A Holistic Approach to Residential Development

for Hanover, Minnesota

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Minnesota Pollution Control Agency

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Table of Contents

List of Tables

List of Figures

1.0 Introduction

This project was initiated to assist the City of Hanover in considering how to meet its growth needs while preserving natural resources and rural character of the city. Under the typical development design process, growth typically comes at the expense of a community's natural resources. Forests, prairie remnants, natural topography, and stormwater resources are often lost or become fragmented by development patterns that are planned based on the number and size of lots to be loaded onto a site, rather than on environmental considerations. As an alternative, conservation design principles generate development patterns that emphasize preserving the integrity of natural resources and creating great places to live. These design principles reduce the tension between development pressure and environmental preservation, and identify alternative patterns of growth that accommodate and respect natural resources. The conservation design approach turns the conflict between growth and preservation into a partnership, and it allows the City of Hanover to meet development demands while preserving the community's natural character.

This study consists of two primary components: the first investigates the creation of an ecological corridor in the Hanover annexation area of Rockford Township; and the second recommends a process of residential development for the area outside the ecological corridor that minimizes environmental impact, slows urban sprawl, and preserves rural character. These components are demonstrated through the creation of two prototypic development layouts designed with the conservation design process in mind.

2.0 Ecological Corridor Study

The first task of this project was to identify the most ecologically valuable land in the Hanover annexation area (Figure 1, Location Map) and to suggest a development strategy that will preserve these areas and create connections between them. An ecological corridor that maintains a continuous protected connection between higher-quality areas was delineated based on the distribution of those areas. This corridor will serve as the backbone for the preservation of the area's natural resources. Development can occur around the corridor so that the Township preserves its natural resources and rural character while accommodating growth.

The project also describes the regional context of Rockford Township's natural resources and identifies their connections to ecologically valuable resources outside of the annexation area.

2.1 Land Use History

Prior to European settlement, the entire area that eventually became Hanover and Rockford Township was part of the Big Woods, an extensive forest that was the dominant landscape feature of southeastern Minnesota, extending up toward the center of the state. The Big Woods was a rich forest dominated by sugar maple, basswood, and oaks with a diversity of shrubs and wildflowers on the forest floor. Regionally, this forest was interspersed with wet prairies and small lakes (Figure 2, Pre-Settlement Land Cover Types).

When land is disturbed, either directly or indirectly, natural cycles are interrupted, and hydrologic and nutrient balances shift. This interrupts native plant life cycles and allows for weed invasion, causing further degradation of habitat. The changes in the types of plants in a community in turn affect the types of insects, birds, and animals that inhabit the community and that play a role in its sustained regeneration. Because of this, disturbance and weed invasion can develop into self-perpetuating problems that require active management to slow and reverse. Direct human disturbances have historically included activities such as logging, grazing, and tilling. There are also indirect disturbances to the ecosystem, including the introduction of non-native invasive plant species such as buckthorn and growing deer populations due to the elimination of natural predators.

The Hanover annexation area is currently dominated by row crops and non-native grasslands used for livestock grazing. Residential development is more prevalent around Lake Martha, Lake Charlotte, and Wagner Lake. Forested areas remain, but they are primarily small patches with little or no connection between stands (Figure 3, Remaining Forest).

2.2 Results

The mapping of land cover types and ecological quality ratings portrays the annexation area as dominated by agricultural land but interspersed with several high-quality remnant forests. The majority of the forested area is in the northern half of the annexation area. These pockets of forest are remnants of the Big Woods that covered the annexation area prior to European settlement and are very good examples of the area's pre-settlement natural history. Their canopies include sugar maple, oaks, and basswood, and they have diverse shrub and wildflower species on the forest floor. Buckthorn and other invasive species are absent or minimally present.

Based on the distribution of high- and medium-quality vegetation communities, a proposed ecological corridor has been identified that spans the proposed annexation area from Moose Lake east to the Crow River (Figure 4, Ecological Corridor). The corridor links several high-quality forested communities, as well as parts of the Lake Martha, Lake Charlotte, and Wagner Lake basins. Two additional high-quality forested areas lie outside of the corridor, but are either close to the corridor or have good proximity to larger groups of natural communities outside of the annexation area.

Starting at the east end, the corridor begins with several high- and medium-quality forested areas near the Crow River. Continuing westward, the corridor enters a large area of high-quality maple-basswood forest located just east of lakes Martha and Charlotte and extends west and south of the lakes to Wagner Lake. Preserving areas of high ecological quality within the corridor and restricting development in the linkages between those areas will establish the corridor as a continuous band of ecologically valuable land cover from the Crow River west to Wagner Lake.

3.0 Development Outside the Corridor

This chapter addresses residential development outside the ecological corridor. A method of residential development planning called Conservation Design is suggested. For demonstration purposes, a prototypic residential development has been created for a 380-acre parcel of land in the Hanover annexation area.

The conservation design process is credited to Randall Arndt. Source: Conservation Design for Subdivisions, 1996 by Randall G. Arndt.

3.1 Current Development Problem

Hanover zoning and ordinances require subdivisions to be platted in 2.5-acre lots. Although there are personal advantages for homeowners with 2.5-acre lots, there are many environmental disadvantages, the largest being urban sprawl and destruction of natural landscape function (such as habitat and stormwater treatment). The City of Hanover recognizes the disadvantages and wants to change the way agricultural land is developed into housing. The City is in the process of revising its ordinances and zoning codes to accommodate the conservation process for subdivision layout.

In many communities, dense housing is required. Unfortunately working *with* the ecology of the land to create a multi-functional community is not required in most communities. Protection of wetlands, lake shores, and stream protection is often required, but protection of forest, significant trees, natural drainage ways, soils, or cultural resources like old farmsteads is not. Social aspects of good living—such as easy access to open space for children and adults to gather, trails, safe access to neighboring communities for kids, and having a connection to the history of a place—are often considered peripheral.

The diverse needs of people and the preservation of natural land function are far too often ignored in the process of suburban residential development.

3.2 Conservation Development Design – It's all about Process

Conservation design is a process of cluster-type development that enables land to be developed while simultaneously reducing impacts, capturing stormwater runoff, and creating great neighborhoods in which to live. These goals are accomplished through a creative design process that identifies conservation areas of sensitive landscapes such as forest and steep slopes, and designs home sites to maximize views and connection to designed open space. A key goal is to preserve predevelopment stormwater flow patterns and to detain and infiltrate stormwater on site.

The conservation design process begins with an extensive analysis of the land to be developed prior to any design work. Naturally and culturally significant aspects of the land are identified and mapped. This includes mapping steep slopes, water bodies (such as wetlands, streams, lakes, and springs), natural waterways, native vegetation (such as forest prairies and savannas), and soils (see Figure 5). Cultural and historical elements such as significant Native American grounds and historic farmsteads are also mapped. These separate maps are then combined in a map that identifies all significant environmental and cultural features of that parcel. Figure 6 shows areas that are not considered for development in the prototype discussed below. In the conservation design process, this land is set aside as open space. The goal is to preserve the natural form and function of the land.

The land outside of the preservation area in the parcel is considered developable. But, of this, **only 50 percent** is developed. The idea is to create 'villages' or clusters of homes framed by the open space to provide:

- Privacy
- Recreation
- Views
- A sense of community
- Safe access to adjoining neighborhoods
- A place to soak stormwater into the ground
- Wildlife habitat
- Energy conservation through wind breaks
- Opportunities for passive solar and active solar energy capture
- Natural beauty and rural character
- Reduced homeowner landscape maintenance
- Reduced irrigation

This design process creates a *healthier* place to live.

3.3 Features of the Hanover Conservation Design Development

As an example of how conservation design can be applied to developing land outside the corridor, two prototypic layouts have been created for a 380-acre parcel of land within the annexation area. For comparison, a development has also been laid out as current Hanover ordinances would require.

