region.

15 Needs Assessment of Public Access Recreation Sites within the Indiana Coastal Area, Eppley Institute, IDNR 2009.
**Forestlands**

Forests provide many economic, environmental and community benefits. From an environmental perspective, forest cover reduces runoff volume and pollutant loading, improves air quality, provides habitat for terrestrial and aquatic life, reduces stream channel erosion and helps maintain cool stream water temperatures during the heat of the summer. From an economic perspective, forest cover can reduce consumer cooling and heating costs, reduce construction and maintenance costs, and increase property values. From a community perspective, forests increase recreational opportunities, improve health and a sense of well-being and provide aesthetic value.

Much of the region’s historic forestland was cleared when the area was being settled for agricultural and development purposes. What remains can primarily be observed as two green swaths following the relatively high relief topography provided the Valparaiso Moraine and the Dunes along southern Lake Michigan. These areas once largely protected because of their unsuitability for agricultural production are under increasing development pressure. Between 1992 and 2009, Lake, Porter and LaPorte counties had some of the highest losses of forestland in the entire state based on data presented in the 2010 Indiana Statewide Forest Assessment by the Indiana Department of Natural Resources. Only 10% of the approximately 101,000 acres of forestland in Northwest Indiana lies within the protective boundaries of managed lands.

While a majority of the region’s forest cover is located in unincorporated areas, nearly 20% falls within municipal boundaries. The 2010 Indiana Statewide Forest Assessment shows that a number of the region’s urban areas could benefit from increased tree cover. In a number of instances the urban areas identified by the IDNR in the assessment correspond with Environmental Justice (EJ) zones identified by NIRPC. Urban forest and forestry programs align with the strategies that serve the urban core and the EJ populations as described in the Urban Framework section of the 2040 CRP.

While there is value in understanding how much forestland still exists for conservation purposes, it is equally, if not more, important to understand the quality of that remaining forestland and future threats. Forests that share a high proportion of their borders with urbanized areas or agricultural uses are at higher risk of degradation than forests that share a high proportion of their borders with nonforested but natural land cover (wetland, grassland or shrubland). According to the 2010 Indiana Statewide Forest Assessment prepared by IDNR, fragmentation and/or conversion of forests to another land use is the most important
threat to the sustainability of Indiana’s forests. Additionally the assessment raises the concern of low species diversity, poor age-class structure, and the threat of emerald ash borer to our urban forests.

The IDNR’s 2010 Indiana Statewide Forest Strategy addresses a limited forest base being fragmented or converted to other land uses, like subdivision housing, paved surfaces or row crop agriculture. The strategy seeks to enhance Indiana forests’ ability to conserve soil and water resources by protecting existing targeted forest cover in watersheds and promoting reforestation along key streams and rivers. It will guide and improve efforts to control and combat the economically and ecologically disastrous effects of invasive plants in woodlands and make dramatic strides in the preservation of biological diversity by assuring that increasingly simplified and one-dimensional forests become more diverse and connected with one another.

**Biodiversity and Wildlife Habitat**

According to the U.S. Environmental Protection Agency, no other region in the Midwest has been as greatly impacted by human activity as Northwest Indiana. Prior to European settlement, a series of white pine and jack pine-covered dunes, and swales rich in wetland species, paralleled Lake Michigan. Inland, the dune and swale topography met the Calumet marshes. Further south, the Great Kankakee Marsh was a resting and nesting place for vast numbers of birds of many species. Oak savannas and tall-grass prairies interspersed dune and swale and marshes. East, to the Valparaiso Moraine, a high ridge marking the edge of the last glacier, eastern woodland plant species met western prairie and remnant boreal forest.

The Indiana Dunes National Lakeshore covers nearly 15 miles of Lake Michigan shoreline from Gary to Michigan City. Biodiversity within the national lakeshore is among the highest of all the national parks. More than 1,400 plant species, including 28 species or orchids, and more than 350 bird species have been observed within its boundaries. The national lakeshore is an especially important resting and feeding area for migratory birds.

