# NELSON'S RIDGE SUBDIVISION

## CONSERVATION APPROACH TO RURAL SUBDIVISION DEVELOPMENT

by

FELIPE SPENCER DENARVAEZ

B.S., Montana State University, 2007.

A REPORT

submitted in partial fulfillment of the requirements for the degree

MASTER OF LANDSCAPE ARCHITECTURE

Department of Landscape Architecture/Regional and Community Planning
College of Architecture, Planning and Design

KANSAS STATE UNIVERSITY
Manhattan, Kansas
2011

Approved by

Major Professor
Katie Kingery-Page

# Copyright

**Felipe Spencer DeNarvaez**

Department of Landscape Architecture and Regional
Community Planning
College of Architecture, Planning & Design
Kansas State University
May 2011

Committee Members:
Katie Kingery-Page
Howard Hahn
Stephanie Rolley

# Abstract

A 2009 research report by the U.S. Census Bureau and the National Resources Inventory predicts that the developed area in the United States will increase by 54.4 million acres during the next 25 years (McMahon 2010, 2). America's rural landscape and character is replaced everyday by "placeless" neighborhoods with limited emphasis on conservation efforts. The intent of this report is to demonstrate the benefits of applying conservation design principles to the development of a conservation subdivision in rural Kansas.

A 132 acre tract of land, currently known as Nelson's Ridge, is planned and designed for a subdivision development. The property is located just east of Manhattan, Kansas. The site includes a tributary drainage corridor surrounded by woodlands, existing agriculture fields and upland prairie. It is located no more than a mile from existing amenities of a growing residential and commercial corridor along Highway 24 in Pottawatomie County. The preliminary plat designed by local engineering firm Schwab-Eaton, demonstrates America's typical or "conventional" approach to subdivision design (Arendt, 1996). The alternative approach is known as a low-impact development or "conservation development" (Gause 2007). After completing a thorough site inventory and analysis, two preliminary designs eventually led to a final conceptual master plan. The two preliminary designs included contemporary and neo-traditional schemes, each portraying conservation principles in alternative ways. Fully understanding the two design alternatives allowed for a balanced and more cohesive final design that incorporated the most positive aspects of both conservation approaches. The preliminary plat and the conservation design were then compared and analyzed in terms of demonstrated design principles and their economic feasibility.

This project provides an example for rural subdivision development in Pottawatomie County, Kansas. The project provides decision makers with a conceptual master plan for Nelson's Ridge that implements conservation subdivision design principles. This project will educate developers, homeowners and the public about design alternatives for subdivision development. The comprehensive analysis of the proposed design will provide important insight into the benefits and limitations of implementing conservation principles into a development.

This book is dedicated to my loving family who have supported me through my graduate studies. Mom, I have finally reached "the light at the end of the tunnel".

# Acknowledgments

I would like to thank my committee members Katie Kingery-Page, Howard Hahn, and Stephanie Rolley for their invaluable assistance in completing my Master's Report. Would also like to thank Rhonda Janke and Huston Gibson for their contributions and feedback.

A special thanks to my Mom, Dad, Oscar and Tana for always encouraging and supporting me through school and life.

# Table of Contents



Figure 0.1 Konza prairie. www.familypedia.wikia.com

# List of Figures

## *Part 4*



## *Part 5*



## *Appendix*

# List of Tables

## *Part 2*



## *Part 3*



## *Part 4*



## *Appendix*


613C
CAT

# Part 1
## Introduction

**Dilemma**
**Thesis**
**Project**
**Methodology**

Figure 1.1 Road preparation at Nelson's Ridge. Author, 2010

# Dilemma

Current patterns of real estate development in America have converted open space and productive agricultural landscapes into endless tracts of subdivisions. Suburban sprawl has created 'placeless' neighborhoods with less functional open space and little productivity. It is important now more than ever to find a logical solution to the current subdivision development patterns that cause these fragmented landscapes in America. Unfortunately, agricultural land (land most suitable for producing food and fiber) is often threatened by subdivision development, (McMahon 2010). If American's value local food and decreased cost of transporting food to market, it is imperative to preserve agricultural lands within rural subdivision developments.

The Nelson's Ridge development is currently planned to be another conventional single family subdivision with complete elimination of its' agricultural lands and open space. While other subdivisions in the area have taken the conventional approach, the Nelson's Ridge development can provide an opportunity to demonstrate to developers and the general public about alternative methods of rural subdivision design that can improve sense of place, connectivity, diversity, and rural character.

## Thesis

Conservation developments can preserve open space and maintain productive lands while providing an economically feasible and environmentally sensitive community. This can be accomplished through the application of 'conservation design' principles and proper planning decisions (Arendt 1996). Nelson's Ridge will become a model of conservation subdivision design for Pottawatomie County and neighboring communities. The development will demonstrate how and why these types of subdivisions are beneficial for all participants of a project including developers and home owners.

Figure 1.2 Elbo Creek Subdivision. Author, 2010

# Project

## *Project Location*

The site is located approximately four miles east of Manhattan, Kansas and about a half mile north of Highway 24 along Green Valley Road. The property is approximately 132-acres in total. The site is part of a rapidly growing commercial and residential area simply known as the "Highway 24 Corridor Development". Bordering the north end is Junietta Road with Green Valley Road to the east.

## *Critical Site Conditions*

The site consists of rural Kansas landscape including tall grass prairie, small wetlands, river bottoms, and rolling topography. Some of the vegetation on site is currently harvested for hay (mostly brome) which is used for animal feed. The soils are rich in fertility due to the site's proximity to the Big Blue River and its' flood plains.

The site currently has a preliminary plat for a subdivision named "Nelson's Ridge" prepared by Schwab-Eaton. The beginning phases of the construction include connections to existing sewer and water from the nearby developments and rough grading of entry drive. Existing drainage on the east side of property has already been compromised and/or destroyed. Other specific conditions are further explored through site inventory and analysis (Part 3). The following page describes three major influences to the property's current conditions.

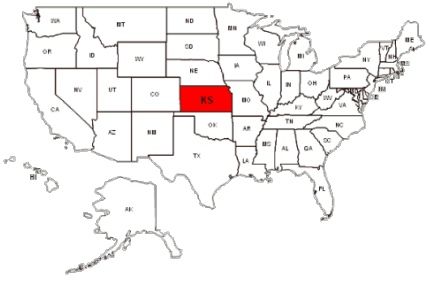



Figure 1.3 Map of U.S. www.myonlinemaps.com

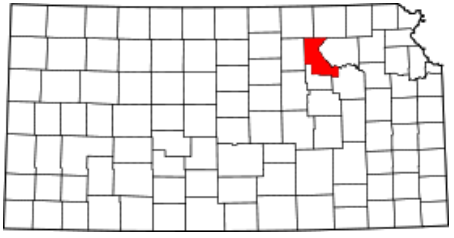


Figure 1.4 State of Kansas. www.wikipedia.com

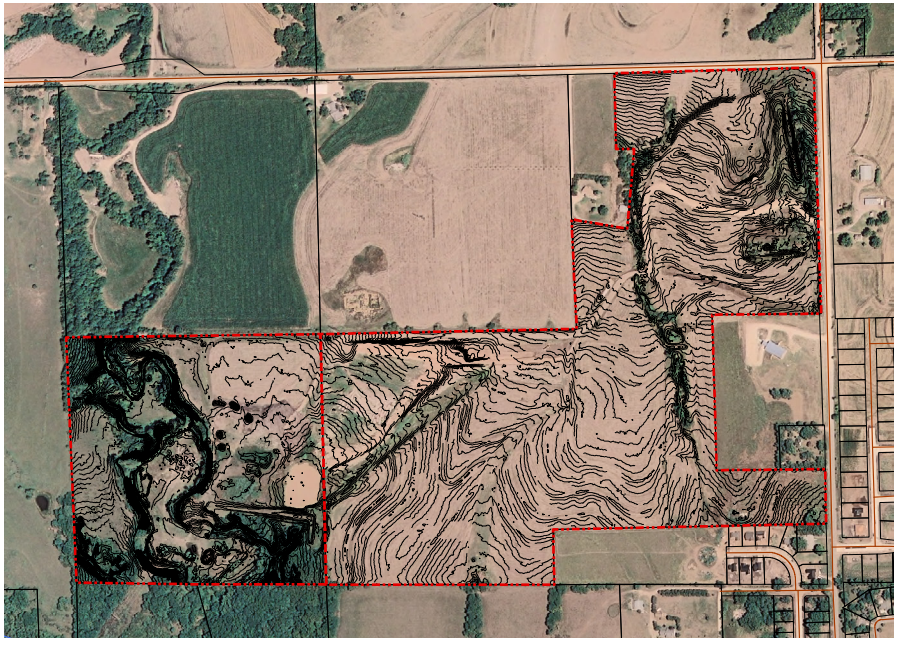


Figure 1.5 Nelson's Ridge property boundary. Author, 2010

Figure 1.6 Big Blue tributary. Author, 2010

Figure 1.7 Borrow pits. Author, 2010

Figure 1.8 Upland prairie. Author, 2010

### *Big Blue Tributaries/River Bottoms*

On the west end of the property is a relatively large drainage tributary of the Big Blue River. This area of the site is critical habitat both for riparian plant species as well as providing a wildlife corridor for deer, avian species such as waterfowl, turkey and song birds, and some fish species. This area is currently undeveloped due to its vulnerability of frequent floods. The soils in the area are rich in nutrients, yet susceptible to erosion. This area has programming possibilities for a protected open space and a greenway connection to adjacent lands and proposed walking trail systems.

### *Borrow Pits*

There are two areas on the property that are currently being stripped of soil to be used as fill for both the road construction and the building lots. These areas are located on the sites most agriculturally suitable soils. These borrow pits are seen as program possibilities for either being created into constructed wetlands and/or restored agricultural fields.

### *Upland Landscape*

Located to the northeast of the property, this area is most valuable due to its topography above the 100 year flood plain and the viewsheds it provides. This area is most suitable for development due to proximity to existing infrastructure such as roads, sewer, and amenities. The upland area is also considered highly suitable for agriculture as well.

## *Key Issues Relevant to Contemporary Landscape Architecture*

Today's developers are learning more about the pros and cons of conservation communities and why they not only benefit the developer financially, but also provide an enjoyable place to live. There is a growing appreciation of how protected lands serve residents of a community. Even though the philosophy of conservation driven development has been around for quite a while, it has become increasingly popular within the profession of landscape architecture. More and more firms around the nation have incorporated sustainable/conservation community development into their line of work. Architects, planners and engineers now understand the benefits of conservation communities and it is landscape architects heading the entire process. "Conservation development requires an integrative, systematic, and holistic approach to land use planning and development," (McMahon 2010, 7).

Another important relevance to landscape architecture is the protection of America's agricultural lands. According to community planner Edward McMahon, planners, engineers, and developers are now seeking out agrarian specialists, ecologists, horticulturists, and landscape architects to help bring holistic solutions to preservation and management of both open space and productive agricultural lands, (McMahon 2010). Engineers and developers are focused on maximizing the amount of lots that can fit on a site regardless of the effects on both natural systems and valuable productive soils. Conservation subdivisions are a way for both the developer and the homeowners to profit from the site. While financially viable, it also provides a stronger relationship between man and nature. Every year thousands of acres of valuable agricultural lands are converted to housing and commercial uses that continue to sprawl into the country side. Subdivisions are turning their back on the rural character and creating placeless neighborhoods.

