Chapter 11
Protecting the Tyler Creek's Green Infrastructure

11.1 What is a Green Infrastructure Plan?

Green Infrastructure is the interconnected network of both publicly and privately owned open spaces and natural areas, such as greenways, stream corridors, wetlands, woodlands, grasslands, parks, and forest preserves. Collectively, these natural features support native flora and fauna, maintain natural ecological processes, sustain air and water resources, manages stormwater, reduce flooding risk and protects / improves water quality.

Green Infrastructure significantly contributes to the health and quality of life of the people who live, work, and recreate in the watershed. As many of these benefits arise from having clean water, it is not surprising that water resources, both surface and subsurface, form the framework of a Green Infrastructure Plan. By protecting our streams, ponds, and wetlands, surface water quality is protected. By protecting areas where groundwater resources can be replenished from surface infiltration, and shallow groundwater resources can discharge cool, clear water into our streams, major components of the hydrologic cycle benefit. These water resources also sustain our biological resources as well, including native wildlife species, and diverse native plant communities.

Above: Example of green infrastructure incorporated along Morgan Creek, in Will County, Illinois

The purpose of a Green Infrastructure Plan is to clearly define those areas that must be preserved, protected, re-connected, and integrated into our developed landscapes (whether they are agricultural farm fields, pastures, roads, or suburban development).

Land disturbances, such as agriculture, land development, and mining all generate pollutants that are washed off the landscape and into our streams, lakes, and wetlands. The increase in stormwater runoff that comes from the new pavement and roof tops generated by land development, even when first detained to comply with stormwater regulations, can destabilize receiving streams.

The overall increase in the volume of stormwater runoff can lead to stream channels downcutting and widening, leading to accelerated stream erosion, and sediment delivery. These impacts contribute to the sediment pollution in streams, threaten public infrastructure such as bridges and culverts, cause safety concerns for adjacent property owners, aesthetically unappealing, and are not healthy for the people and animals who recreate and/or use the stream.

However, natural systems such as wetlands, floodplain forests, and prairies are extremely capable of reducing the volume of stormwater runoff through infiltration and evapotranspiration. These natural systems are also very efficient at removing pollutants from the runoff that passes through them.

A Green Infrastructure Plan is divided into two components – the first is the protection of existing natural areas. The second is the preservation and expansion of natural landscape systems to buffer the high quality natural areas from future development.

11.2 Need for a Green Infrastructure Plan

There are many existing government regulations involving wetlands, floodplains, land use, and stormwater management that can collectively provide a measure of protection against direct impacts to surface water resources, if they are thoughtfully implemented. However, regulations protecting woodlands, native prairie remnants, lowland soils, or wildlife habitat are often inadequate or non-existent, resulting in their destruction during the development process.

To provide a more comprehensive level of protection, it is necessary to consider the benefits these areas collectively provide, and determine how to integrate a reasonable, higher level of protection.

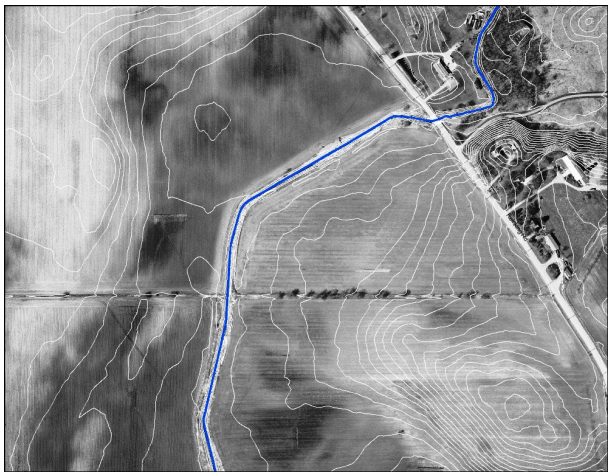
From a watershed perspective, the landscape feature that ties everything together is the mosaic of soils deposited by the glacial advances. These soils have the most significant influence on land development. For example, a gravel pit will only be sited where there are sufficient reserves of gravel available, and ideally a sanitary landfill would be sited in an area of thick, impermeable clays. Similarly, early farmers recognized the tremendous productivity of prairie soils, and only needed to develop a plow to cut through the dense root systems, or install drainage improvements to allow wet soils to be cultivated.