Within our region, the IDNR’s Heritage Database records more than 2,900 endangered, threatened, or rare (ETR) species and high-quality natural community element occurrences (observations). These include a variety of bird, plant, amphibian, reptile, insect, and mammal species as well as globally rare and significant dune and swale habitat. While many of these observations have occurred within the protected boundaries of managed lands (63%), a large number are not afforded such protection. Northwest Indiana remains one of the most, if not the most, biologically diverse area in Indiana and the Great Lakes Basin. However, Northwest Indiana ecosystems are fragmented and under constant, diverse stress from multiple sources. Without the protection and restoration of ecosystem functions and structures, their long-term viability is severely threatened.
of economically viable agricultural land, including increased demand for locally produced food; awareness of the historic, cultural and aesthetic value of rural landscapes; and consensus that agricultural land typically requires less in government services than it pays in taxes, thus having a net positive fiscal impact.

There are approximately 530 square miles of prime agricultural land within Northwest Indiana based on farmland classified as “all areas are prime farmland” and “farmland of statewide importance” by the NRCS. As can be seen in Figure III.10, the greatest percentage of prime farmland can be found in the Kankakee River sub-basin.

Indiana currently ranks second in the nation in total acreage of prime farmland being lost at the rate of 100,000 acres/year or 10 acres/hour. Between 1996 and 2006, a little more than 13 square miles of agricultural land was converted to developed land uses in Lake, Porter and LaPorte counties. About 20% of this was classified as prime farmland by the NRCS.

Prime Agricultural Lands

In many areas, agricultural land use can be taken for granted, but there is an increasing recognition that agriculture preservation plans should be included as a component of overall community planning efforts. Agricultural and rural areas are key components of a green infrastructure network, preserving natural and aesthetic qualities that enhance community character and well-being. Nationally, several factors have begun to push back against the loss of economically viable agricultural land, including increased demand for locally produced food; awareness of the historic, cultural and aesthetic value of rural landscapes; and consensus that agricultural land typically requires less in government services than it pays in taxes, thus having a net positive fiscal impact.

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16 http://ldm.agriculture.purdue.edu/Pages/P1/EnvNatRes.html
The 2040 CRP describes a vision and establishes a direction for both cooperative regional actions and local actions with regard to land use and transportation planning. The “third leg of the stool” that will guide the region in realizing its vision for 2040 is protection and stewardship of the natural environment. This section describes the Plan recommendations related to the region’s natural resources, framing these recommendations in the context of a “Green Infrastructure Network.”

As noted previously, the recommendations included here are informed by a strong foundation of previous studies and planning efforts that address elements of the natural environment, seeking to build on an understanding of current conditions and challenges to establish a shared, sustainable path forward with regard to the natural environment.

What Is the Green Infrastructure Network?

The concept of a Green Infrastructure Network for Northwest Indiana is central to fostering greater awareness of the environmental impacts of land use and transportation planning decisions, and establishing mechanisms at all levels to ensure that impacts are considered and mitigated as the region grows through the implementation of an “ecosystem approach.”

The Green Infrastructure Network consists of the following:

- Protection, and responsible and sustainable use and management of the region’s existing ecological assets
- Protection, and responsible and sustainable use and management of the region’s water resources
- Pursuing opportunities to restore, enhance, expand and better connect existing elements of the region’s ecosystem
- Thoughtful design, construction and maintenance of needed “gray infrastructure” to serve the region, such as the transportation network, water conveyance and wastewater treatment systems, and utility systems
- Implementation of “green infrastructure” solutions that lessen the burden on existing, and the need for additional, gray infrastructure
- Sensitivity to the environmental considerations of urban development patterns by accommodating planned population and employment growth in the region in locations and in an urban form that augments the natural environment rather than being at odds with it, including utilizing the Livable Centers concept to guide future urban growth
- A planning mind-set that asks, in every land use and transportation planning decision, whether development or facilities are being sited appropriately to minimize impacts, whether potential negative impacts are being effectively mitigated, and whether potential enhancements to the natural environment are being realized.
CHAPTER III: ENVIRONMENT & GREEN INFRASTRUCTURE

Chapter III

From a physical planning perspective, the Green Infrastructure Network builds upon the current environmental conditions described earlier in this chapter, seeking to protect the ecological assets, water resources, groundwater, and prime agricultural areas of the region as depicted in Figure III.8.

What Are the Benefits of the Green Infrastructure Network?

As future population and employment growth in Northwest Indiana is accommodated in an environmentally sensitive manner through effective planning and development management at all levels of government, both local municipalities and the broader region will benefit in several ways.