This lay-out includes 2.5-acre lots, wide streets, and property-boundary-to-property-boundary platting of lots (see Figure 7). It is referred to as 'rural residential' development in this document. Figure 8 shows how this method of development leads to the destruction of many of the natural features of the site identified in Figure 6.

Both conservation design scenarios (see Figures 9 and 10) avoid areas identified as environmentally sensitive (see Figure 11) and allow development of only 50 percent of the developable land outside the sensitive area. Aspects of the conservation area design scenarios are compared to the rural residential design in Table 1. For purposes of this document conservation design scenarios 1 and 2 will be referred to generally as conservation design.

Table 1 Conservation Development Analysis

total acres	380
significant wetlands, slopes > 12%, floodway	-51
Buildable acres	329

		CONVSERVATION DESIGN	
	Rural Residential Design	Scenario 1: 100-Foot Frontage	Scenario 2: 80-Foot Frontage
Total Area	380 acres	380 acres	380 acres
Total Buildable Area	329 acres	329 acres	329 acres
Average Lot Size	2.82 acres	0.33 acres	0.26 acres
Lots per Acre (Buildable area)	0.31 lots/acre	0.88 lots/acre	1.13 lots/acre
Total Lots	103 lots	289 lots	373 lots
Road Miles	4.6 miles	6.6 miles	6.6 miles
Total Road Hard Surface	19.5 acres	20.8 acres	20.8 acres
TOTAL HARD SURFACE	42.2	53.3 acres	62.7 acres
Open Space	50.5 acres	211 acres	210 acres
Open Space Percentage of Total Area	13%	56%	56%
Walking/Biking Trails	0.7 miles	9.4 miles	9.4 miles

Specific features of the prototypic conservation developments designed for the City of Hanover are described below.

3.3.1 Ecological Corridor

The corridor mapped for the annexation area (Figure 4) creates connected habitat between the Crow River and the lakes west of Hanover. A portion of this regional feature reaches through the site to the river and is incorporated in this prototypic development as open space. The corridor provides wildlife habitat and movement as well as an opportunity for a unified, safe regional trail system.

It is important to have a community-wide corridor plan in place prior to development so that when development occurs it can proceed in a manner that preserves this important open space.

3.3.2 Open Space Network within the Community

One appealing aspect of conservation design is that families own a third- or quarter-acre of land while having direct access to hundreds of acres of land with trails, active parks, natural areas, and with easy access to friends. Less time is spent mowing and caring for a landscape, leaving more time for recreation that can occur just outside the back door. In this example, every home has open space adjacent to their back yard while many others also have open space across the street. This provides a connection to nature and a feeling of privacy. Figure 12 illustrates this concept.

People can socialize as they encounter neighbors on daily walks. Children can safely bike to friends' homes, reducing the number of car miles logged for 'play dates'.

Much of the open space is composed of the forest and wetlands that long existed on the property, while former agricultural fields are restored to prairie wildflowers and grasses. Maintenance is lower in prairies than for mown landscapes. Prairies also eliminate the need for irrigation, fertilizers, and pesticides while providing wildlife habitat. Nestled into this natural landscape are, play structures, gazebos, and small active use parks for ball games. These provide destinations on daily walks and places for neighborhood gatherings.

3.3.3 Distinct Neighborhoods

Neighborhoods are clustered into 'villages' where neighbors can identify and easily get to know each other. Central open space is available for informal interaction and organized neighborhood events. Knowing one's neighbors is an added value which creates community and a sense of belonging.

3.3.4 Home Energy Savings

The first and least expensive step in home energy savings is to provide direct access to the sun, and this starts by orienting roads east-west when the development is designed. The streets in this prototypic development are, as much as possible, oriented east-west in order to position the front or back of the home to the south for solar gain. Passive solar gain in south-facing windows saves a considerable amount of heating energy in the winter. By building appropriately sized roof overhangs, summer sun is blocked but winter sun comes beaming into the house. Orienting the house to the south also provides roof space that is appropriately oriented for solar panels (see Figure 13).

An additional aspect of energy savings in the conservation development plan is to plant windbreaks within every open space. The wind breaks serve to lift winds above rooftops, thus saving heating costs. This is increasingly important in Minnesota as the climate changes. Higher wind speeds are predicted and are beginning to be experienced. Windbreaks on the northern and western aspects of the site take winds aloft. It is also important for homeowners to plant trees on their lots. The landscape between windbreaks should have 40 to 50 percent tree canopy cover to keep winds aloft. Trees should not, however, be planted on the south side of home where they block winter sun.

3.3.5 Rural Character

People move to suburbs like Hanover to live within a rural landscape. Often, however, as people build, the very aesthetic they are seeking is spoiled by residential development. The layout of the conservation design developments strives to retain rural character while allowing hundreds of homes to be built on the land. This is accomplished through preservation of the site's significant natural features and creation of interconnected open space.

Rural character is also preserved by creating an undeveloped buffer along the roads surrounding the site. This open space keeps homes a few hundred feet away from busy roads and not in the central cone of vision that is seen from the driver's seat. Within this undeveloped buffer, windbreaks serve a double purpose by screening the views into neighborhoods adding to the rural feel. The buffer not only preserves a rural feel for those driving the major collector roads but also provides privacy for residents.

All pre-existing farmsteads on the parcel have been preserved. Nothing represents the rural landscape more than the presence of barns, silos, and outbuildings. The farmsteads can be sold as small hobby farms, or be converted into community centers. Either way, they provide a valuable aesthetic and retain an historic aspect of the land.

Lastly, to add to the beauty of the landscape, many homes on the periphery of the development along the surrounding collector roads face the street rather than being placed with their backs to the collector roads. In many suburbs, homes are built with beautiful approaches, but because of road layout they often turn their backs to major streets. At the edge of this prototypic conservation development, homes are positioned to face the major street by placing them on one side of the interior street.

3.3.6 Using Stormwater as a Resource

Stormwater in urban and suburban environments is often treated as a waste product–piped to the nearest natural water body away from homes and streets. This creates problems downstream and wastes a precious resource which could be put to good use watering landscapes and recharging groundwater.

In the conservation design development, streets have no curb, gutters, or stormwater ponds. Stormwater flows off streets and into rainwater gardens where it soaks into the ground. During large storm events the rainwater gardens overflow into the open spaces where large, shallow infiltration basins (stormwater meadows) are placed (see Figure 12). These subtle, broad basins blend with the prairie landscape and accept twelve to eighteen inches of water which soaks into the ground in one or two days. Ponds are not necessary. Here, street runoff waters the prairie and soaks down to the water table rather than running off site in a pipe to the river where flooding may become an issue.

It is helpful to compare the stormwater runoff statistics of the 2.5-acre lot rural residential development (Figure 7) to the conservation design development (Figure 9). The stormwater drainage system assumed for the rural residential development is the typical storm sewer pipe and pond approach. This includes streets with curb and gutter and catch basins that drain to retention ponds, which in turn drain to the Crow River. In contrast, the conservation design development manages stormwater with an infiltration based system that minimizes storm sewer pipes and eliminates ponds. Infiltration is achieved by directing runoff into a series of rainwater gardens and storm water meadows.

The conservation design development uses infiltration to manage stormwater runoff and therefore generates far less runoff (up to four times less) than the rural residential design. This is true even though there are nearly three times the number of houses and many more miles of road. This is the most striking and most significant difference between the two design approaches. Stormwater modeling indicates that over 80 percent of the development's annual runoff soaks into the ground through the rainwater gardens and stormwater meadows. This irrigates the landscape and recharges groundwater rather than simply running off the land and into a pipe that drains to the Crow River. Recharging groundwater helps the Crow River by contributing clean water slowly to the system through underground routes. This allows the river to flow during dry times. In the rural residential development no water is infiltrated, and all runoff is piped to the Crow River.