About 9,500 acres (36%) of the Tyler Creek watershed is comprised of hydric soils, which in pre-settlement times, were comprised of wetlands, wet prairies, or shallow drainage swales. Most of these hydric soil areas were converted to cropland by the construction of drainage ditches, installation of subsurface drain tiles, or the channelization of streams. While now suitable for agricultural purposes, and not necessarily considered regulatory wetlands, these converted hydric soils were not a location where you would want to build a home, or expect to have a functioning septic system.

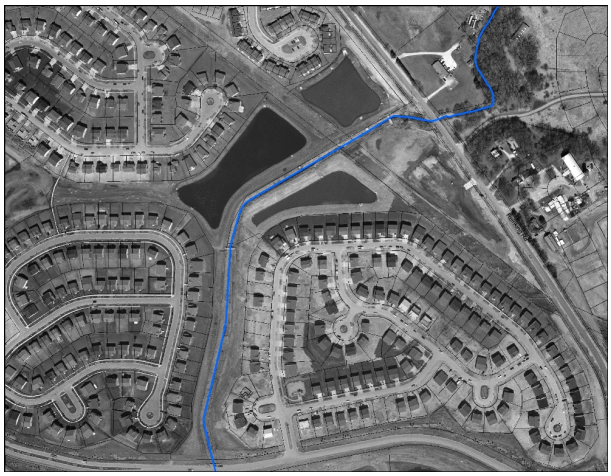
If residential development in the Tyler Creek watershed were only comprised of single lot projects, individually developed, there would be a natural tendency for those landowner's to avoid the damper parts of their property. The soils in the low-lying areas would be left undisturbed, and would still provide significant groundwater recharge and flood storage benefits. Some communities, such as the Village of Long Grove, have recognized the limitations, as well as benefits, associated with these low-lying areas, and have adopted a "Lowland Conservancy" ordinance.

In contrast, when it comes to large-scale urban development projects, the existing soil characteristics become less and less of a factor, as site engineering and large grading

equipment moving and rearranging huge volumes of soil can transform areas with significant natural soil limitations into just another development site. Unfortunately, this approach totally ignores the natural benefits of the multi-horizoned organic soils. In a natural, undeveloped state, these soils provide tremendous filtering and storage benefits for precipitation. The microscopic void spaces between soil particles can collectively store and gradually release large volumes of water.



"Pre-development" photo illustrating agricultural landuse. Stream is channelized and stream corridor is very narrow, but could be expanded easily by simply altering agricultural practices.



"Post-development" photo illustrating how stream corridor has now been permanently lost due to encroachment by residential development and its required stormwater drainage system.

The photographs above demonstrate how green infrastructure is often permanently lost when agricultural land is converted to development. In the pre-development photo on the right, the topography and hydric soils (those dark areas on the photo) suggest that the green infrastructure prior to agricultural development was probably a very wide, flat wetland that drained to upper right of the photo. To increase agricultural productivity, the wetlands and saturated (hydric) soils were drained by excavating a ditch and installing drain tiles so that row crops could be planted to the very edge of the constructed stream channel. While this had negative impacts to the water quality of the downstream receiving stream (sediment, nutrients from fertilizers, etc.), it still was a "reversible" condition. The problem occurs when these agricultural parcels are planned for development, the development design fails to recognize the water quality and habitat benefits that the landscape had prior to the agricultural land use and only the narrow agricultural channel is preserved. Stormwater basins are excavated within the green infrastructure area and designed to discharge as point sources directly into the stream system. This type of development layout does not take advantage of the filtering capabilities of the natural soils and historic wetlands and does not preserve or restore the natural habitat that makes the watershed a sustainable place for its residents to live, work and recreate.

If as part of land development activities, these undisturbed soils were subject to compaction (not excavation) from the operation of construction activity, these benefits in the upper soil would be impaired for a period of time, but would return as a result of freeze-thaw cycles, earthworm activity, and other natural processes.

However, the typical scenario in large scale development is to strip off the existing layer of topsoil, often two to three feet in depth, and stockpile it. The exposed clay is then graded, formed, and compacted to create the future landscape. Four to six inches of

stockpiled topsoil is then respread over the compacted clay to allow a vegetative cover (turfgrass) to be established. The balance of the topsoil is then sold, and leaves the site, and the filter / storage benefits are lost forever.

In reality, these mass graded areas can often exhibit a significant degree of imperviousness due to this compaction, but because they are subsequently planted to turf-grass, they are not accurately accounted for in stormwater detention calculations. More importantly, the natural storage capacity of the pre-disturbance soil horizon has been lost, and not accounted for in stormwater detention calculations. While natural processes may eventually restore some infiltration capacity to the compacted hardpan, it will likely take many decades or more (after all, the original soils took CENTURIES to form).