Community Benefits - A Green Infrastructure Network minimizes the physical impacts of urbanization by promoting a compact urban pattern. Doing so enables communities to maintain natural visual amenities, creating a civic identity and becoming a source of community pride. The historical, cultural and archaeological heritage of the region is also protected. A robust network will also include outdoor recreational and educational facilities, both active and passive, promoting community interaction with the environment.

Mobility Benefits - A Green Infrastructure Network seeks to reduce impacts from transportation projects, while still accommodating the region's mobility needs. Roadways are more carefully integrated into the natural system; accommodating public transportation reduces vehicle miles traveled and the resulting environmental degradation, and a well-developed network of nonmotorized transportation, including trails and marked on-street routes, increases mobility alternatives for the region's residents.

Sustainability Benefits - A Green Infrastructure Network focuses on the reuse and upgrading of existing infrastructure, which is more economical and sustainable over the long term. Implementing environmentally sensitive improvements also results in less resource consumption and less required treatment of stormwater and wastewater over time. A land use strategy that focuses on the redevelopment of brownfields (contaminated properties) and grayfields (vacant properties) further reduces demands on the natural environment while still accommodating growth.

Economic Development Benefits - A Green Infrastructure Network can boost the economic potential of tourism, leisure and cultural activities. Access to attractive and usable open spaces also reinforces local community identity and enhances the physical character of an area. This can result in increased property values, thereby aiding urban regeneration and neighborhood renewal efforts. Despite some upfront costs, implementation of green technology options can also provide both the public and private sectors with significant life cycle cost savings, and reduce costs associated with flooding and water quality degradation.

Located in the Galena River watershed, this protected forestland is part of the Moraine Forest. The Moraine Forest lies along the southern tip of Lake Michigan and follows the shoreline across LaPorte and Porter Counties. As described by the LaPorte County Conservation Trust, the Moraine Forest is the last forest cover truly large enough to still be called “forest” in LaPorte County.

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Environmental Benefits - A Green Infrastructure Network promotes improved watershed health and enhanced ecosystem function, by both protecting the natural environment from incursions and mitigating the impacts of incursions where they must occur. Ecological habitats and levels of biodiversity can be protected and enhanced through the ecosystem approach, with the added benefit of improvements in air quality and moderation of temperature extremes. Providing an effective system of environmental infrastructure will also limit the need for “engineered” flood control solutions and moderate the impact of flood events.

Lifestyle Benefits - A Green Infrastructure Network expands the network of recreational amenities available to the region’s residents, contributing to health agendas and promoting participation. It also can provide a wide variety of cultural, social and community facilities and activities that promote education and awareness of the environment. Improving physical and social inclusion through these amenities is particularly beneficial for young, disabled and older populations.

How Can Urbanized Areas Contribute to the Green Infrastructure Network?

Man-made elements of the environment that serve community needs with regard to water conveyance, wastewater conveyance and treatment, and stormwater control can be considered “gray infrastructure.” Implementing innovative design and construction practices as transportation facilities and utilities are expanded or upgraded is a key element in achieving the objectives of the Green Infrastructure Network. Often referred to as Low Impact Development (LID) practices, these strategies should be an integral part of the region’s efforts to “tread lightly” and minimize the physical impacts of urbanization as population and employment growth occurs.

Effective application of these “green” strategies can reduce the burden placed on the region’s existing gray infrastructure, and minimize the need for additional gray infrastructure in the future, resulting in the potential for significant capital and maintenance cost savings over time for both the public and private sectors.

Key “green” strategies that can make urbanized areas more environmentally sensitive, and lessen the gray
infrastructure burden, include the following:

**Rain gardens**: Rain gardens are planted areas that typically consist of deep rooted native plants, and which are designed to collect local stormwater and contain it until it can be absorbed into the soil. Allowing for bio-retention of stormwater aids in recharging groundwater and naturally removes contaminants. Rain gardens also provide wildlife habitat and aesthetic enhancements to property, and are reasonable and achievable projects to implement at the site level and at the neighborhood scale.

**Bioswales**: Bioswales are linear stormwater management elements that augment the conventional stormwater management system. Swales along roadway pavement edges that are strategically planted with native plants will slow stormwater runoff, thereby reducing erosion, recharging groundwater and removing pollutants to reduce treatment demands. Bioswales can help reduce peak flows for storm events, and significantly lower capital costs for stormwater infrastructure in both site development and roadway construction projects. As urban streets are reconfigured to better accommodate multiple modes of travel, cost savings can be realized by locating bioswale areas directly above existing catch basins rather than having to relocate them.