Water quality improvements are experienced in both developments, but are greater in the conservation design development. Total suspended solids (TSS) are particulate matter that runs off streets, lawns and driveways. They contain phosphorus, among other contaminants, which become pollutants in down stream water bodies. About 85 percent of TSS settles out in the ponds of the rural residential development, whereas about 98 percent is removed in the infiltration system. Another measure of water quality is total phosphorus. Sixty (60) percent is removed in the rural residential development system whereas 92 percent is removed in the conservation design system. In the infiltration system the phosphorus becomes fertilizer for plants within infiltration basins rather than a pollutant in the Crow River.

Table 2 Stormwater Runoff Comparison of Rural Residential and Conservation Design Scenario 1, 100-Foot Frontage

Development Type	Total Suspended Solids Removal	Total Phosphorus Removal	Runoff Volume Reduction
Rural Residential	85%	60%	0%
Conservation Design	98%	92%	83%

3.3.7 Impervious Surface Reduction

"An ounce of prevention is worth a pound of cure." Paving the surface of the earth causes problems such as increased stormwater runoff and downstream flooding, lack of groundwater recharge and watering of plants because stormwater is piped away, and increased urban-heat-island-effect as pavement accumulates heat in the summer. In designing the development, consideration was given to reducing the amount of pavement to that which is necessary only to reduce the amount of stormwater runoff and reduce construction costs. Streets with parking on both sides are planned only where the demand for parking warrants their construction. Most roads are narrow with parking on one side or with bump-out parking. One-way streets are also used to reduce road width, and in stretches of road with no homes, the road is reduced to just two driving lanes. This reduces the amount of pavement and therefore the amount of stormwater runoff. It also reduces the amount of petroleum and gravel used in construction, thus reducing costs. The loop roads in the northern portion of the site are designed for one-way traffic to further reduce road width. An added benefit of narrower streets is reduced driving speeds. Lastly, maintenance is reduced since there is less street to plow in the winter, and when the time comes to repair the streets, less surface area is repaired. Great cost and environmental savings are experienced.

Bump-outs allow for parking while reducing pavement.

Long, paved driveways add up to a lot of impervious surface. This is especially evident when three-car garages are built. A three-lane driveway the length of two or three cars adds up to a significant amount of paved surface. This is prevented in the conservation design scenario by limiting the house setback from the street to 20 feet. This leaves room to park two or tree cars in the driveway, depending on width, but keeps the amount of paved surface low.

A comparison of hard surface area within the conservation design scenarios compared to the rural residential (2.5-acre lots) is presented in Table 1.

3.4 Considering Climate Change

As evidence of climate change mounts, we may want to consider designing new neighborhoods to be less polluting, to consume less fossil fuel during construction and maintenance, and with homes that are required to be more energy efficient. Predictions for changing climate in Minnesota indicate potential changes that include the following: (Source: Minnesota Weather Almanac, 2006 by Mark Seeley)

- Greater wind
- Storm events that are less frequent but more intense
- Warmer winters
- Less snow cover in winter
- More summer days above ninety degrees

Coupling these changes with rising energy costs, it makes sense to design our communities to withstand changing weather conditions while conserving energy. The conservation design neighborhood accomplishes this in the following ways:

- Providing windbreaks that slow winter winds and therefore save heating costs. Creating open space in the development allows for the planting of windbreaks throughout the development.
- Incorporating rainwater gardens and storm water meadows that prevent storm water from leaving the site. Instead it is soaked it into the ground where it waters the landscape and recharges groundwater.
- Reducing lot size reduces the amount of mowing, watering, fertilizing and pesticide application in individual yards. Instead of communities with large lots that are mostly mown, neighborhoods with common open spaces are created that are planted primarily with native prairie species that do not require as many resources to manage.
- Designing dense housing. This results in less urban sprawl and reduced driving. Narrower streets and shorter driveways take less fossil fuel to construct and maintain. They also absorb less heat in the summer, and therefore preventing urban-heat-island-effect and requiring less energy to cool homes in the summer.
- Orienting road to run east-west in order for either the front or back of the home to be oriented to the south to take advantage of passive solar gain. This allows for the capture of the sun's free energy to supplement home heating. It also allows for appropriately oriented roofs that can accommodate solar panels.
- Providing a variety of open space allows for highly desirable local recreation opportunities. People can step out their back door for a nice walk or bike ride. They don't have to drive to a nearby park. Also, children can safely walk or bike to friends in nearby neighborhoods avoiding the necessity to drive kids to friends' houses.

3.5 Development Costs

Cost per lot development for the conservation design scenario is cheaper than rural residential development even though the overall cost for the development is greater (See Table 2). Higher density allows for greater cost efficiencies. This, combined with the ecological and social benefits of conservation design, make it an appealing alternative to traditional development. Table 3 illustrates the cost of rural residential design in terms of urban sprawl by comparing how much hard surface is used in 289 lots of the conservation design scenario verses 289 lot of the rural residential design scenario.

Table 3 Cost Comparison of Rural Residential and Conservation Design Scenario 1, 100-Foot Frontage

	Rural Residential	Conservation Design, Scenario 1
Roads	$1,275,918	$1,357,824
Sanitary	$1,103,310	$1,566,720
Water	$858,130	$1,218,560
Storm Sewer	$108,150	$85,050
Walking/Biking Trails	$32,525	$436,762
Total	**$3,378,033**	**$4,664,916**
Cost Per Lot	$32,796	$16,142

Table 4 Urban Sprawl Comparison of Rural Residential and Conservation Design Scenario 1

	Rural Residential	Conservation Design 100-Foot Frontage	Percent Reduction
Hard Surface Required for 289 Lots	118.5 acres	53.3 acres	55%
Total Area Required for 289 Lots	1066 acres	380 acres	64%