By preserving undisturbed corridors of hydric soils, larger wetlands that remain in the landscape can also be connected to local stream corridors. While more than 40% of the stream corridor in the lower region of Tyler Creek was identified and preserved when developments were constructed in the past, most of the wetlands and ephemeral tributaries draining into Lower Tyler Creek were drained and filled during development. This trend has continued in the upper reaches of Tyler Creek as well, and can be observed in newer developments in Gilberts and Pingree Grove.

Preservation of the existing stream corridor along Tyler Creek and its major tributaries is a step in the right direction; however, protecting these narrow corridors alone will not adequately protect the ecological integrity or water quality of Tyler Creek. Upstream of the Gilberts WWTP, the stream corridor has been severely narrowed and wetlands drained to suit the agricultural uses that, until recently, have dominated the landscape of the Tyler Watershed. If development of these areas proceeds according to existing development and stormwater ordinances, there is concern that the remaining green infrastructure left over will be too small, too disturbed, and to fragmented to provide any of the ecological or water quality benefits that are necessary to protect and enhance Tyler Creek.

The way to address these problems is for land-use decision makers in the watershed to establish a green infrastructure plan for their community which defines a green infrastructure boundary and sets up criteria as to how new development can integrate with the watershed's green infrastructure.

11.3 Getting Started - Delineating the Green Infrastructure Boundary

One of the first steps in developing a Green Infrastructure Plan is to create a preliminary map of green infrastructure areas using available map data. It should be noted that the green infrastructure areas delineated in this plan are PRELIMINARY and are intended to serve as a guide to local officials and planning staff. Actual green infrastructure boundaries on a given parcel must ultimately be determined by adoption of specific green infrastructure criteria (rules set forth by the local jurisdiction) and field survey done on the parcel in question.

The establishment of Green Infrastructure Areas in this Tyler Creek Watershed Plan was accomplished by determining appropriate setback guidelines for specific natural features (such as high quality wetlands) and overlaying available GIS datasets on top of one another. These combined data layers of natural resource information created "linkages" of geographic areas.

The boundary for the Tyler Creek Watershed's Green Infrastructure Plan is delineated using the following guidelines:

- A minimum 50 foot wide buffer along each side of all streams identified in the stream channel network
- 100-Year Floodplain, as mapped on FEMA's Digital Flood Insurance Rate Map (FIRM) Floodplain Map
- All Kane County Forest Preserve District Properties
- A minimum 100 foot buffer width around all Advanced Identification (ADID) study identified High Habitat Quality and Natural Open Water Wetlands.
- A minimum 50 foot buffer around all Advanced Identification (ADID) study identified High Functional Value and other, lower quality wetlands contiguous with a stream channel or larger than 5.0 acres in size.
- All Advanced Identification (ADID) study identified Farmed Wetlands (with no additional buffer)
- Areas mapped as hydric (wetland) soils that can serve as connecting corridors between isolated wetlands larger than 5.0 acres to provide habitat and natural drainage connection between the wetlands and the perennial stream system.
- The map was then edited to ensure that existing buildings and developments were not included within the green infrastructure boundary.

The maps in Figures 11.1 – 11.5 illustrate several of the incremental steps using the guidelines above to delineate the boundary of the draft green infrastructure plan. Priority areas included publicly owned natural open space parcels, stream corridors, and high quality wetlands. This draft Green Infrastructure Plan recognizes that it is not feasible, nor practical to protect and connect each and every isolated wetland, regardless of quality, to the integrated green infrastructure network of the watershed. Therefore, only isolated wetlands larger than five acres in size are proposed to be included in the boundary. This would allow future development to incorporate and reconfigure smaller, lower quality wetlands (wetlands not classified as High Habitat Quality or containing T&E species) within proposed development areas into their proposed stormwater system, if it is not feasible to preserve them without disturbing their underlying soils.