Today, local governments are responding to citizen's calls for stronger land use planning, laws, and regulations to encourage a more "rural character" and "rural lifestyle". Nearly two-third of the respondents to a recent National Association of Realtors survey said that it is "very important" to preserve land being used for farming and/or agricultural purposes (64 percent)) and natural areas such as forests, wetlands or deserts, and stream corridors (62 percent), (McMahon 2010, 33). More and more Americans that once valued suburbia are now choosing to retire in rural communities where open space is more accessible. Rural subdivision developers must acknowledge these ideals when considering the conversion of farmlands and open space into housing and/or commercial development.

# Methodology

The methodology used to create the final conservation subdivision design was a design process guided by principles derived through research of related literature. There are five conservation subdivision design principles. These principles are used to compare and analyze the differences between the conventionally designed subdivision proposed by Schwab-Eaton, and the proposed alternative conservation design.

## *Cluster Development*

Cluster development is one of the more commonly used planning strategies that aggregates development into discrete zones of interdependent land uses so that the remaining land can be conserved as public/shared green space. Studies have shown that potential home buyers are willing to pay more for a lot or home and lot that has views and access to open green space (Arendt 1996). Because development consumes less area, there is far less disturbance to the existing landscape. Cluster development can also "create the charm and scale of the small town while reducing the requirements for infrastructure development" (Jarvis 1993, 120).

## *Water Conservation*

Water conservation is another generally used design principle when developing a subdivision, although not all developers make it a major consideration. Water conservation is a natural system-based approach to site planning that focuses on stormwater management and landscape design and development (McMahon 2010). By protecting existing drainage patterns, it ensures that less grading will be needed and also reduces risk of flooding during heavy rain falls. "Reduced amount of impervious surfaces profoundly affects how water moves above and below ground, as well as decreasing the quality of stormwater and the ultimate condition of nearby rivers, lakes, and streams" (McMahon 2010, 73).

## *Green Infrastructure*

Green infrastructure is defined as a "strategically planned and managed network of natural lands, working landscapes, and other open spaces designed to maximize ecological values and functions" (McMahon 2010, 12). Providing the community with a network of open spaces connected by trails and sidewalks allows for a healthier and engaging lifestyle for the residents. It also connects the residents to site amenities and ecological features. "It provides a framework for development by identifying the land areas that are appropriate for preservation, recreation and circulation. By providing interconnectedness, a whole-system approach that leverages maximum ecological and real estate value is achieved" (Gause 2007, 47).

## *Sense of Community/Diversity*

This design principle has several design choices that create a subdivision that maintains a strong sense of community. Streets should promote safety, comfortability, and be pedestrian focused. The compact development in conservation communities also increases interaction among neighbors, fostering a stronger sense of community. By providing the community with amenities such as community centers, cultural programs, and/or community events, it can further encourage a sense of community (McMahon 2010). Such amenities can also increase profitability of the project for the developer. "An increasing number of Americans are searching for

more variety and choices in both housing and neighborhoods. Many people do not like the one-size-fits-all developments" (Gause 2007, 13). Diversity can be accomplished by providing several housing options as well as developing a distinctive sense of community.

### *Economic Viability*

For any development project to succeed, it must be economically viable. As a design principle, there are many ways to increase profitability and reduce financial risks. Reducing the amount of roads on site can in turn reduce cost of infrastructure, grading and other construction costs. By applying the previous design principles, many financial benefits arise. For instance, if homes in the subdivision are placed within or along parks, natural areas, agriculture, and other open spaces, "home owners are willing to pay premium prices" (McMahon 2010, 30).

On the following page, *figure 1.9* explains which literature reference addressed the design principles. Solid black lines indicate references that provided a definition, while dashed lines indicate references that addressed a design principle but did not provide a clear definition.

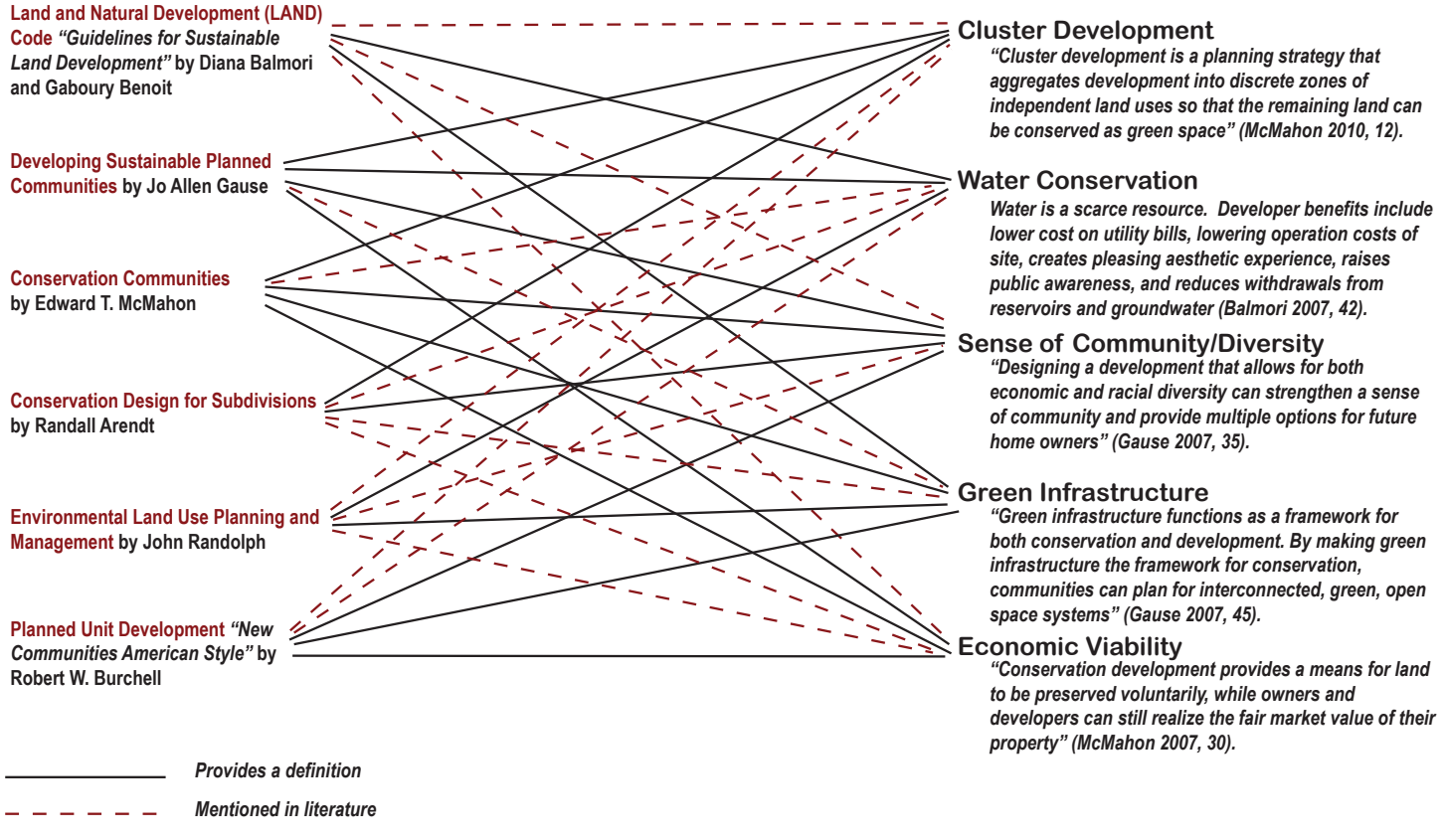



Figure 1.9 Definitions supported by literature. Author, 2010

# Part 2

## Nelson's Ridge: A Typical Approach

**Highway 24 Corridor Development**
**A Typival Subdivision in Pottawatomie County**
**Schwab-Eaton Preliminary Plat**

Figure 2.1 Typical subdivision. www.engineeringcivil.com

# Highway 24 Corridor Development

## *Plan Overview**

The US-24 Corridor Management Plan included a study area along 16 miles of US-24 reaching approximately a mile north of the corridor and stretching south to the Blue River. The project was broken down into three segments:

*West Corridor* – This segment extended from Manhattan Town Center Mall east to Flush Road. It also included McCall Road from Tuttle Creek Boulevard to US-24; includes eastern Manhattan and the Blue Township.

*Central Corridor* – From Flush Road east to Flint Rock Road; includes the City of St. George.

*East Corridor* – Flint Rock Road to Airport Road, including the City of Wamego; and from Kansas Highway 99 (K-99) from the US-24 intersection three miles north to Cannonball Road south of Louisville (Pottawatomie County 2009).

## *Significance*

*Figures 2.3 and 2.4* illustrate two projection scenarios of how the US-24 Corridor will develop over the next 20 years. The location of Nelson's Ridge subdivision is within the "west corridor" development. *Table 2.1* shows projected housing units for the corresponding scenarios with the "west corridor" highlighted in yellow. The graph shows that this corridor is projected to have the highest amount of growth.

Nelson's Ridge

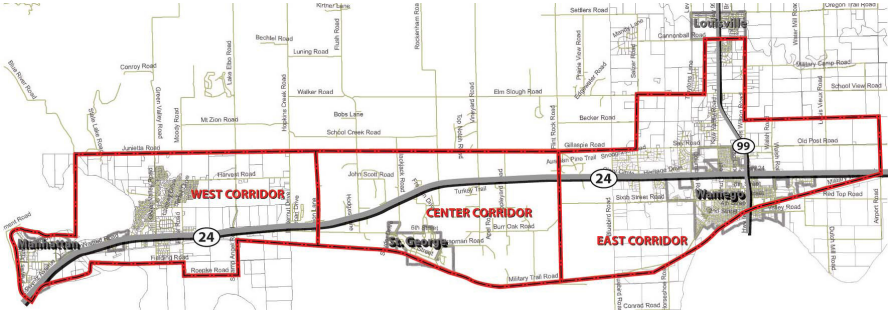



Figure 2.2 Corridor sections. Pottawatomie County

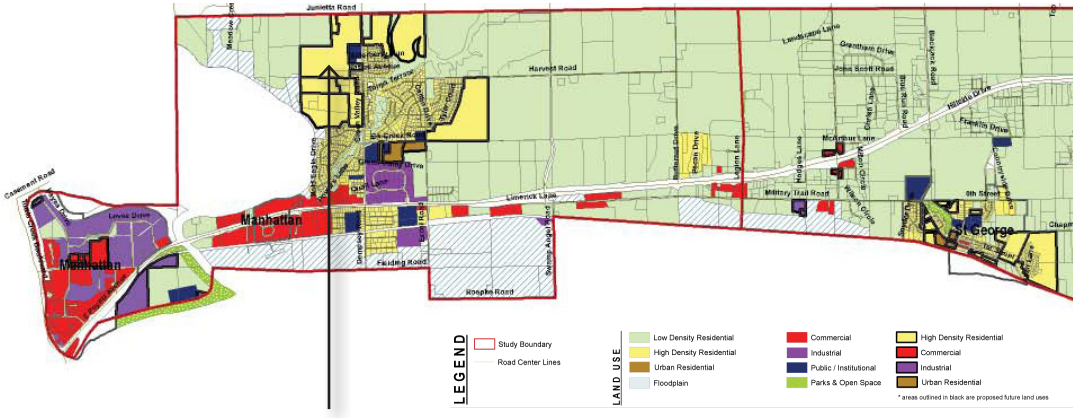
| TABLE E.A<br>Projected Housing Units 2010-2030 | | | | |
|---|---|---|---|---|
| Land Use | | | | |
| Moderate Scenario | West Corridor | Central Corridor | East Corridor | Total Units |
| Single Family Units | 1,250 | 450 | 425 | 2,125 |
| Multi-Family Units | 175 | 50 | 100 | 325 |
| **TOTAL** | **1,425** | **500** | **525** | **2,450** |
| High Scenario | West Corridor | Central Corridor | East Corridor | Total Units |
| Single Family Units | 1,850 | 575 | 575 | 3,000 |
| Multi-Family Units | 225 | 75 | 100 | 400 |
| **TOTAL** | **2,075** | **650** | **675** | **3,400** |
| Percent of Corridor Residential Growth | 58%-61% | 19%-20% | 20%-21% | 100% |