4.0 Conclusion

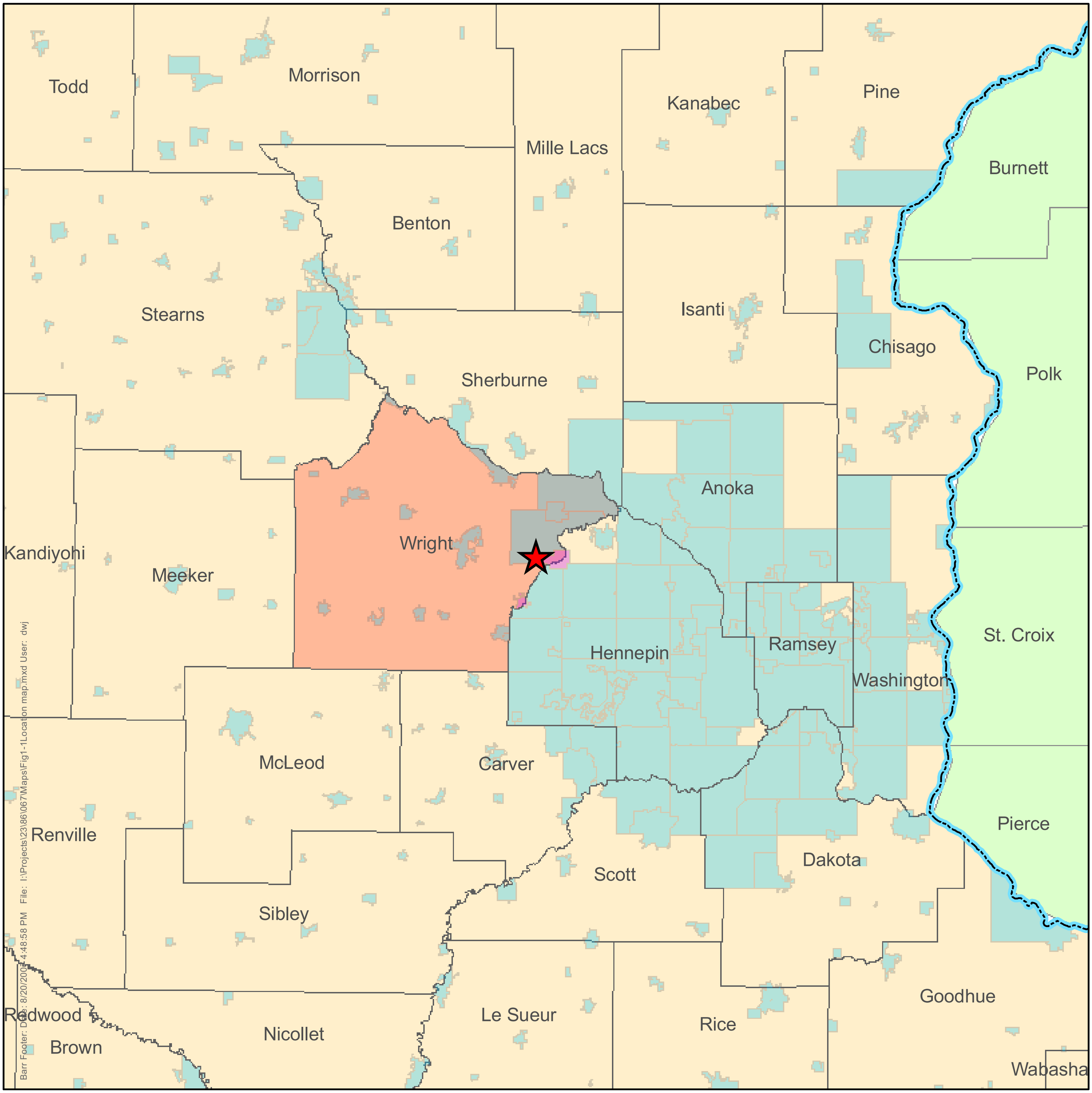
In the conservation design process of subdivision layout, creating great places to live begins with preserving the natural features of a site and its rural character. The process focuses on limiting ecological impacts on a site; impacts that in the past have resulted in long-term headaches for neighborhoods and cities such as expensive road repairs, continual erosion and water quality problems, and maintaining big yards.

As presented in this document, conservation design has many significant advantages for residents and ecosystems as well as the greater community. Creating a conservation design development may not be possible in your community because of the way city ordinances and zoning policies have been written. The first step in promoting conservation design in your community is to rewrite these policies. A resource that can assist in this endeavor is: Growing Greener; Putting Conservation into Local Plans and Ordinance, 1999 by Randall Arendt.

The second step to creating a conservation design community is to hire a multidisciplinary team of qualified designers. Locate designers that have been trained in the many facets of creating healthy living environments, including social, behavioral, ecological, recreational, and structural considerations. This team should include landscape architects, planners, ecologists, hydrologists, soil scientists, civil engineers, and other appropriate professionals who, together, can address all the issues encountered when designing great places to live.

The conservation design community might appear futuristic. But isn't it simply a harkening to the past when small villages were surrounded by natural and agricultural land? Consider promoting conservation design in your community.