**Permeable pavements**: Permeable pavements are an alternative paving material that allows rainwater to pass through the pavement surface, percolating into the soil below. Much like rain gardens and bioswales, they help recharge groundwater and also remove contaminants that typically gather on pavement surfaces as a result of parked vehicles. The use of permeable pavement can also reduce the overall impermeable footprint of a development that triggers the need for large and expensive detention basins. In addition to parking lot applications, permeable pavement can be a viable solution for public alleys, low-traffic streets and the on-street parking lanes of wider streets.
Greenways: Greenways are corridors of open space, often located adjacent to streams and other water corridors, which can accommodate multifunctional trails and wildlife habitat connectivity. Greenways help promote an active healthy lifestyle while also providing a vegetated buffer that slows and cleans stormwater before it flows into adjacent water bodies, lessening the need for engineered stormwater infrastructure. In addition to a network of public greenways, developing a network of private greenways in conjunction with new development can be effective in expanding the regional open space framework, reducing everyone’s reliance on conventional gray infrastructure.

Photos from web.

Native landscaping: Use of native and drought-tolerant landscaping in development projects, and in open spaces created as a result of public infrastructure projects, aids in maintaining biodiversity and animal habitats, and reduces the demand for artificial irrigation solutions.

Photos from web.

Green design: As both public and private buildings and parcels are designed and developed in the Northwest Indiana region, it will be important to encourage “green design” to minimize the impact of the built environment on water and utility systems. Design elements include such features as green roofs and walls, daylighting strategies, use of rain water to irrigate landscaping, use of gray water to flush toilets, and use of geothermal or solar or wind energy to reduce public utility demands. LEED (Leadership in Energy and Environmental Design) standards developed and monitored by the U.S Green Building Council through their LEED certification process have become the current industry standard for incorporating green features into building and site design, and many municipalities across the country now require LEED certification as a condition of permit approval and/or financial incentives, for public buildings and in some cases for all buildings.

LEED Building, green wall on building façade. Photos from web.

Photos from web.

Achieving the Green Infrastructure Network

The recommendations included below address the many aspects of achieving a Green Infrastructure Network, and are intended to support, and be undertaken in conjunction with, recommendations elsewhere in the 2040 CRP related to growth, conservation, and transportation.

These environmental recommendations dovetail in many ways with those related to supporting Livable Centers, concentrating growth on infill sites in the core communities, and improving transportation choices across the region. Achieving the 2040 CRP vision will require planning “with nature,” anticipating dynamic natural processes and managing ecological systems to both minimize the impacts of urban development and be adaptive to changes caused by urban development.

Water Resources

Water is one of the region’s most important resources; it is what first attracted residents and commerce to the area. Realizing its importance and protecting it will maintain it as a resource for future generations. It can serve a central role in establishing regional identity and opportunity. Plan recommendations include:

Conservation Measures

1. Making priorities for conserving wetlands based on water quality, flood control and groundwater benefits. These should be made at the watershed or sub-watershed level, using criteria as established in the Indiana Wetlands Conservation Plan. The historical and recreational benefits of wetlands should also be considered in identifying conservation priorities.
2. Promoting source water planning in the Kankakee Basin.
3. Using treated effluent for irrigation and other gray water uses (such as toilet flushing or industrial cooling processes).
4. Developing and advocating for water conservation strategies appropriate to each water user group in the region, including industrial, agricultural and energy production users.
5. Encouraging water conservation strategies for residential and commercial development, including plumbing retrofits in existing buildings, using water-conserving plumbing fixtures in new construction, and using high-efficiency mechanical systems and appliances.
6. Promoting growth in areas with access to Lake Michigan water, rather than in the Kankakee River watershed or in areas without existing water service.