Table 2.1 Projected housing units. Pottawatomie County

These predictions support the need for increased density in this segment of the corridor. The graph shows a 58%-61% growth in residential units for the "west corridor". Nelson's Ridge development will propose both single family and multi-family housing to reach highest possible density while still maintaining the rural character of the region.

* All information taken from Pottawatomie Couty website. www.pottcounty.gov

Moderate Scenario




Nelson's Ridge

High Scenario

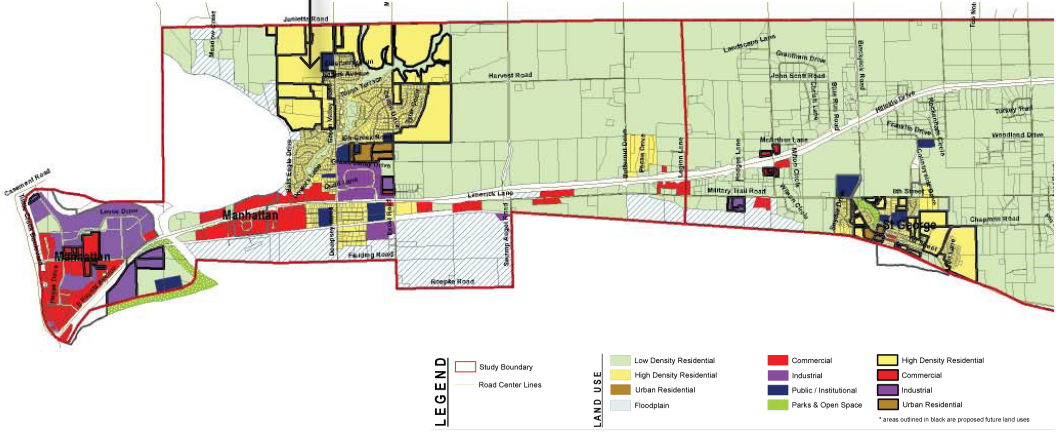



Figure 2.3 & 2.4 Build Out Scenarios. Pottawatomie County

## Typical Subdivision in Pottawatomie County

Surrounding neighborhoods and subdivisions in the county lack identifiable character and seem boring. The dwellings are typically one or two story attached garage homes approximately 1,500 to 2,500 square feet. *Figures 2.5, and 2.6* are photos taken of nearby Elbo Creek and Fallen Leaf subdivisions. Recent issues with some homes' backyards eroding away into the creeks have caused an inconvenience to homeowners. This is because the developers did not understand the value and importance of not building too close to flood prone areas.

Figure 2.5 Elbo Creek Subdivision. Author, 2011


Figure 2.6 Fallen Leaf Subdivision. Author, 2011


Figure 2.7 Surrounding Neighborhoods. Author, 2011

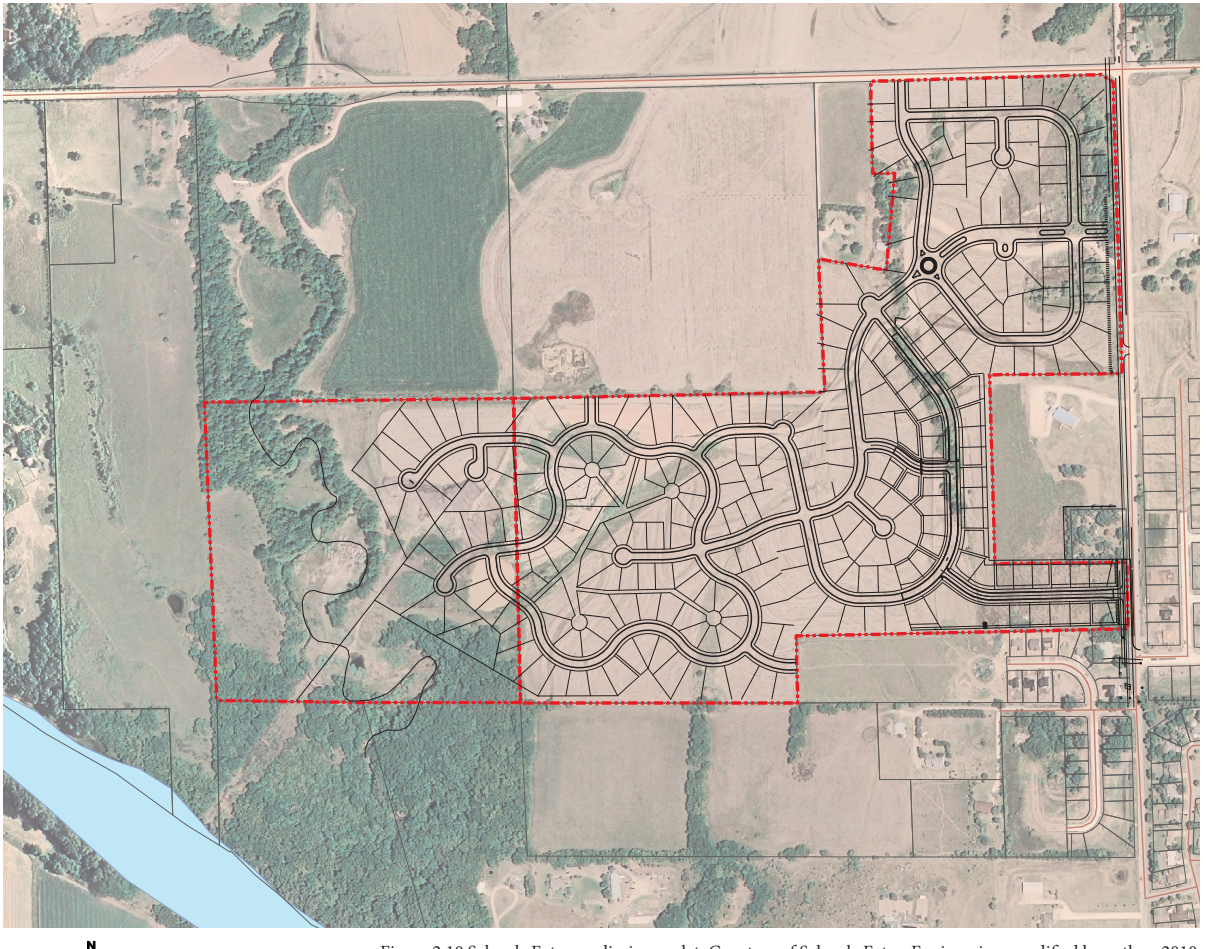
## Schwab-Eaton Preliminary Plat

Dave Nelson (developer) teamed with engineering and landscape architecture firm Schwab-Eaton to develop a preliminary plat for Nelson's Ridge development. The plat includes approximately 293 home sites with minimal open space (shown in *figure 2.7*). The only areas protected or left in original state is the west end of the site located within the 100 year flood plain. The lot sizes vary from 0.20 acres to 0.40 acres. There is a lack of entry experience because homes are proposed too close to entry points with minimal setbacks from both Green Valley Road and Junietta Road. There is a large amount of infrastructure cost associated with the development due to amount of roads and distance to existing utilities.

After speaking with Dave Nelson and some of the design team, they are excited to learn about new conservation approaches to subdivision development. They are familiar with some of the concepts, yet have trouble understanding the economic viability of such a community.

Figure 2.8 Entry drive from Green Valley Road. Author 2010

Figure 2.9 Road preparation and catch basin. Author 2010




NTS

Figure 2.10 Schwab-Eaton preliminary plat. Courtesy of Schwab-Eaton Engineering, modified by author, 2010

# Part 3

## Nelson's Ridge: A Conservation Approach

**Site Inventory and Analysis**
**Determining the Market**
**Program**
**Preliminary Design**
**Conceptual Master Plan**
**Design Principles Applied**

Figure 3.1 Hidden Springs. www.realityidaho.com

# Inventory and Analysis

## *Primary and Secondary Conservation Areas*

One of the most important phases of the design process for a development is identifying primary and secondary conservation areas (Arendt 1996). The property consists of valuable woodlands and tributaries of the Big Blue River. These areas are highly vulnerable because they provide critical wildlife habitat and are highly susceptible to erosion if any vegetation was to be removed. These areas are considered to be the primary areas of conservation. Primary conservation areas will be left undeveloped and may be in need of minor restoration.

The area to the east of the woodlands is considered the secondary conservation area. This area is vulnerable to development because it currently is used for some agriculture as well as having established areas of native tallgrass prairie. While the secondary conservation areas are vulnerable, these areas may come under development. Planner Randall Arendt states, "…wetlands, floodplains, and slopes take first priority for inclusion in the designed open space, as they represent highly sensitive environmental resources that are generally considered to be unbuildable in a legal sense, in a practical sense, or for reasons of common sense" (2006, 41).