Figures



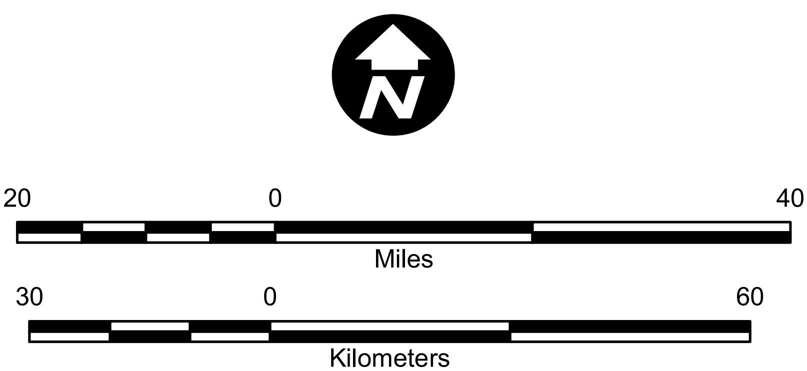


Figure 1
Location Map

★ - Project Location

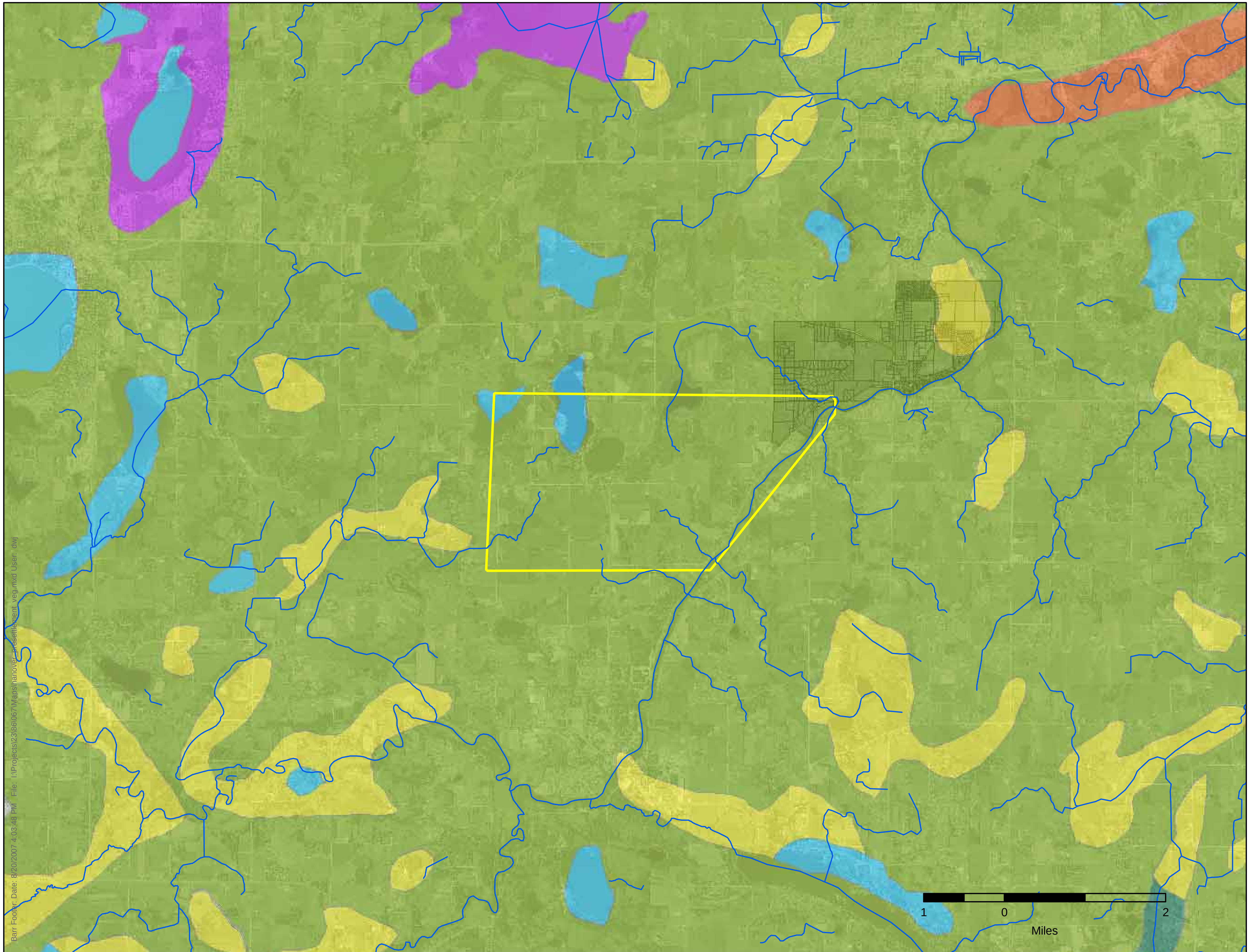
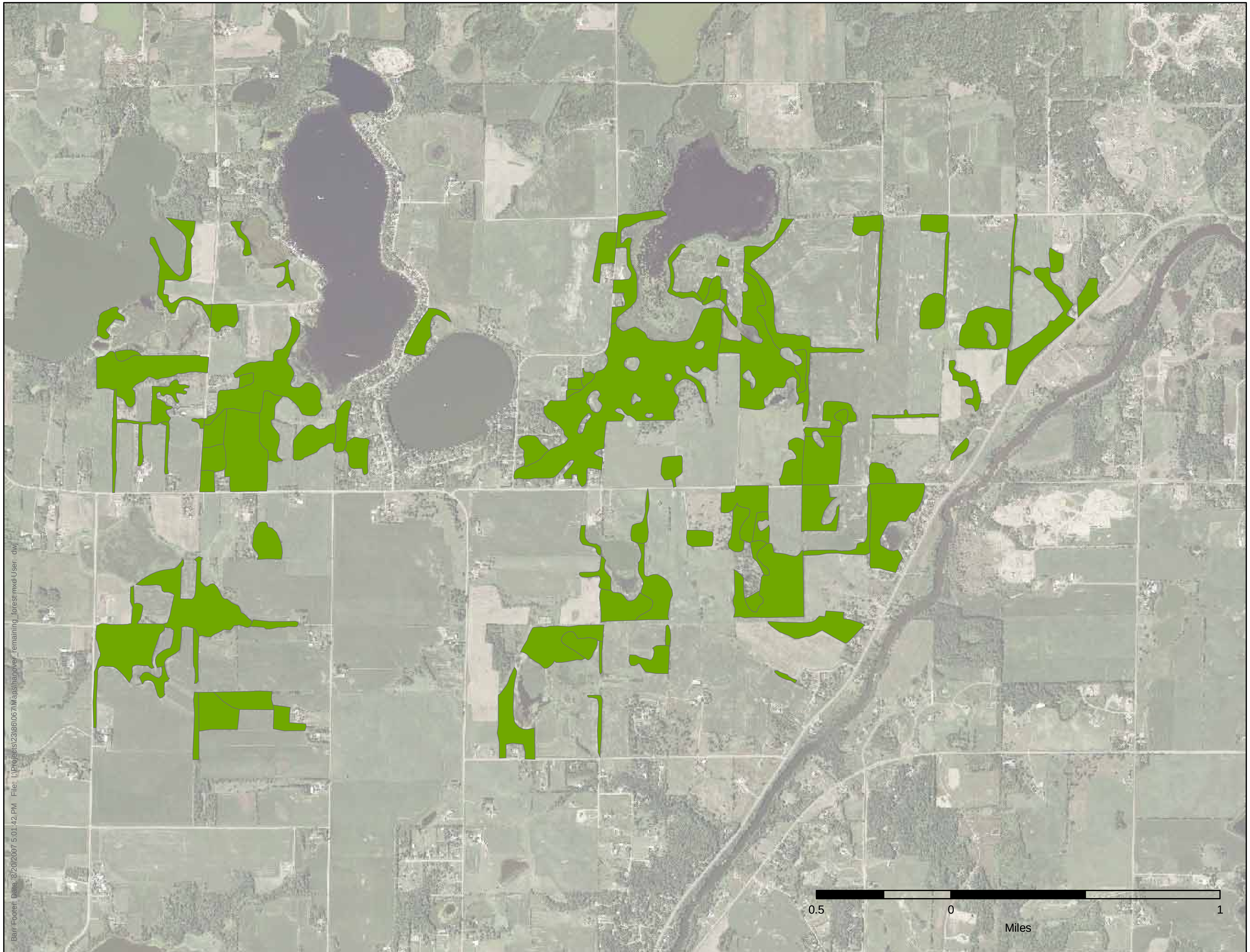


Figure 2
Regional Presettlement Vegetation



Legend

Remaining Forested Area

1" = 6000'

Figure 3
Remaining Forested Area
in Proposed Annexation

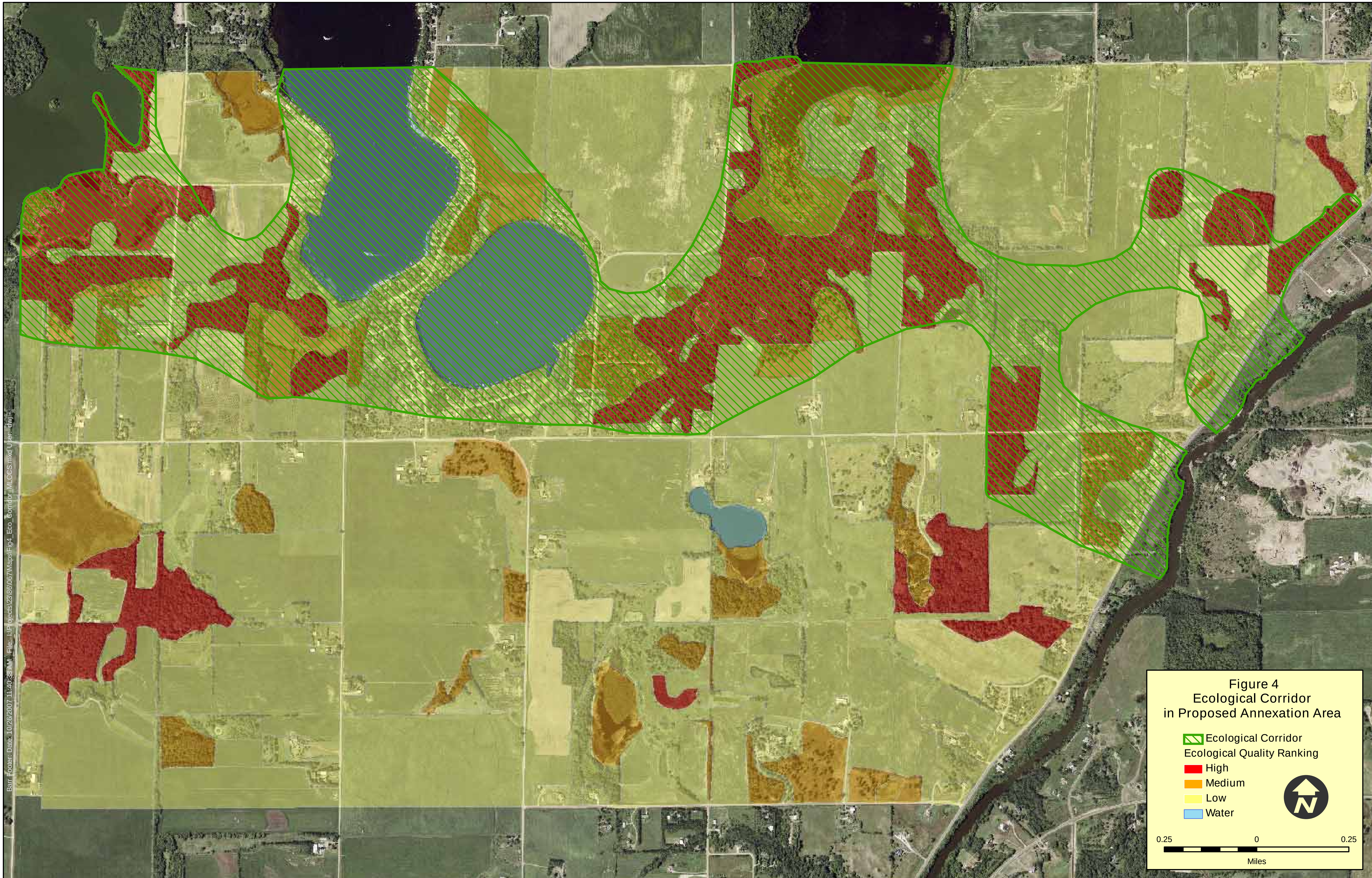
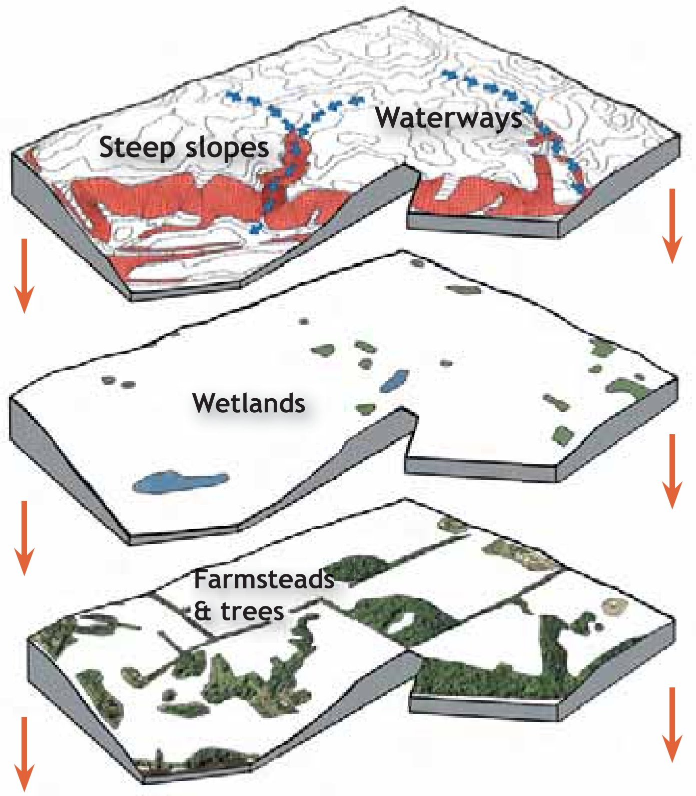