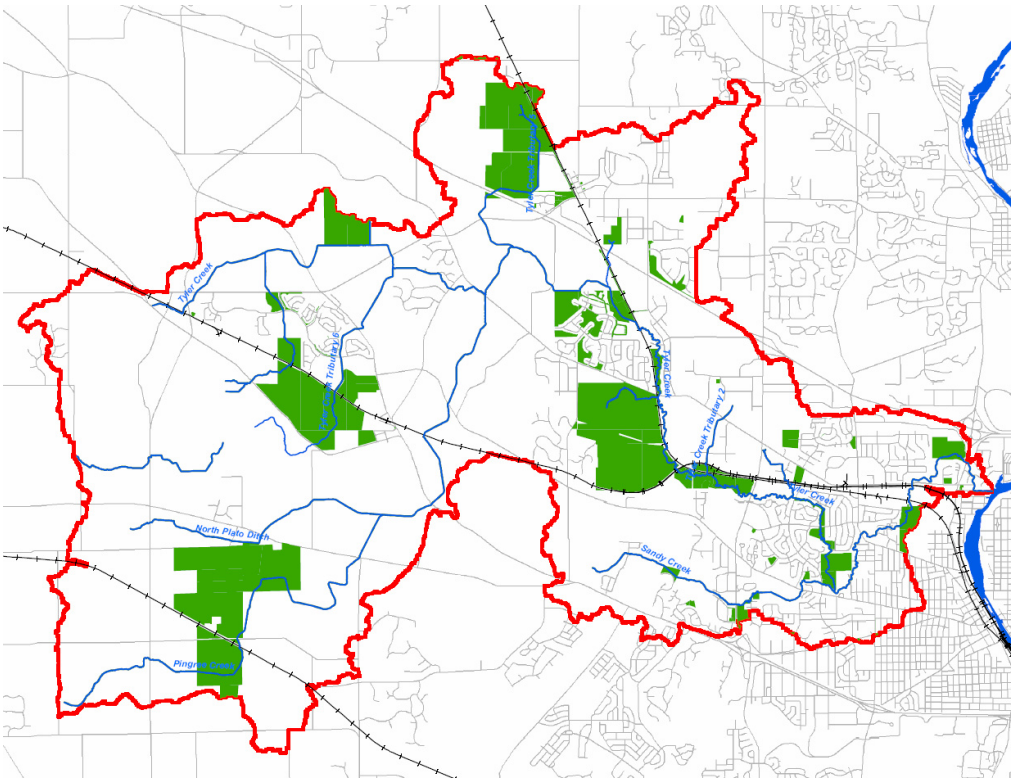


Figure 11.1 Publicly owned land and stream channels buffered 50 feet.

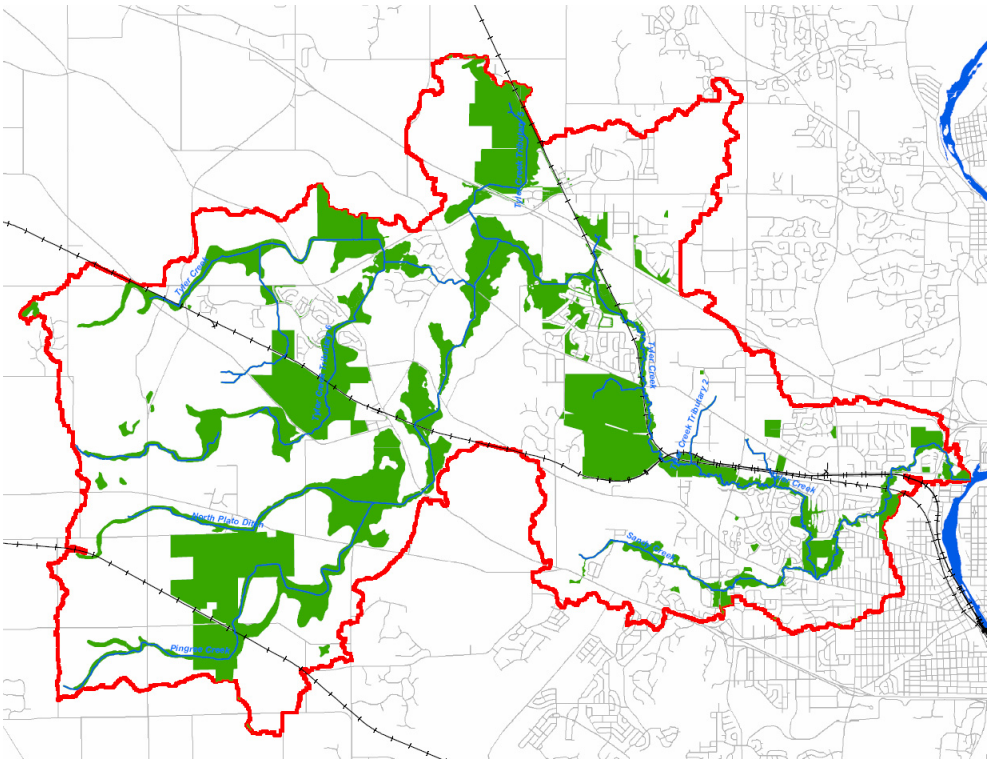


Figure 11.2 Public open space, streams buffered 50 feet, and 100 year floodplain.