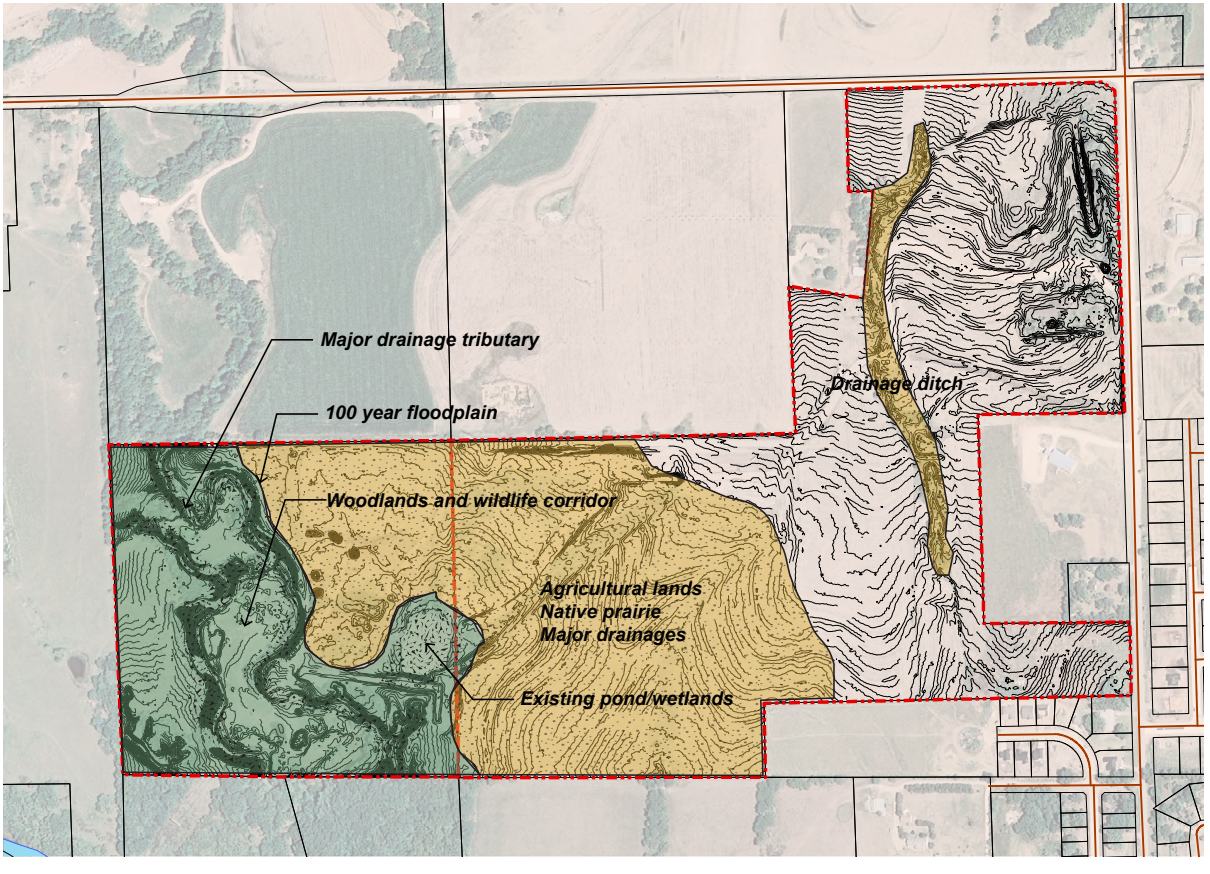



Figure 3.2 Primary and Secondary Conservation Areas. Author, 2010

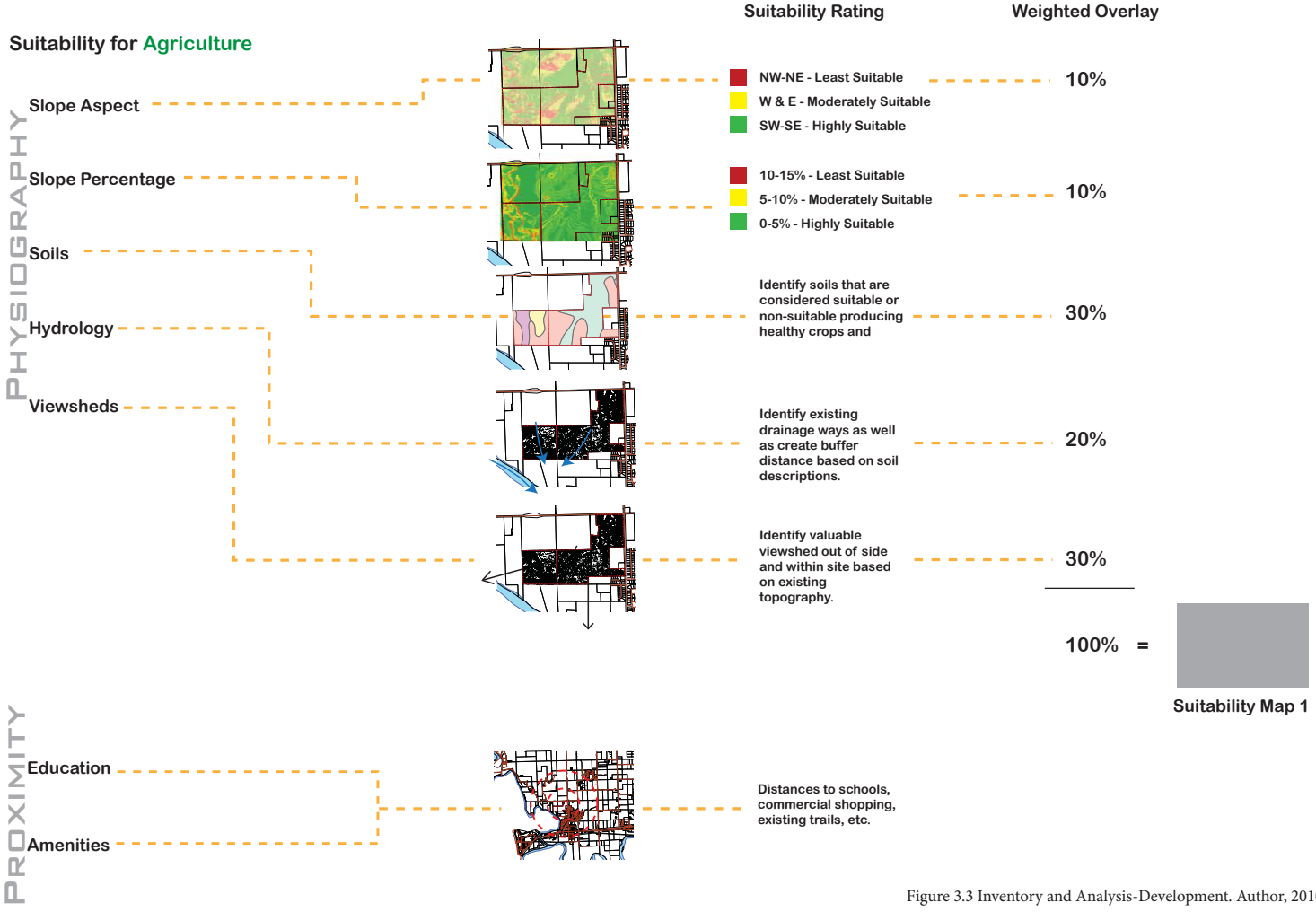



Figure 3.3 Inventory and Analysis-Development. Author, 2010

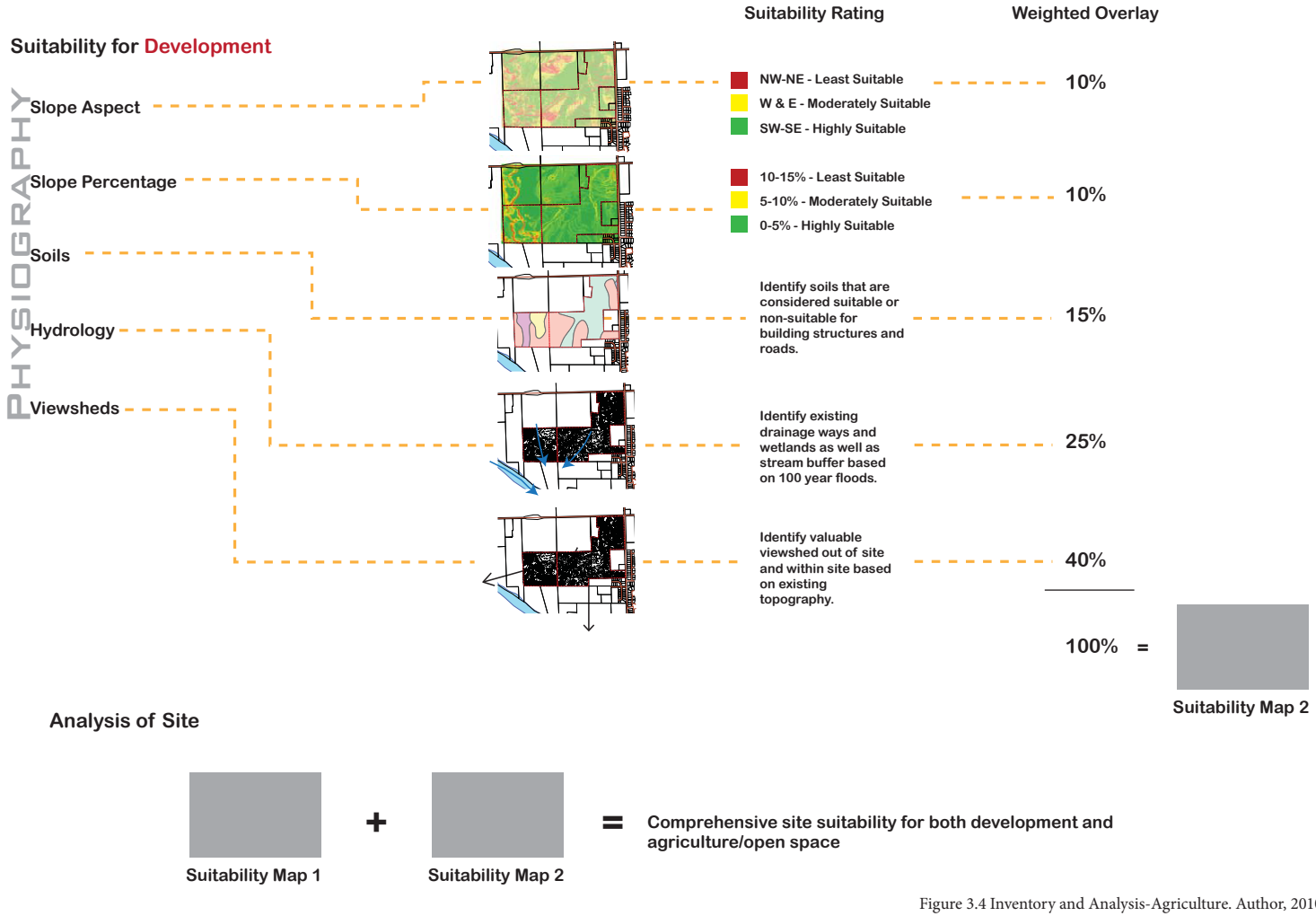



Figure 3.4 Inventory and Analysis-Agriculture. Author, 2010

## *Slope Aspect*

In general, the property slopes gently to the southwest. The slope aspect can make significant influences on microclimates on site. North aspects tend to have cooler temperatures as well as moister soils. On the contrary, southern aspects are generally warmer and dryer climates. "Passive solar design is primarily about energy and comfort. It simply means heating, lighting and cooling your home using directly and indirectly the sun's heat and light" (efficienthomeenergysavings.org 2011). Aspect is important when considering both development as well as agriculture.