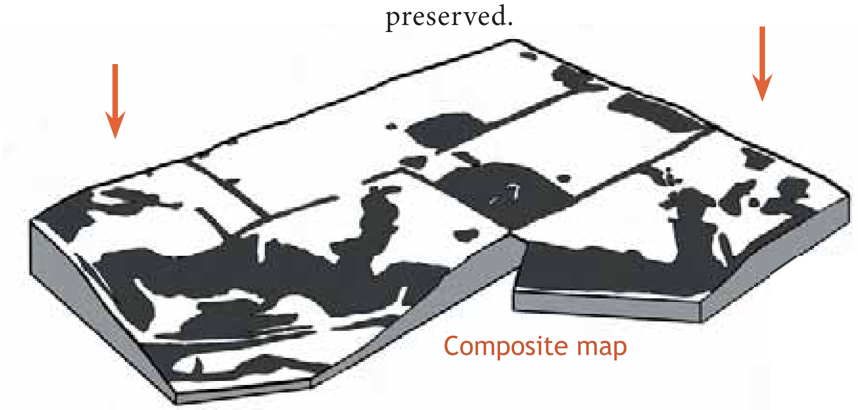
Figure 4
Ecological Corridor
in Proposed Annexation Area
Ecological Corridor
Ecological Quality Ranking
High
Medium
Low
Water
N
0.25
0
0.25
Miles
Barr Footer: Date: 10/26/2007 11:40:38 AM File: I:\Projects\23\86\067\Maps\Fig4_Eco_Corridor_MLCCS.mxd User: dwj

Process

First, the natural features of the land are evaluated and mapped.



Then, the separate maps are brought together in a composite map that identifies all of the natural and historical features of the land that should be preserved.



The land outside of the identified natural areas is considered developable. Of this, half is set aside for recreational open space, stormwater management, and wildlife habitat. Together with the preserved natural areas, this open space serves to retain the natural character of the land.