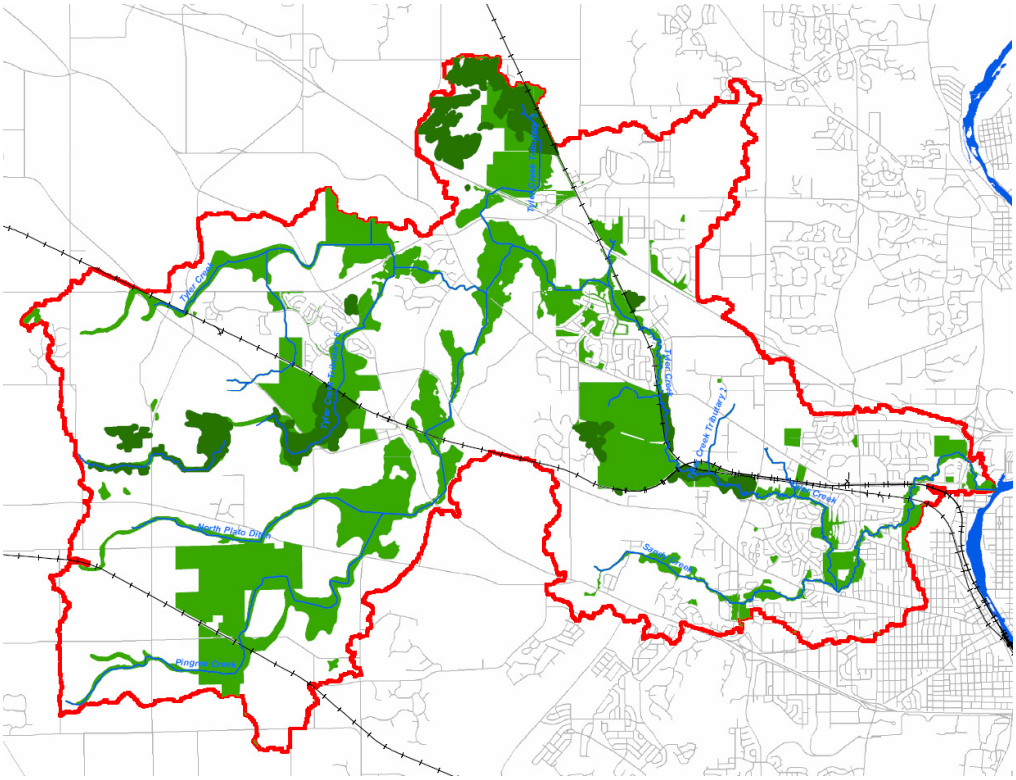


Figure 11.3 Public land, streams, floodplains, and high quality ADID wetlands (HQ wetlands shown in dark green)