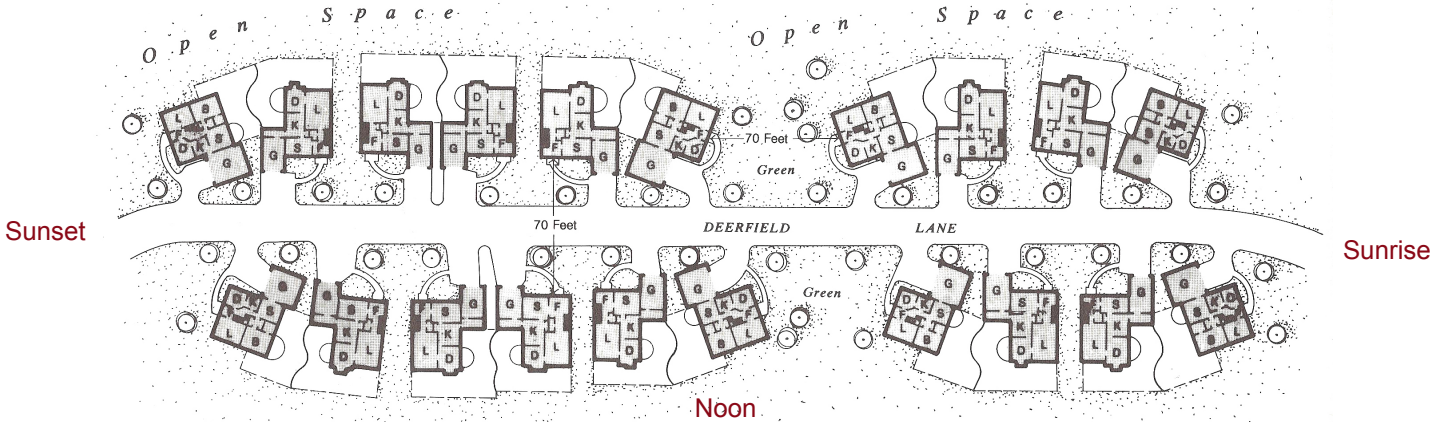



Figure 3.5 Solar gain orientation. Arendt 2006. Modified by author, 2011

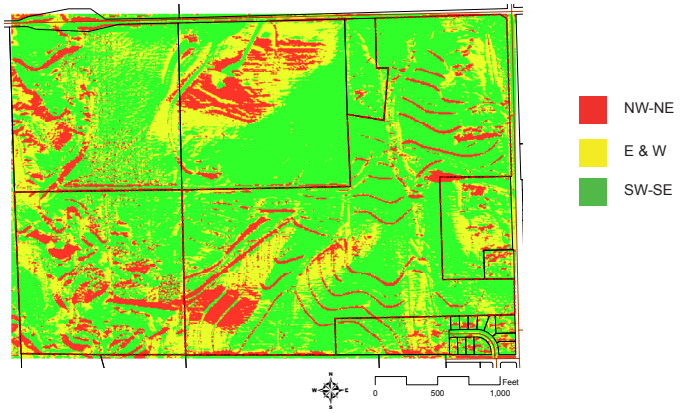



Figure 3.6 Slope Aspect-Development. Author, 2010

*Development*

Home sites should consider maximizing solar gain (placing homes on south facing slopes) for safety issues such as prevention of ice buildup and having lot placement on a more east-west orientation.

*The suitability map shows that any north facing slopes (indicated as red) are considered to have low suitability while southern aspects have high suitability (indicated as green).*

***Weighted Overlay: 10%***

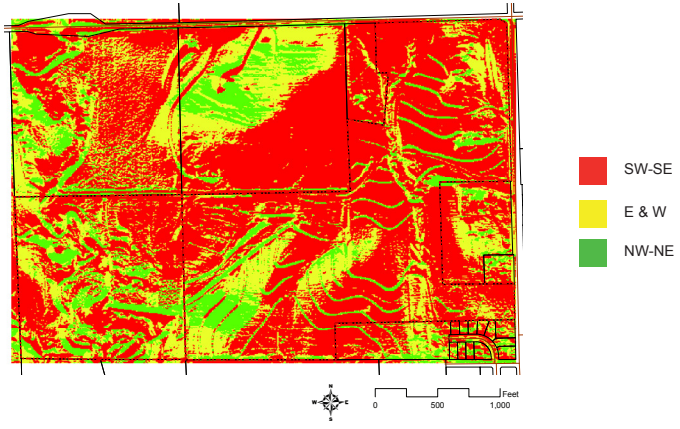



Figure 3.7 Slope Aspect-Agriculture. Author, 2010

*Agriculture*

Crop fields should be located on north facing slopes to help maintain soil moisture. Southern facing aspects are desirable for crops needing full sun and low moisture requirements.

*While the determining factors indicate that southern facing slopes are considered to have a low suitability rating, the overall weighted value is low due to amount of crops that are able to flourish on full sun slopes.*

***Weighted Overlay: 10%***

## *Slope Percentage*

"Due to their high potential for erosion and consequent sedimentation of watercourses and waterbodies, slopes over 25% should be avoided for clearing, regrading, or construction. Slopes of between 15 and 25% require special site planning and should also be avoided whenever practical" (Arendt 2006, 34).

Majority of the site does not exceed a 25 percent slope. Only the stream banks of the tributary have greater slope percentage and are within the primary conservation area. Percentage of slope is an important factor when considering limits of construction for roads, building, and erosion control. Accompanying figures show that criteria for slope percentages are the same when considering development and agriculture.

Figure 3.8 Eroded soils on site. Author, 2010

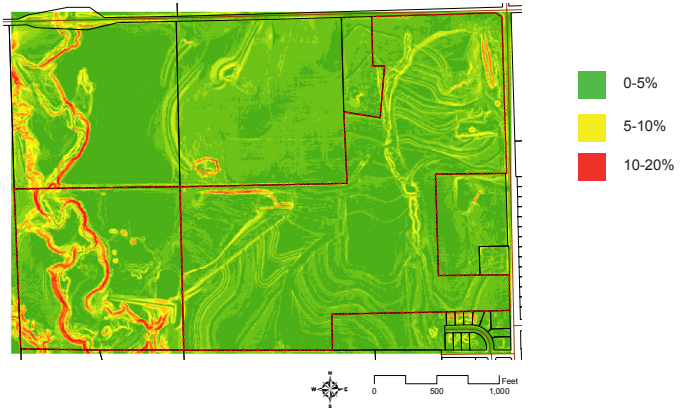



Figure 3.9 Slope Percentage-Development. Author, 2010

*Development*

Building lots and roads should be placed only on slopes no steeper than 10%. Minimal grading should be used when creating pads and road bases.

*The suitability map shows that a majority of the site is considered suitable for development. The suitability values are based on typical slope percentages for roads and utilities. Stream banks are only area considered to have low suitability.*

***Weighted Overlay: 10%***

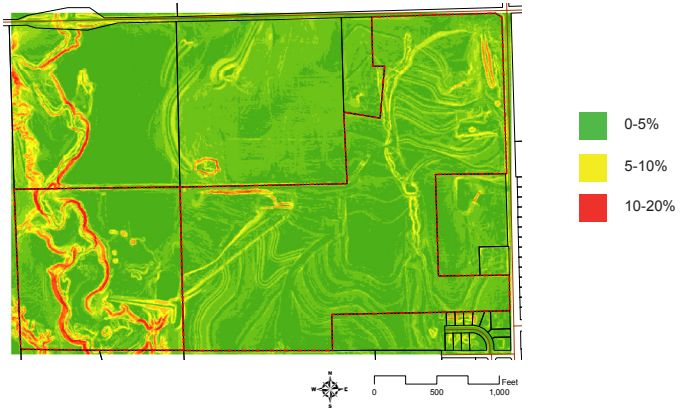



Figure 3.10 Slope Percentage-Agriculture. Author, 2010

*Agriculture*

Crops fields and orchards should not be developed on steep slopes due to higher potential for erosion. Steep slopes prevent water and nutrient percolation through soils. Shallow slopes are also to be avoided due to potential for flooding and standing water areas.

*Suitability for agriculture has similar percentage suitability values. Except for the stream banks, almost the entire site has slopes under 5% which is considered highly suitable.*

***Weighted Overlay: 10%***

## *Soils*

"Healthy soils help regulate the hydrologic cycle, minimize sediment loss, cleanse water, and nurture native plants" (Balmori and Benoit 2007, 53). The several types of soils on site are identified in the following map. Each soil type has different water holding capacity, compaction characteristics, leaching qualities, and fertility. Some soils are within the 100 year flood plain. There are no known polluted soils within the property.

Figure 3.11 Native ecosystem on site. Author, 2010

Figure 3.12 Existing soil conditions. Author, 2010

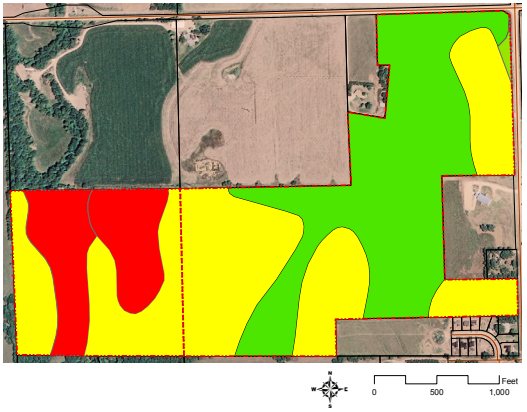



Figure 3.13 Soils-Development. Author, 2010

*Development*

Soils for building pads and roads should be compactable and should have adequate drainage. Soils within wetlands should be able to have high water holding capacity.

*This map illustrates that occasionally flooded and/or frequently flooded soils are considered to have a low suitability rating. Other soils on site are suitable for development because soils will not be flooded.*

***Weighted Overlay: 30%***

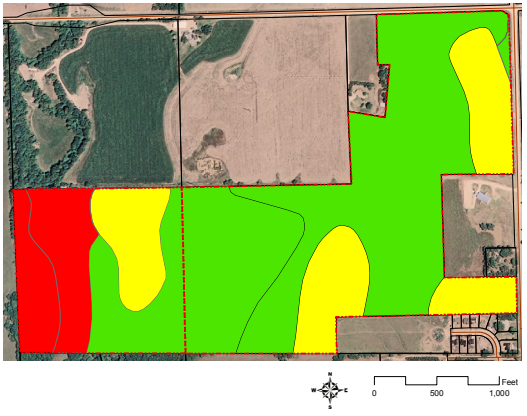



Figure 3.14 Soils-Agriculture. Author, 2010

*Agriculture*

Most suitable soils have high organic matter and high water holding capacity. They should also be located on edge or outside the 100 year flood plain.

*Suitability for agriculture is slightly different than that for development because soils that are frequently flooded can be proposed for agricultural uses. These soils can support crop species that are able to grow in saturated and occasionally flooded soils.*

***Weighted Overlay: 15%***

## *Hydrology*

Drainage on site predominately flows from the northeast to the southwest. Located on the west end of the property is the Big Blue tributary. This is considered a primary drainage corridor for the site. Secondary drainage corridors should be protected or properly integrated into the development.

Arendt states, "Buffers perform a number of significant functions- filtering stormwater runoff, providing critical habitat at the land-water interface, and offering opportunities for wildlife travel corridors and informal walking trails for the immediate neighborhood" (1996, 51). These buffer areas are "primary conservation areas" and provide opportunities for aesthetic water features in the community.