### Impact Reduction Measures

1. Restrict development activity within the watershed of “high-quality” streams or lakes, as designated by IDNR
2. Discourage or restrict development activity within designated floodplains and within the recharge area of wetlands
3. Protect aquifer recharge areas with appropriate buffers, rather than just surface water bodies
4. Protect streambank habitat and riparian areas with significant buffering from adjacent urban development, coordinating these efforts with expansion of the regional trail system where appropriate
5. Reduce sediment pollution, in particular from agricultural uses, by restoring stream buffers
6. Work with farm operators to control runoff and pollution (including pesticides and herbicides) and implement innovative irrigation solutions
7. Limit active use of sensitive shoreline and streambank areas that are prone to erosion or other environmental degradation
8. Restore natural hydrology patterns where previous channelization or other engineered solutions have been used, including bioengineering solutions for shoreline and streambank stabilization
9. Establish a model water use conservation ordinance for communities to adopt – addressing all types of water use (commercial, residential, institutional). The model water use conservation ordinance should include incentives such as reduced permit fees, expedited reviews and greater design flexibility, in exchange for incorporating “green” design elements
10. Expand the metering of water use, to both raise awareness regarding water use and enable cost recovery mechanisms
11. Audit water systems to detect leaks and inefficiencies, and target upgrade efforts to systems that are experiencing the most water loss through leakage

### Management Measures

1. Fund and pursue studies of critical groundwater recharge areas, to document and enforce necessary recharge area protection buffers
2. Encourage consideration of precipitation as a resource to be used close to where it falls, rather than as a nuisance to be conveyed to another location
3. Minimize impervious surfaces, including consideration of minimizing roadway widths and opportunities to create planted medians
4. Pursue opportunities to restore and expand existing wetlands, thereby reducing stormwater run-off and filtering discharge

Northwest Indiana Paddling Association’s Trail Creek Fun Float. Photo courtesy Dan Plath.
5. Target implementation of stormwater management practices toward highly erodible lands, utilizing deep-rooted native vegetation
6. Plan and design any channel modification activities to mitigate negative physical, chemical, and habitat impacts
7. Develop and implement an on-site wastewater operation and maintenance program
8. Study the feasibility of county on-site wastewater districts
9. Document all new and existing on-site wastewater disposal systems in the ISDH iTOSS tracking system
10. Support the installation of water detention systems to maximize on-site pollutant removal, in the context of a regional stormwater strategy
11. Coordinate and assist the nine communities that have combined sewer systems to separate the systems and reduce CSO incidents by working toward their Long Term Control Plans (LTCPs)
12. Develop and implement watershed management plans. Coordinate with adjacent counties and states that share watershed boundaries with Northwest Indiana in watershed management efforts
13. Use waste water and stormwater fees to fund watershed level planning and implementation
14. Pursue strategies to assist property owners in the elimination of the inappropriate use of septic systems

Ecological and Open Space Assets

Ecological and open space assets will form the backbone of a regional Green Infrastructure Network. Realizing their importance and protecting them will provide the organizing strategy for accommodating future population and employment growth. Plan recommendations include:

WATER CONSERVATION PLAN FOR VALPARAISO CITY UTILITIES

When Valparaiso wanted to promote and provide leadership in environmental stewardship, offset or delay capital expansion costs, and provide customers with means to increase water use efficiency, it created a Water Conservation Plan Task Force with the mission to develop a Water Conservation Plan.

The objectives of the plan are to:
1. implement comprehensive public education for residential, commercial, and industrial users;
2. control and reduce costs;
3. promote and allow for economic development opportunities with limited capital expenditures;
4. develop conservation-friendly water and wastewater rates;
5. demonstrate that water conservation will work in the Great Lakes region; and
6. develop city codes/incentives and policies to achieve these goals.

After months of study and evaluation, the highest priority implementation activity for Valparaiso is a comprehensive public education and information program.
**Conservation Measures**

Pursue strategic open space acquisition that provides opportunities to expand existing open spaces and improve network connectivity, for the benefit of both the regional trail system and wildlife and biodiversity habitats.