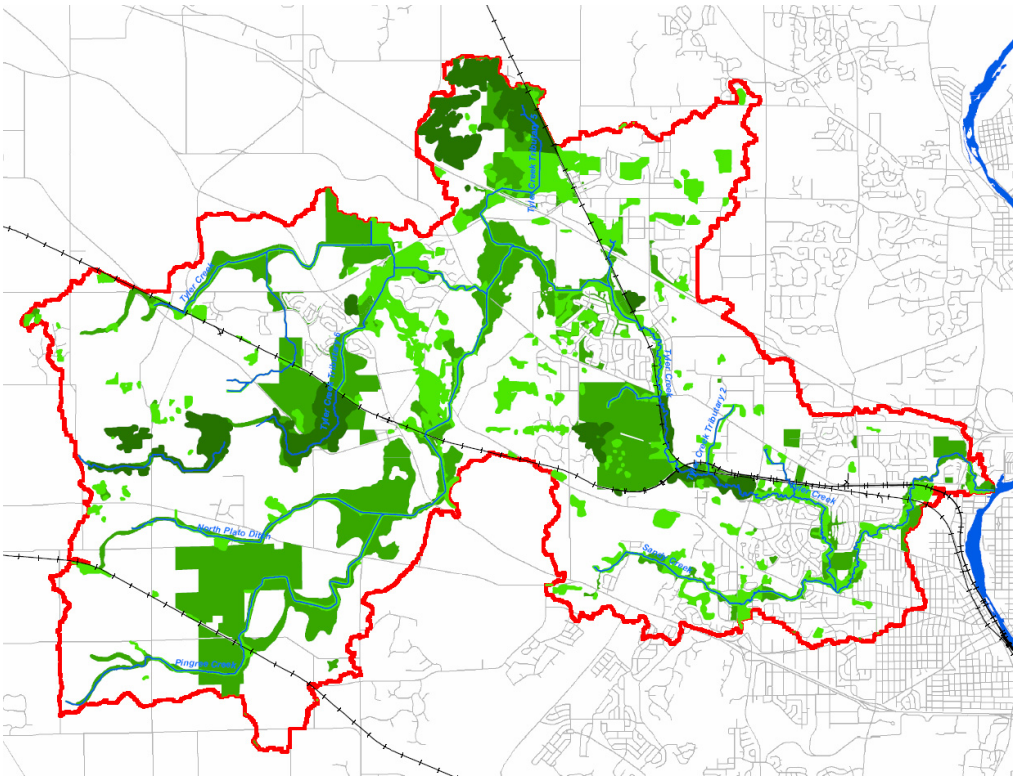


Figure 11.4 Public Land, streams, floodplains, high quality ADID, and high functional value ADID wetlands.

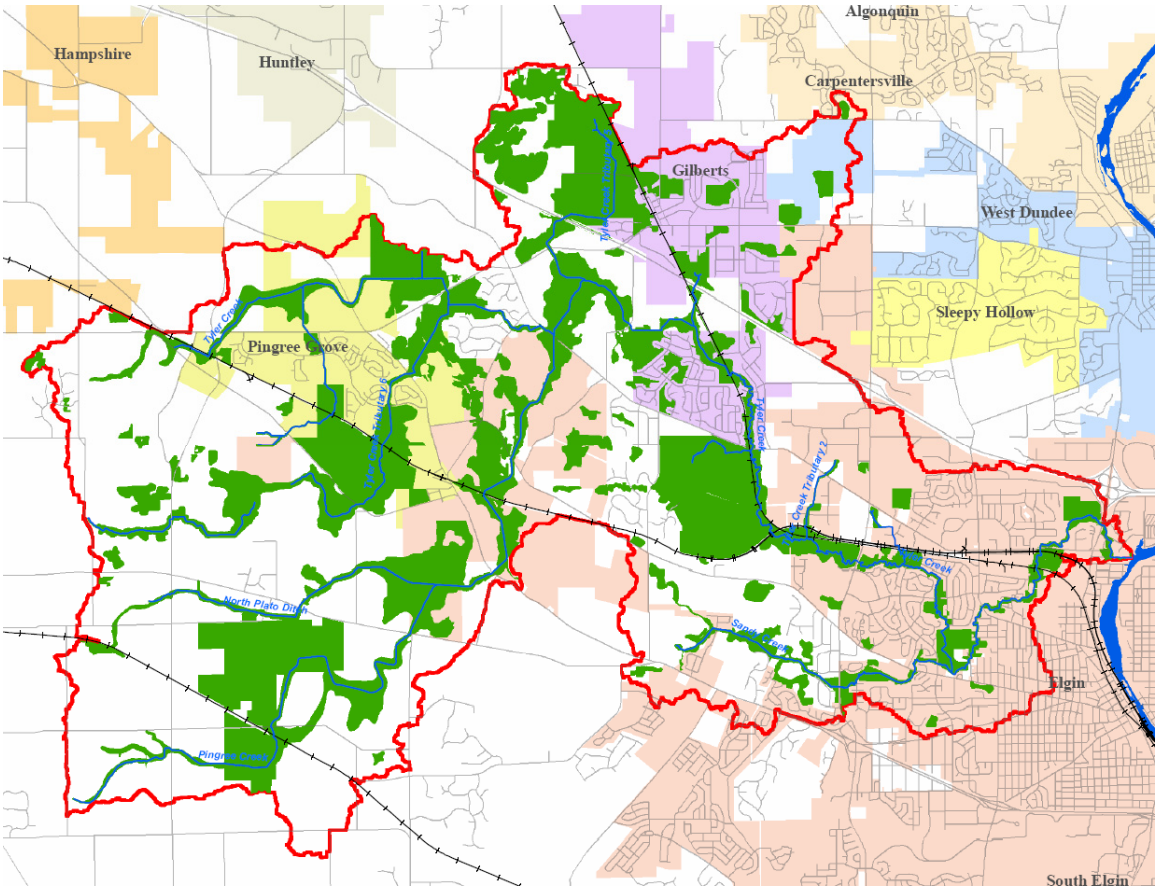


Figure 11.5 Proposed Draft Green Infrastructure Boundary created from composite GIS datasets.