Figure 3.15 Existing drainage corridor. Author, 2010

Figure 3.16 Existing wetlands. Author, 2010


Figure 3.17 Hydrology-Development. Author, 2010

*Development*

No development shall be within the 100 year flood plain. Any existing drainage patterns should be maintained and surface runoff should be retained in basins and/or wetlands.

*This map illustrates existing drainage patterns, wetland areas and 100 year flood plain. These mentioned areas are considered to have low suitability for development. Ridges and uplands have a higher suitability.*

***Weighted Overlay: 20%***


Figure 3.18 Hydrology-Agriculture. Author, 2010

*Agriculture*

Crop fields and orchards shall be placed outside of 100 year flood plain. Drainage can be captured to be used for the development and/or irrigation.

*Besides the area within the 100 year flood plain and the existing wetlands, most of the site has a moderate to high suitability rating for agriculture. Lands proposed for agriculture can possibly utilize existing drainage for irrigation uses and/or keep soils saturated.*

***Weighted Overlay: 25%***

## *Viewsheds/Topography*

Due to higher elevations being located to the northeast end of the site, this area provides views over the property and adjacent lowlands. Supporting site photos are taken within important high points.

### *Development*

Development should take advantage of viewsheds by placing home sites on higher elevations located to the northeast of property. "From a developer's point of view, it is desirable for sales purposes to maximize the number of homes with attractive views" (Arendt 1996, 37).

## *Weighted Overlay: 30%*

### *Agriculture*

Agriculture should be located in areas within home site viewsheds. Agriculture should be placed in lower elevation to allow for more accessible viewsheds from development.

## *Weighted Overlay: 40%*

Figure 3.19 Panoramic site photo. Author, 2010

Figure 3.20 Panoramic site photo. Author, 2010

Figure 3.21 Panoramic site photo. Author, 2010

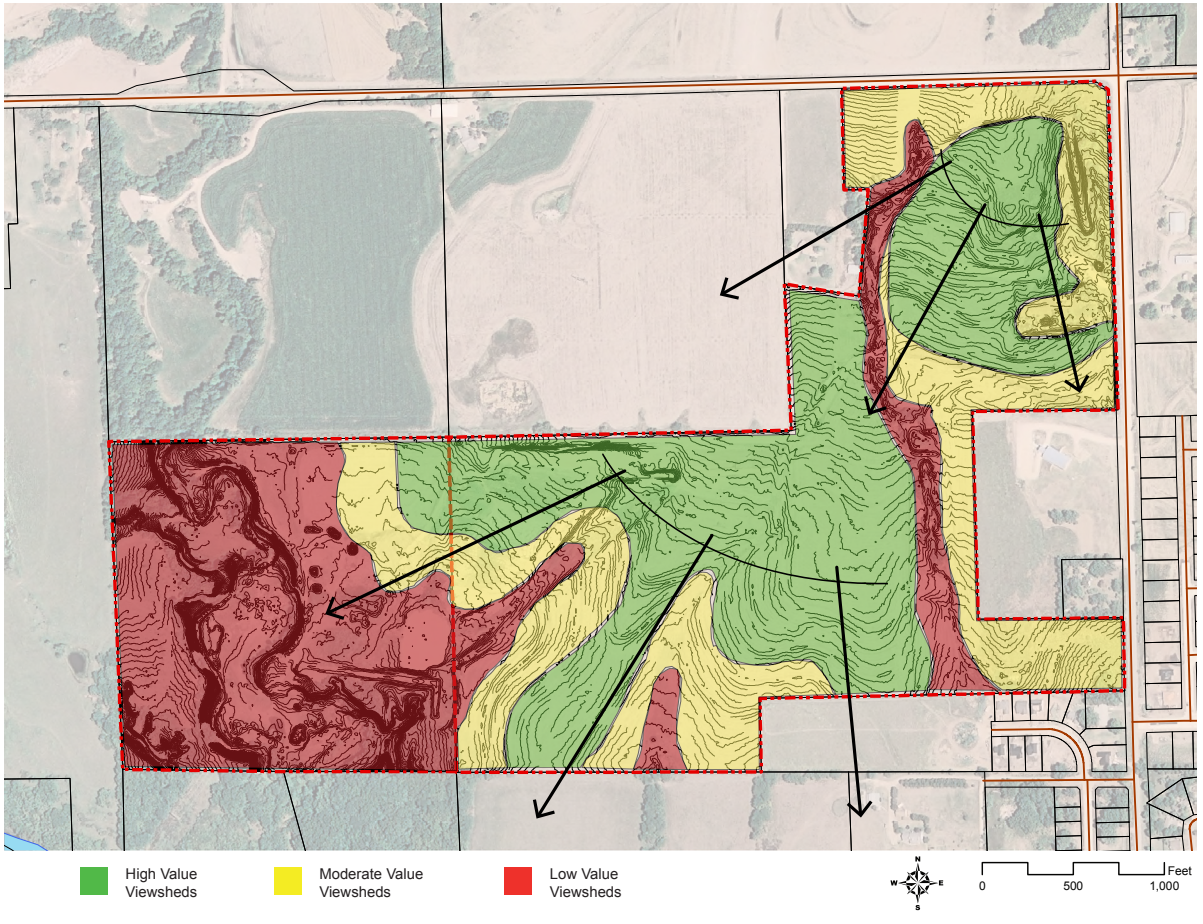



Figure 3.22 Viewsheds. Author, 2010

## *Comprehensive Suitability Analysis*

### *Development*

The comprehensive suitability analysis for development shows that approximately 70% of the site is considered to have high suitability for development. Areas shown in green take into account the importance of views on site while red and yellow illustrate development restrictions within the 100 year flood plain.

**Weighted Overlay Summary**

| | |
|---|---|
| Aspect: | 10% |
| Percentage: | 10% |
| Soils: | 15% |
| Hydrology: | 25% |
| Viewsheds: | 40% |

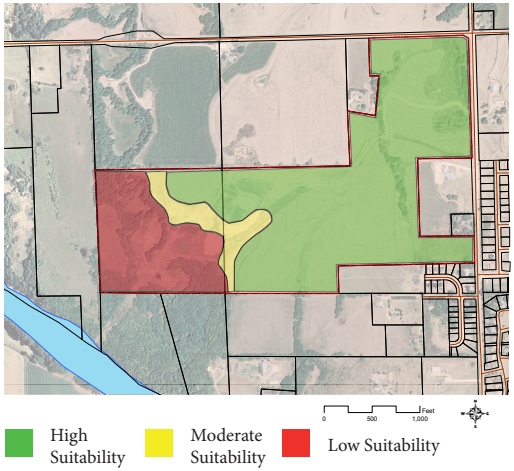



Figure 3.23 Comprehensive Suitability-Development. Author, 2010

### *Agriculture*

The comprehensive suitability analysis for agriculture has the highest weighted overlay for soils and viewsheds on site. Hydrology is another important factor when considering possibility of floods and allowing the site to drain properly. While the major drainage on site, indicated as red, is not suitable for agriculture, they are highly suitable for preservation of open space.

**Weighted Overlay Summary**

| | |
|---|---|
| Aspect: | 10% |
| Percentage: | 10% |
| Soils: | 30% |
| Hydrology: | 20% |
| Viewsheds: | 30% |

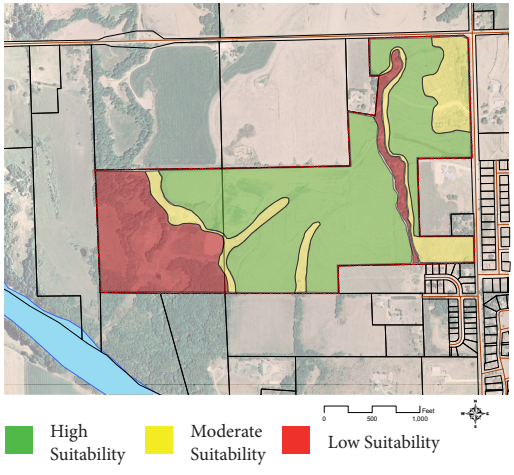



Figure 3.24 Comprehensive Suitability-Agriculture. Author, 2010

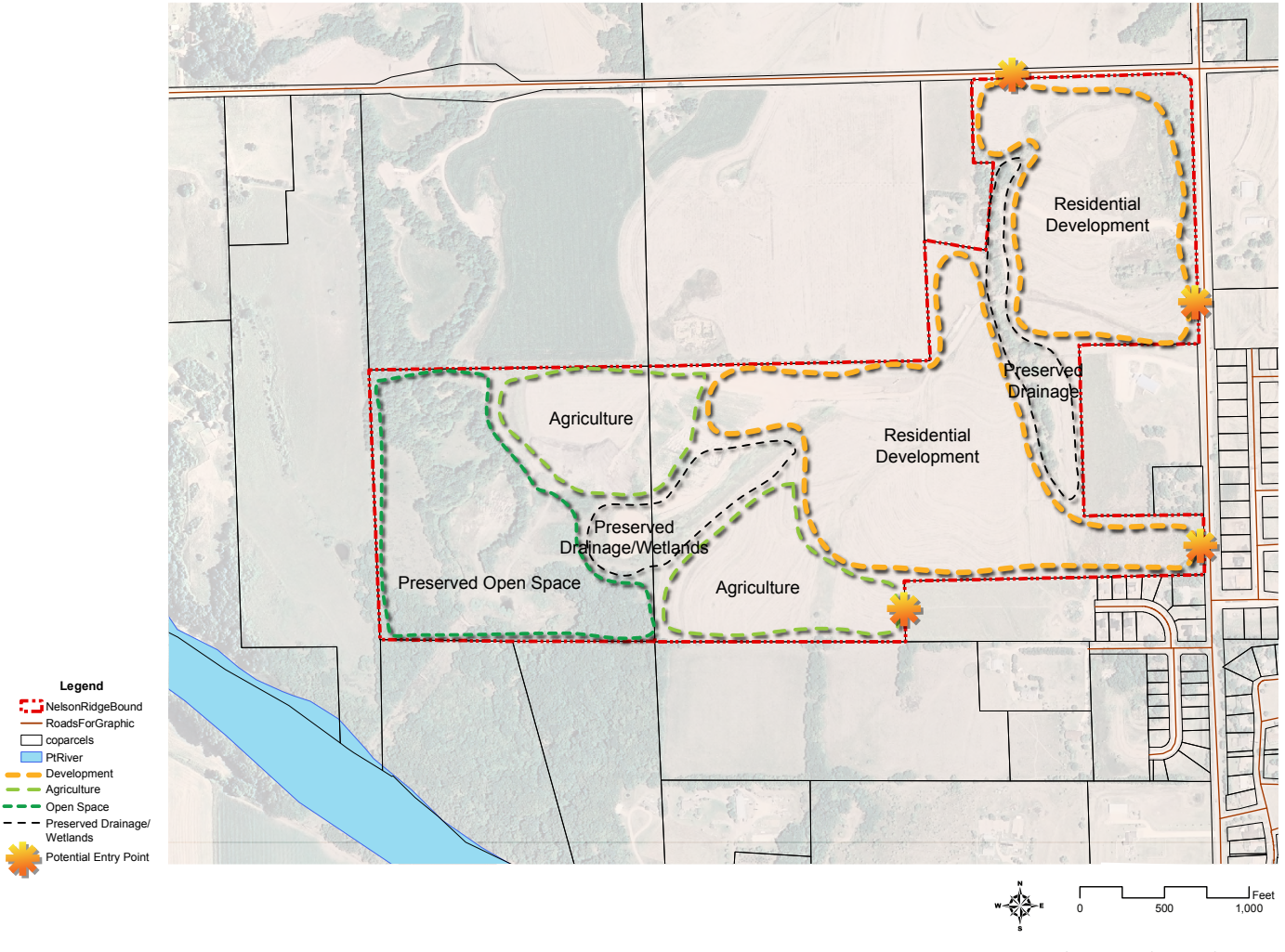



Figure 3.25 Comprehensive Analysis. Author, 2010

## *Proximity*

*Figure 3.30* shows half mile and one mile proximity rings that illustrate that the development is within walking distance to everyday needs such as shopping, churches, and businesses. The intersection of Green Valley Road and Highway 24 is the closest area of shopping and the city of Manhattan is within the one mile buffer. While currently the walking experience is uncomfortable along Highway 24, the possibility of a future regional trail tying into residential developments could create a more enjoyable connection. Manhattan has a population of approximately 50,000 residents and includes most everyday needs for the residents of the community.