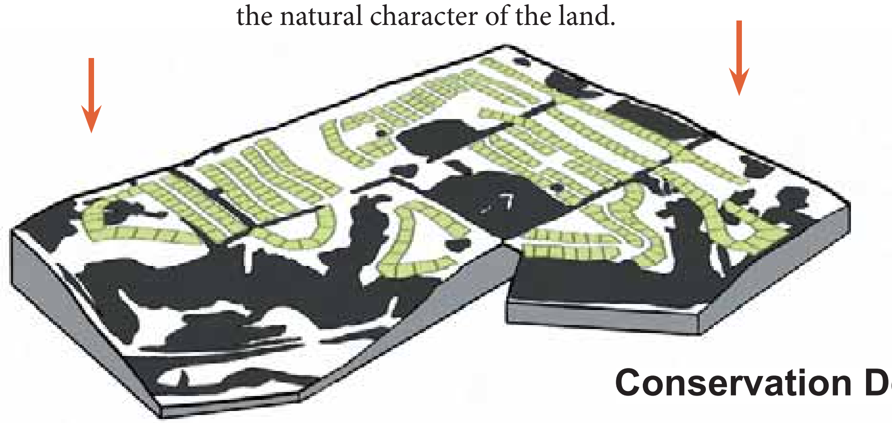


Figure 5
Conservation Design Process

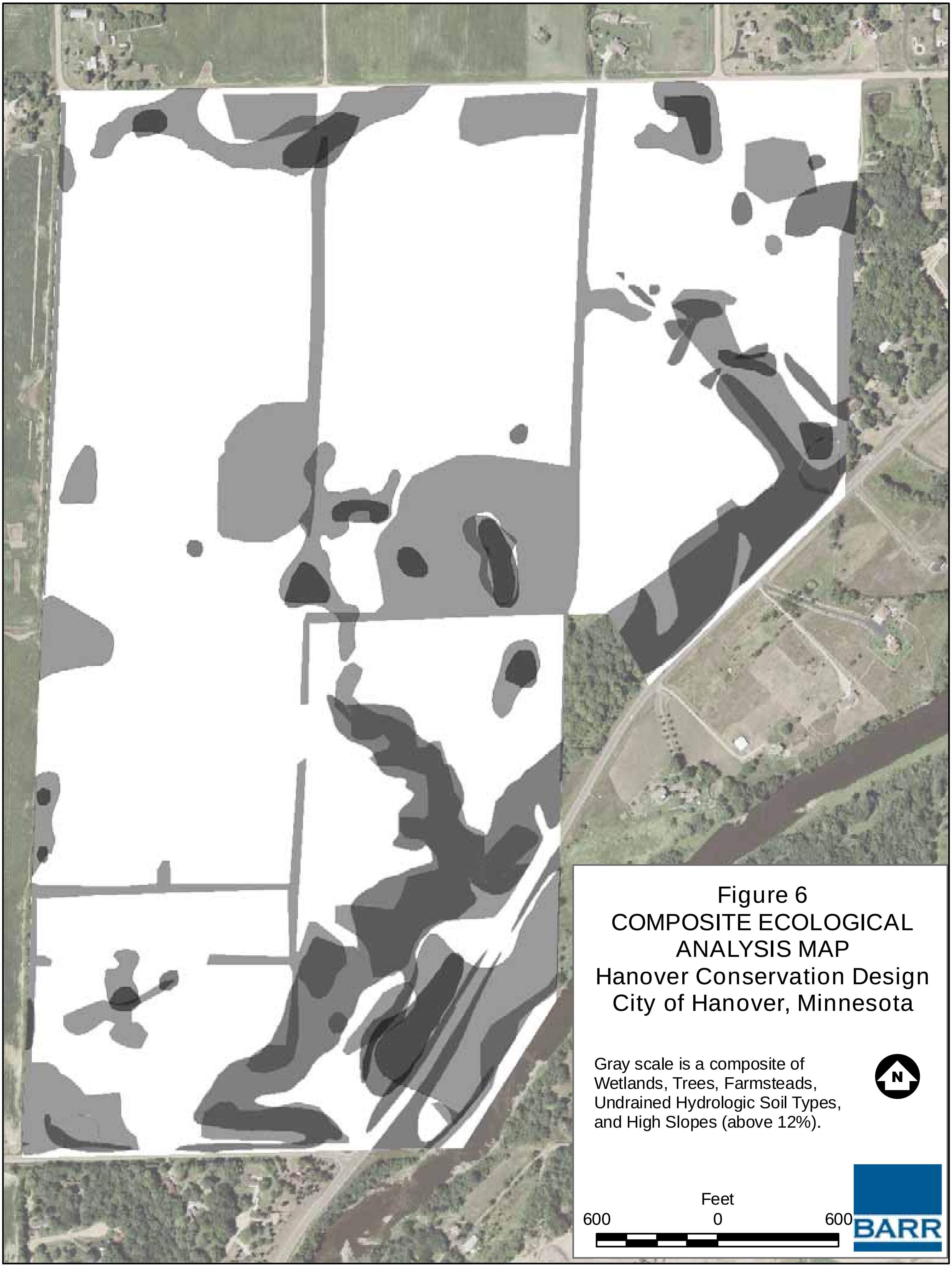


Figure 6
COMPOSITE ECOLOGICAL ANALYSIS MAP
Hanover Conservation Design
City of Hanover, Minnesota

Gray scale is a composite of Wetlands, Trees, Farmsteads, Undrained Hydrologic Soil Types, and High Slopes (above 12%).

Feet
600 0 600

BARR


Figure 7
RURAL RESIDENTIAL
2.5 ACRE LOTS
Hanover Conservation Design
City of Hanover, Minnesota
Legend
Lots
Wetland
Park/Open Space
Prairie
N
600
0
600
Feet
BARR

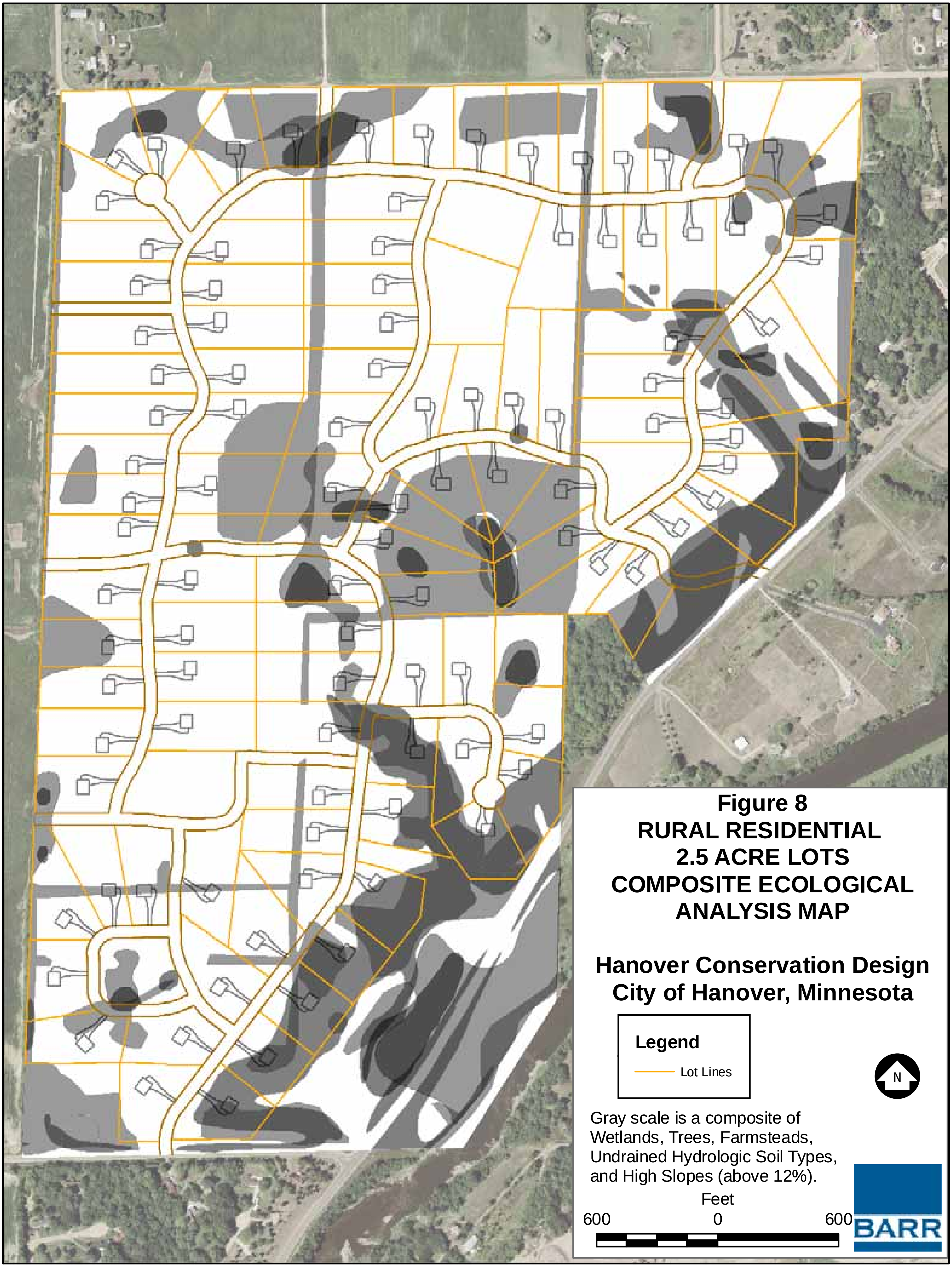


Figure 8
RURAL RESIDENTIAL 2.5 ACRE LOTS COMPOSITE ECOLOGICAL ANALYSIS MAP

Hanover Conservation Design
City of Hanover, Minnesota

Figure 9
CONSERVATION DESIGN OPTION SCENARIO 1
100 FOOT LOT FRONTAGE
Hanover Conservation Design
City of Hanover, Minnesota

Figure 10
CONSERVATION DESIGN OPTION
SCENARIO 2
80 FOOT LOT FRONTAGE
Hanover Conservation Design
City of Hanover, Minnesota