11.4 Guidelines for Interfacing with and Utilizing Tyler Creek's Green Infrastructure

Where development has already occurred in or immediately adjacent to existing natural areas or the stream corridor, the Green Infrastructure Plan can be used as a guide to promote the installation of buffers to help protect those sensitive areas.

On parcels in which development is proposed for future construction, the green infrastructure boundary indicates the areas where the existing land features should be preserved and perhaps enhanced to receive and transport runoff much as it did in its natural, pre-development or pre-agriculture state.

11.5 Implementing the Green Infrastructure Plan

The municipalities in the watershed should review the draft Green Infrastructure Plan criteria presented in this chapter and adopt their own green infrastructure plan to be incorporated into their comprehensive land use plans as well as their subdivisions ordinances. This will allow municipal staff to guide developments early on in the planning process and will give perspective developers a clear picture as how a community wants new development designed to meet their community goals, which should support and compliment the goals and objectives of the Tyler Creek Watershed Plan.

Because the green infrastructure boundary presented in this plan is derived purely from GIS datasets and not field data, the boundary shown on the exhibits represents the approximate extent and not the exact boundary on a given parcel should occur. It is useful at this resolution to assist land planners and engineers during the concept planning stage of development to help locate areas within the proposed development which should remain undisturbed or require additional stormwater treatment to protect high quality sensitive areas. The exact boundaries of the green infrastructure on a parcel planned for development should be determined early on during the development design stage using wetland and soil field investigations, and mapping of the true 100 year floodplain (not Zone A approximations) on the project site using 1 foot topography. Wherever possible, isolated depressional areas (such as farmed wetlands) should be preserved and connected to the green infrastructure network using relatively undisturbed overland flow corridors.

11.5.1 Suggested Ordinance & Zoning Revisions

The following restrictions and requirements should be considered by the municipalities to incorporate the green infrastructure concepts into their ordinances and zoning designations:

- Review existing subdivision and zoning ordinances to determine if higher building densities could be offered to developers in exchange for them providing Green Infrastructure Plan elements in their proposed plans.

- Require developers to submit a delineated Green Infrastructure Boundary on their development plans and provide a brief explanation of how existing green infrastructure will be protected or how the green infrastructure will be restored to provide enhanced ecological, water quality, and aesthetic benefits to the watershed.

- Restrict encroachment and disturbances in the green infrastructure boundary (GIB) by new development. Allow disturbances only if they are absolutely necessary and in those cases enforce strict guidelines as to the amount of disturbance allowed and degree of site restoration required (along the lines of “put it back to a condition better than you found it”).

- Require stormwater facilities be constructed outside of the green infrastructure boundary and all stormwater discharges to the green infrastructure area occur via outlet systems designed to release runoff as sheet flow rather than concentrated point discharges from traditional storm sewer outfalls (i.e. level spreaders, subsurface drains, etc.).

- If new development infrastructure, such as stormwater facilities, must be constructed within the green infrastructure area, then such facilities must be designed to maximize habitat and replicate the geometries of natural wetlands (i,e, shallow side slopes, native wetland vegetation, etc.)

- Where new development occurs near channelized stream corridors or isolated low quality wetlands, the development should be required to restore or enhance

these features to replicate their pre-disturbed vegetative quality and hydrologic function.

- Review existing landscape ordinances to ensure that property owners who maintain a green infrastructure buffer are not cited for weed nuisance laws

- Review existing ordinances to ensure that prohibitions on landscape waste or pet waste disposal in green infrastructure area exist, and can be enforced.