Figure 3.26 Local Church. Author, 2010

Figure 3.27 Local Church. Author, 2010


Figure 3.28 Local Church. Author, 2010

Figure 3.29 Local Church. Author, 2010

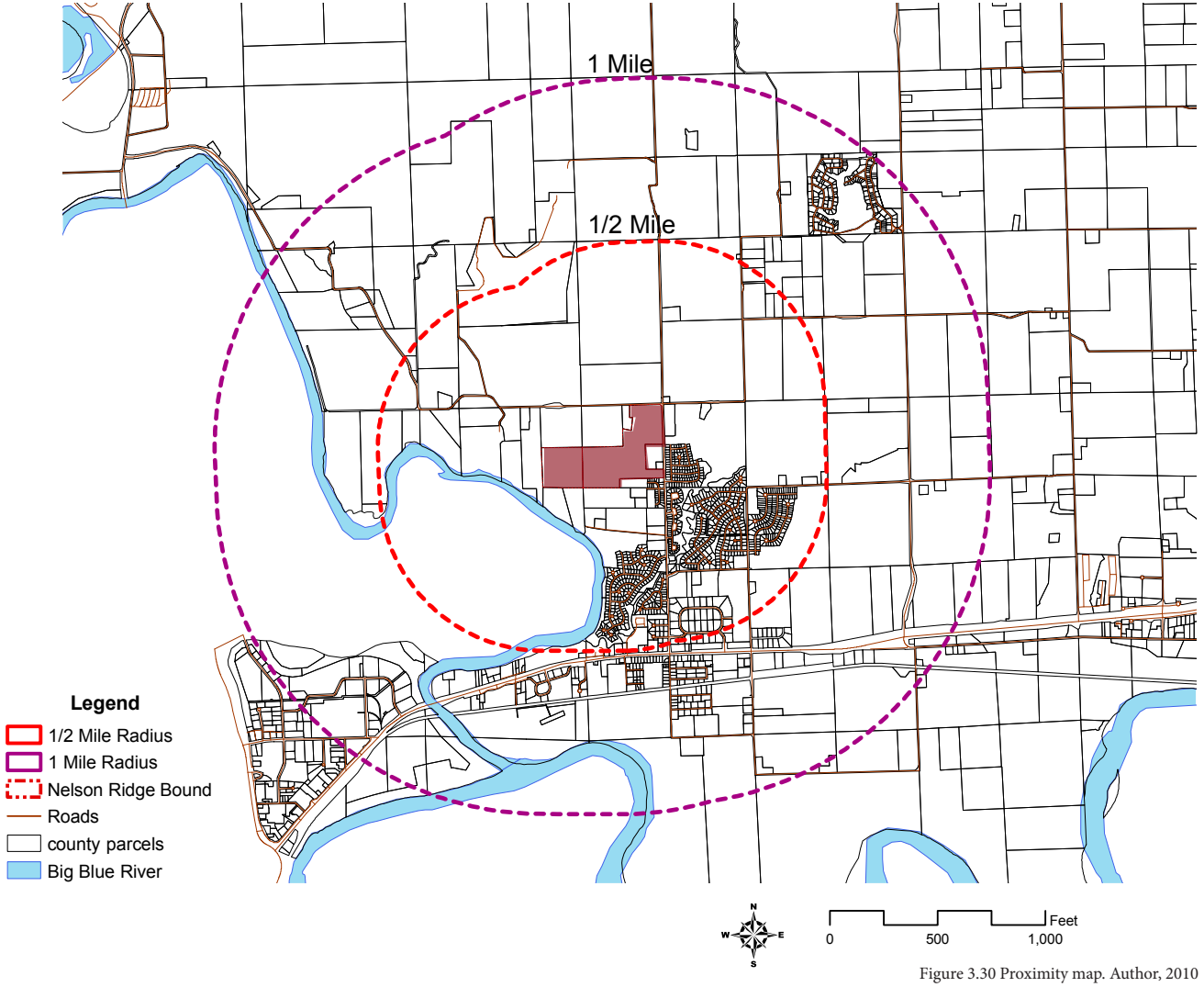



Figure 3.30 Proximity map. Author, 2010

# Determining the Market

## *Introduction*

According to the U.S. Census Bureau, the current population of the nearby city of Manhattan is 52,836 and growing (www.census.gov). In order to design the subdivision, the developer must understand who is most likely willing to buy a home in a conservation development. Determining the market is established by assessing and understanding the people who live in the area, their average income, and household size.

More Americans are choosing to live a "greener" lifestyle these days. "Green consumers may look for communities in which they are less dependent on their automobiles or that grow their own food. As the baby boom generation retires, a growing market may emerge for homes away from urban employment centers, in rural communities where retirees can relax and enjoy the natural world around them" (McMahon 2010, 58). As shown in *figure 3.33*, a majority of individuals in the area are between the ages of 17 and 26. This spike in population age distribution is due to the enrollment of students at Kansas State University. When considering potential homebuyers, this population of young students are ignored. People between the ages of 30 to 55 are the more attractive market for potential homebuyers in the area. The housing options at Nelson's Ridge must attract both first-time homebuyers and retirees over the age of 55. By allowing the community to have multiple housing options, a more diverse interaction can occur between neighbors.

*Mean House Values by Ages of Householders*

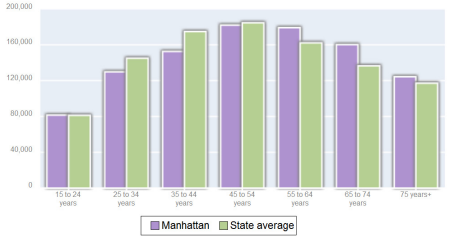



Figure 3.31 Mean house values by ages of householders. www.city-data.com

*Home Sales in Manhattan, KS*

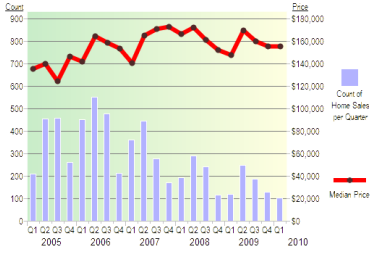



Figure 3.32 Home sales in Manhattan, KS. www.city-data.com

*Distribution of Residents' Ages*

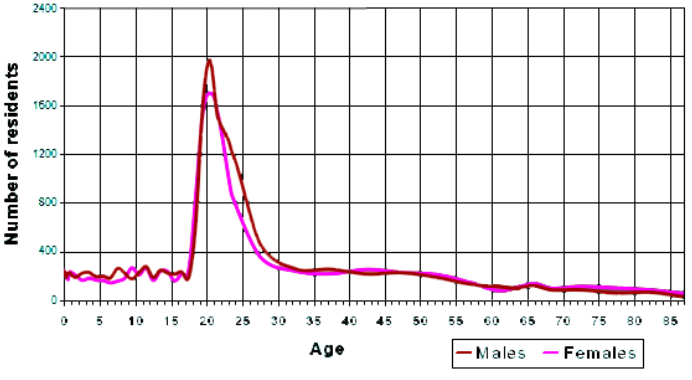



Figure 3.33 Distribution of residents' ages. www.city-data.com

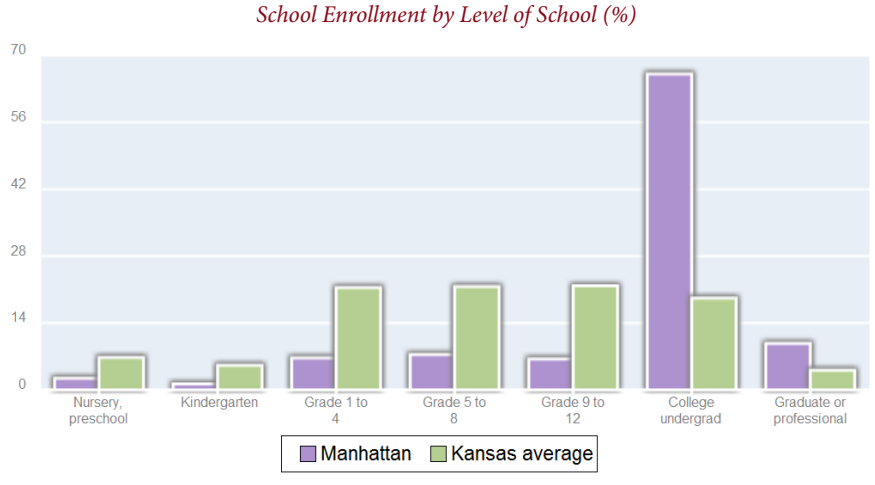



Figure 3.34 School enrollment by level of school. www.city-data.com

## Schools

The location of Nelson's Ridge is within School District 383. It is likely that children will attend Woodrow Wilson Elementary and Manhattan High School. Woodrow Wilson's reputation as a well operated elementary school can serve as another attractive aspect for potential homebuyers to purchase in Nelson's Ridge. Manhattan High School also has a well deserved positive reputation. With consistent growth in the area, schools will most likely need to expand as well.

# Program

## *Programming Process*

The process for developing a program for the project was based primarily on conservation design principles and existing program elements derived from literature and Schwab-Eaton's preliminary plat. By "filtering" program elements defined by Schwab-Eaton through the conservation design principles, it allows for a holistically planned program for the project. Understanding principles applied in precedent studies such as Prairie Crossing (Appendix A) also guided the development of the program. Prairie Crossing has similar site conditions and provides a built project that demonstrates successful/unsuccessful techniques for a creating a conservation community.

## *Program Goals*

The intent of this section is to identify the goals, wants, and needs for the Nelson's Ridge development. By providing a focused list of program elements, it will allow for a more thorough approach to the site inventory and analysis as well as direction for the design phase of the project. The following is a list of goals and objectives for the program of the project.