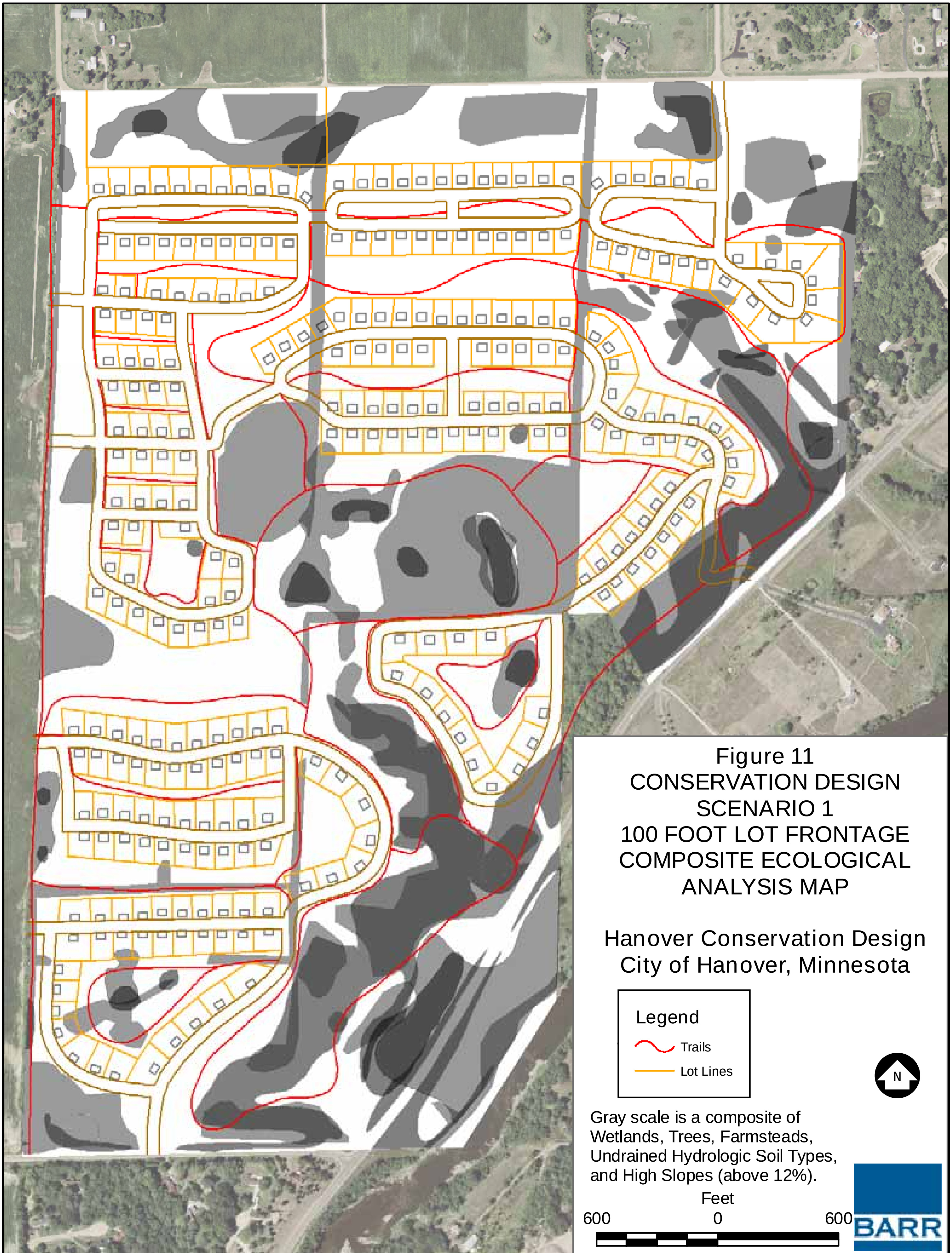


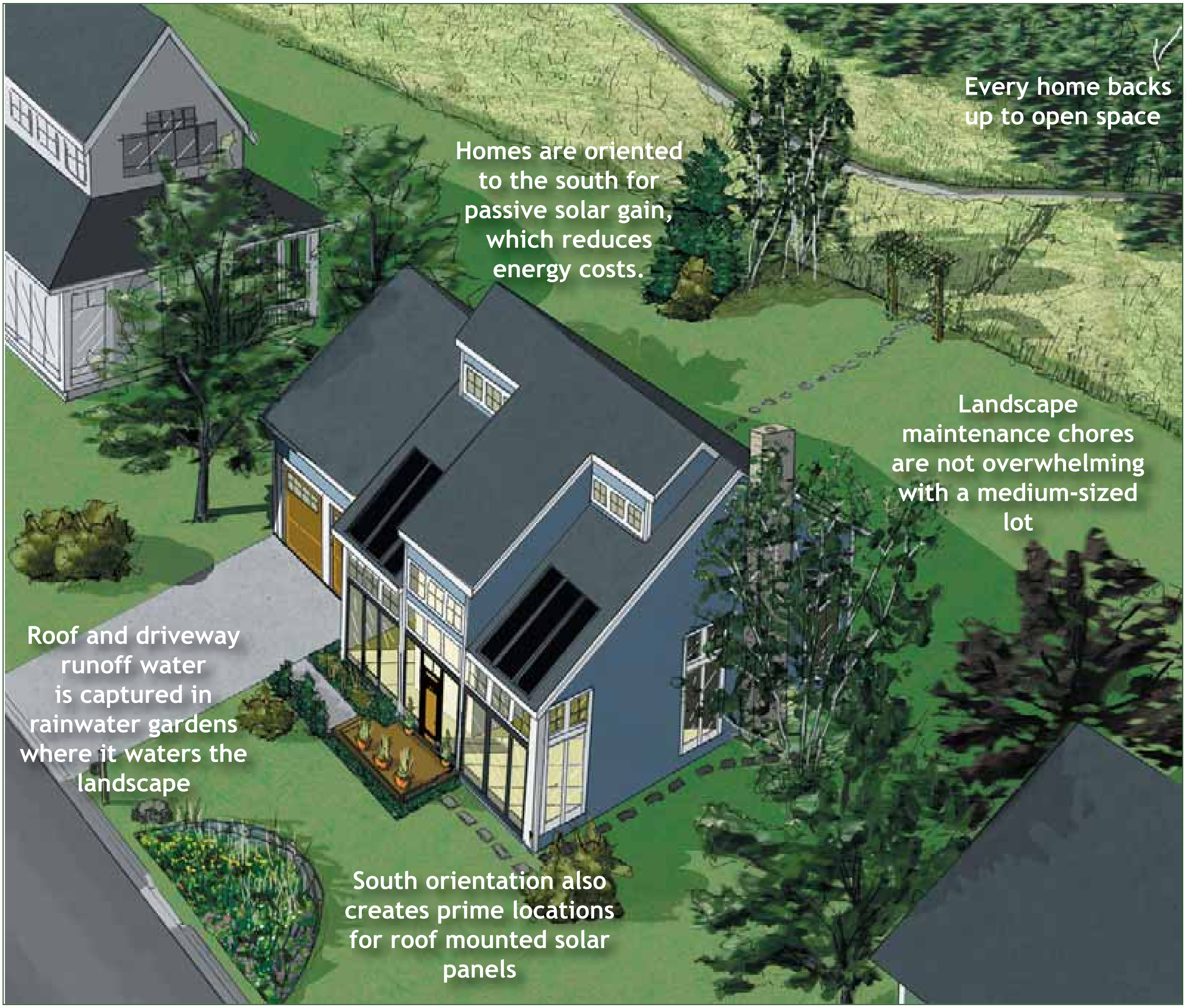
Figure 11
CONSERVATION DESIGN SCENARIO 1
100 FOOT LOT FRONTAGE
COMPOSITE ECOLOGICAL ANALYSIS MAP

Hanover Conservation Design
City of Hanover, Minnesota

This prototypic design for a property in Hanover, Minnesota, used the conservation design process for neighborhood layout. The plan features 50 percent open space with green space adjacent to every back yard, a trail system, habitat creation, distinct neighborhoods, and a natural stormwater management system.

Figure 12
Conservation Design Community

What makes for a great place to live?



With increasing energy costs, it is even more important to take advantage of free heating - the sun! This passive solar home works to store the heat of the sun collected during the day in the floor of the south facing rooms. At night, this stored energy radiates to heat the home (for free). In order to harvest this free energy, it is important to orient homes to the south and streets east-to-west in a new development.

You may have noticed that as a result of climate change our summer rains come less frequently, but more intensely. Large amounts of rain come in short periods. Most of this rain runs away. But we need this water in our landscapes, so it is important to collect stormwater either in rainwater gardens (as shown here), or in large shallow basins that are typically dry (as shown on the previous page). Also, it is best to limit the amount of paving in our neighborhoods to reduce runoff. Building homes closer to the street limits the total amount of driveway in a neighborhood. Narrowing streets by limiting parking to just where it is needed also limits the amount of paving, saving future costs of plowing and repair.

Figure 13
Passive Solar Home in Conservation Design Community