1. Conserve and protect lands identified through Indiana Biodiversity Initiative (IBI) as “high priority” open spaces
2. Conserve and protect existing forests, especially large remnant forests and those in riparian areas
3. Establish preserves in areas with remnant plant and wildlife communities, including upland habitats, allowing for their future viability through expansion
4. Protect or restore connectivity between natural areas and habitat types to support ecosystem function
5. Preserve large contiguous tracts of open space with permeable soils.
6. Preserve open space and natural areas that are ideally suited for scenic resources and recreational opportunities
7. Promote the development and preservation of regional greenways and blueways (water trails) and establish linkages between them

**Impact Reduction Measures**

1. Protect sensitive areas and forestlands through creation of sufficient buffer zones
2. Seek opportunities to maintain or restore habitat connections through agricultural areas, in conjunction with natural drainage, filtering and irrigation solutions
3. Preserve and enhance strategically sited green areas in developed areas to mitigate their impacts on the region's ecosystem and wastewater system
4. Improve access to major regional parks and preserved open lands, including the Indiana Dunes, in particular via nonmotorized transportation

**Management Measures**

1. Develop a regional funding strategy for the ongoing maintenance of natural open spaces, including reforestation efforts
2. Encourage habitat protection and restoration on both public and private lands, through appropriate regulation and incentives
3. Encourage cooperative land management agreements that allow for habitat protection and maintenance on private properties
4. Expand the use of best management practices, with special attention to control of exotic and invasive species
5. Encourage the adoption and enforcement of tree preservation ordinances
6. Where deemed beneficial to the region, support artificial habitat creation in areas where natural habitat areas are too degraded or fragmented to restore effectively
7. Coordinate education, training and technical assistance, especially to develop strategic partners in open space management
8. Increase public awareness and access to the open space network, through a coordinated branding and marketing effort that highlights the ecosystem and human health benefits of regional open spaces

**Air Quality**

Improving air quality will be a vital component of the region's vision for 2040; improvements will be realized through a variety of regulatory initiatives on business and industry at the state and federal level. Additional measures to address air quality improvement through reducing transportation related emissions will be discussed Growth and Conservation and in Transportation Chapters.
**Conservation Measures:**

1. Educate, promote and develop new opportunities to reduced fuel consumption by residents, businesses and industry
2. Promote Sustainable and Transit Friendly development patterns to reduce dependence on single occupancy vehicles.

**Impact Reduction Measures**

1. Continue to partner with PACE in Illinois to provide coordinated bistate rideshare and vanpool programs
2. Continue to provide CMAQ funding and technical support to promote retrofitting of long-lived diesel vehicles and engines with emission reduction technology
3. Continue to partner with South Shore Clean Cites and other partners to explore and grow emission reducing alternative fuels and vehicles

**Brownfields**

Returning contaminated properties to an environmentally safe condition, and to either active or conservation use, will be a vital component of the region’s vision for 2040; improvements will be realized through a variety of initiatives discussed here and in the growth and conservation chapter. Plan recommendations include:

1. Facilitating the mitigation and reuse of brownfield sites, in particular in the core communities.
2. Working with the business sector to develop strategies and incentives to encourage voluntary remediation programs (VRPs) for brownfield sites.

**Green Development Practices**

Demands placed on the natural environment as a result of siting, design and construction practices will have a significant impact on the success of the Green Infrastructure Network strategy. Plan recommendations include:

1. Coordinating urban development and open space planning efforts, per the growth management strategies outlined in the Growth and Conservation section of this Plan.
2. Encouraging redevelopment of infill locations within established Livable Centers, per the growth management strategies outlined in the Growth and Conservation section of this plan.
3. Preserving prime agricultural land and rural landscapes, per the conservation design strategies outlined in the Growth and Conservation section of this plan.
4. Encouraging the concentration of development around existing infrastructure, with a focus on upgrading rather than expanding urbanized areas.
5. Encouraging site planning that both protects high-quality natural features and minimizes the disturbance of natural topography and drainage patterns.
6. Avoiding the fragmentation of existing ecosystems or the introduction of invasive plant types during development.
7. Establishing consistency in local building codes and subdivision regulations, requiring responsible sustainable site planning and building design practices, including LEED-ND certification for site plans and LEED certification for new and renovated buildings.
8. Establishing consistency in local building codes facilitating repurposing and renovation of existing buildings, requiring reclamation and reuse of construction waste, and minimizing the potential environmental effects of building demolition and site preparation.
9. Facilitating and supporting the use of alternatives forms of energy at all viable scales, including wind, solar and geothermal.
10. Requiring erosion and sedimentation control, and protection of existing trees and other vegetation, during construction projects.
11. Encouraging responsible municipal practices with regard to maintenance and service provision, such as the use of low-impact fertilizers and herbicides, natural roadway deicing agents and environmentally friendly municipal vehicle fleets.