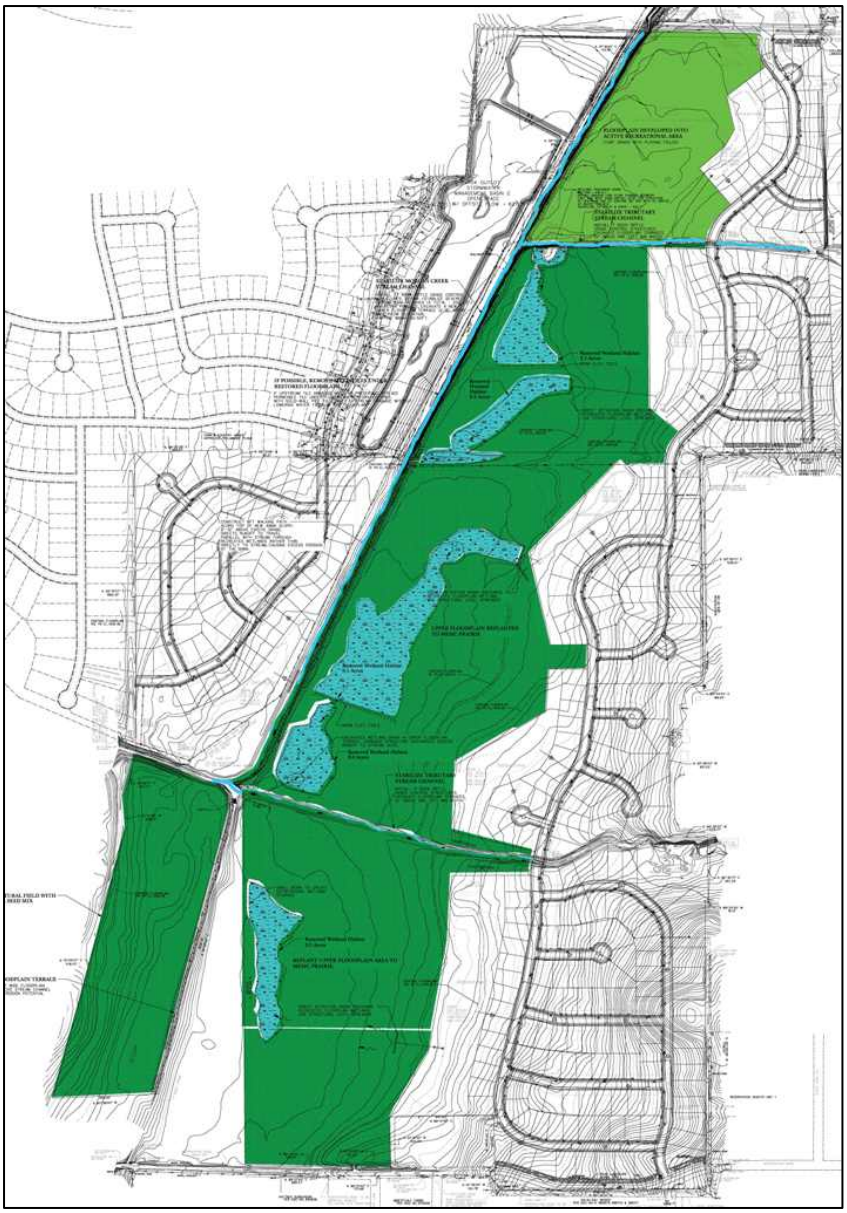


Figure 11.6: Example of green infrastructure being preserved as part of a future development. In this case, the development proposed for the east side of the stream is locating it's stormwater drainage system outside of the greenway (shown here in green) and restoring a 300 foot to 800 foot buffer along the stream corridor to native prairie as well as converting farmed wetlands and hydric soil depressions back into functioning wetland basins. All stormwater detention on the east side of this new corridor will discharge using level spreaders to maximize infiltration and pollutant removal as runoff flows from the development overland through the restored prairie and wetland communities. Development on the west side of the creek was already under construction at the time of this project, and it is very apparent that traditional planning was utilized, resulting in essentially no functional green infrastructure on the west side of the stream.

11.5.2 Landowner Outreach & Education on Green Infrastructure

Outreach and education on the components of and benefits associated with the watershed's green infrastructure should occur at two levels.

11.5.2.1 Developers

The Green Infrastructure Plan should be adopted by the municipal leaders and presented to developers as a guide to illustrate which existing landscapes the municipality values and desires to see them preserved or enhanced as part of development on a given parcel. The green infrastructure plan should be made available to developers as soon as possible in the concept planning stage and developers should be encouraged to contact and coordinate with municipal staff to discuss the how the development will be designed to fit within the framework of the green infrastructure network.

11.5.2.2 Private Landowners

A practical Green Infrastructure Plan recognizes that existing buildings and manicured landscapes have already encroached into the Tyler Creek's green infrastructure zone. Where possible, the plan should recommend that landowners consider the benefits to Tyler Creek by re-establishing a buffer of native vegetation between maintained landscapes and the adjacent stream or wetland. The draft plan recommends that landowners maintain or re-establish a 50 -100 foot natural buffer wherever possible along stream corridors and 25 - 50 foot buffers around natural wetlands. Access paths are recommended rather than large turf grass borders along wetlands and stream channels. Prohibit dumping of waste (like grass clippings, landscape waste, construction debris, garbage, etc.) in the buffer zone.

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