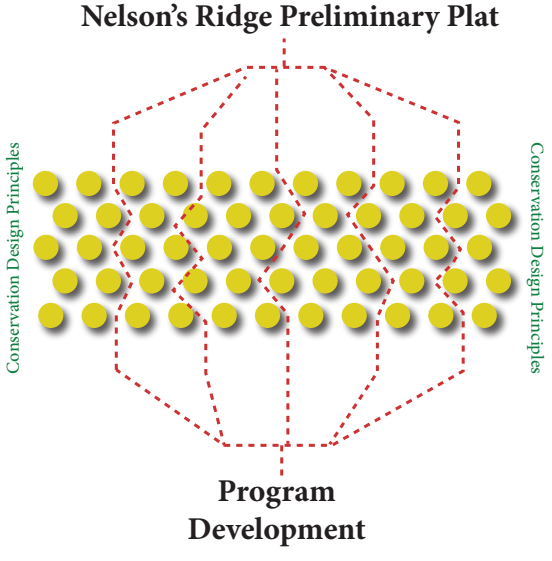



Figure 3.35 Program Process. Author, 2010

## Housing and Lot Layout

*Lot sizes shall be approximately 60' x 100' (0.14 acres) and placed in clusters to allow for larger acreage of open space and agriculture.*

*Average home shall not exceed 3,500 square feet and shall incorporate green building technologies.*

*Homes shall not exceed two-story levels to protect viewsheds across site.*

*Homes shall maximize solar gain. Lots shall be placed on south facing slopes.*

*Architecture shall respond to Kansas prairie styles and materials.*

*Home sites shall respond to topography aspect to allow for highest amounts of solar gain.*

*Homes shall have ease of access to open space/agricultural views.*

*Sidewalks will connect community to amenities and existing/proposed trail systems.*

*Lot layout shall be designed with adequate drainage tying into existing drainage pattern.*

*Lots shall be double loaded on roads where possible to justify infrastructure costs.*

*Overall development shall meet preliminary plat density (DU/acre) or exceed density.*

## Roads and Streets

*Roads shall be minimized and should sit "light on the land" with minimal amount of land disturbance.*

*Roads shall provide access for emergency vehicle turning radius and access to all housing units.*

*Entry drive and experience shall be expressive of the Kansas vernacular.*

*Service roads shall be screened by vegetation or other means.*

*Roads shall be graded with attention to balance of cut and fill.*

*Roads shall be composed of asphalt (4") with adequate subgrade preparation (min. 8" course aggregate).*

*All roads will incorporate concrete curb and gutter with concrete storm drain inlets (boxes).*

*No storm runoff shall leave site. Drainage shall be directed into properly placed retention/detention ponds.*

## Agriculture/Open Space

*Agriculture on site shall be comprised of organic produce to be maintained by members of the community as well as the Home Owners Association (HOA).*

*Produce grown on site shall be distributed to members of the community or sold at local scale (farmer's markets).*

*Site shall set aside acreage for an orchard producing fruits.*

*Chosen plant species shall be either native or considered non-invasive species.*

*Agricultural lands must be easily accessible for maintenance as well as residents of the community.*

*Disturbed agricultural lands shall be restored to original state or converted to open space/wetlands.*

*West end of site shall be preserved as open space due to frequent flooding. This area will be revitalized as natural habitat and shall incorporate walking trails (may not all be universally accessible).*

## Amenities

*Community will include a working farm with barn, greenhouses and storage for maintenance on site.*

*Community Center includes other amenities such as cafe, pool and fitness, tennis courts, rental equipment and large outdoor gathering space for special events.*

*Property shall provide walking trails with covered shelters. Shelters shall be placed according to special views within and across the site.*

## *Approaches to Development*

### *Conventional Development*

*Figure 3.36* illustrates the typical or conventional approach to developing a subdivision on a site that has existing woodlands and open space. The homes are situated on large lots dispersed evenly throughout the buildable area. There is little shared open space and and some of the woodlands have been cut through creating a fragmented ecosystem.

### *Conservation Development*

Arendt's preferred design, shown in *figure 3.37*, illustrates how a conservation approach to development ensures the pretection of both woodlands and open space by clustering housing and reducing length of roadway while still providing the same housing units.

*Table 3.1* shows how each of the design approaches address the design principles and how they are further compared to one another.

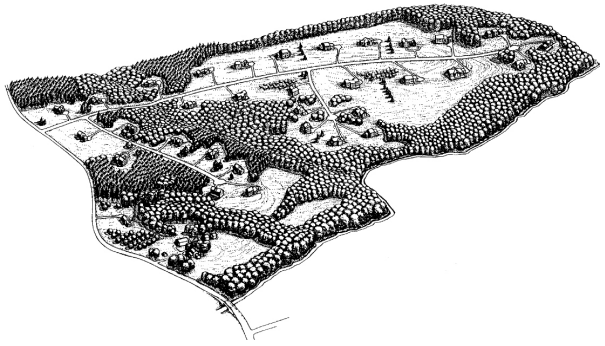


Figure 3.36 Conventional subdivision design. Arendt 2007.

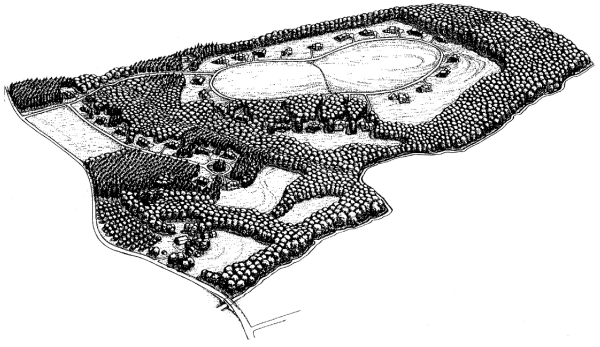


Figure 3.37 Conservation subdivision design. Arendt 2007.

| Design Principles | Conventional Subdivision Development | Conservation Subdivision Development | Analysis of Preliminary Plat vs. Proposed Design |
|---|---|---|---|
| Cluster Development | "All land is paved over, built upon, or converted into lawns or backyards" (Arendt 1996, 5). Typically have larger lot sizes and are evenly spread throughout the site. | "Planning strategy that aggregates development into discrete zones of independent land uses so that the remaining land can be conserved as green space" (McMahon 2010, 8). Minimizes cost of infrastructure. | Lot sizes, housing types and amount of infrastructure (roads and utilities) compared between the two design proposals. |
| Water Conservation | Stormwater on site is collected and piped into existing city stormwater management systems. Major grading efforts are made to maximize buildable lands which create new drainage patterns. | "Natural system-based approach to site planning that focuses on stormwater management and landscape design and development" (McMahon 2010, 12). | Comparison based on amount of stormwater management systems that promote a zero-runoff site. |
| Sense of Community/ Diversity | May only provide few housing options with limited target market due to narrow spread of housing cost (Balmori 2007). Little to no sense of community or interaction between neighbors. | Streets should promote safety, multimobility, comfortability, and pedestrian focused. "Incorporating a range of housing types and price levels will result in healthy communities that express the inherent diversity and richness of our society" (Gause 2007, 49). | Comparison primarily based on ranges of housing costs, community involvement, and design incorporating public interaction. |
| Green Infrastructure | Green infrastructure is typically destroyed and "all the natural areas have been cleared, graded, and planted with grass and nonnative shrubs and trees" (Arendt 1996, 5). | "Strategically planned and managed network of natural lands, working landscapes, and other open spaces designed to maximize ecological values and functions" (McMahon 2010, 12). | Analysis will compare total acreage of open space and natural landscapes vs. built landscape. Productivity of natural systems will also be evaluated. |
| Economic Viability | Design based on maximizing profitability. If poorly planned and phased, can result in losses for both home owners and developers. Home construction can have low energy efficiency causing long-term costs. | Reduced cost of infrastructure, grading and other construction costs. "Home owners are willing to pay premium prices for parks, natural areas, and other open space amenities" (McMahon 2010, 58). | A preliminary cost analysis will show how total costs of the projects were influenced by design choices. |

Table 3.1 Design principles comparison. Author, 2010

# Preliminary Design

## *Contemporary and Neo-traditional Conservation Design*

Arendt describes neo-traditional design to be "faithful to the historic pattern of rectilinear streets and blocks, (Arendt 2010, 55). As shown in *figure 3.38*, Arendt's third design (far right) ties into the surrounding street structure while still conserving open space. Arendt illustrates the contemporary design in the middle as a design proposed by a more progressive developer. The plan incorporates a more contemporary, curvilinear design approach (Arendt 2010).

The following page shows the development of the two conservation approaches (*figures 3.39 and 3.40*). These designs were explored conceptually on trace paper, and then finalized in the computer. They were then compared on factors including amount of development, open space, and infrastructure. The two drawings facilitated the development of a final design that incorporated the most valuable aspects of each alternative. The final concept addresses the deficiencies of the preliminary designs, including greater housing density.


Figure 3.38 Contemporary vs. Neo-traditional Design. Arendt 2010.

## *Contemporary Design*

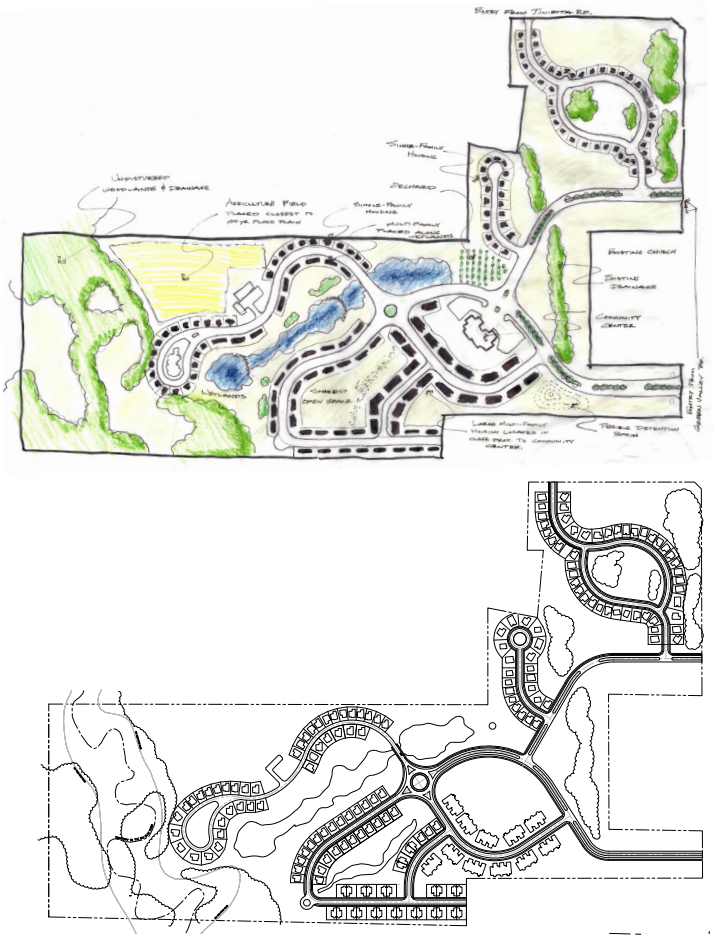


Figure 3.39 Conceptual and Final Contemporary Design. Author 2011.

## *Neo-traditional Design*

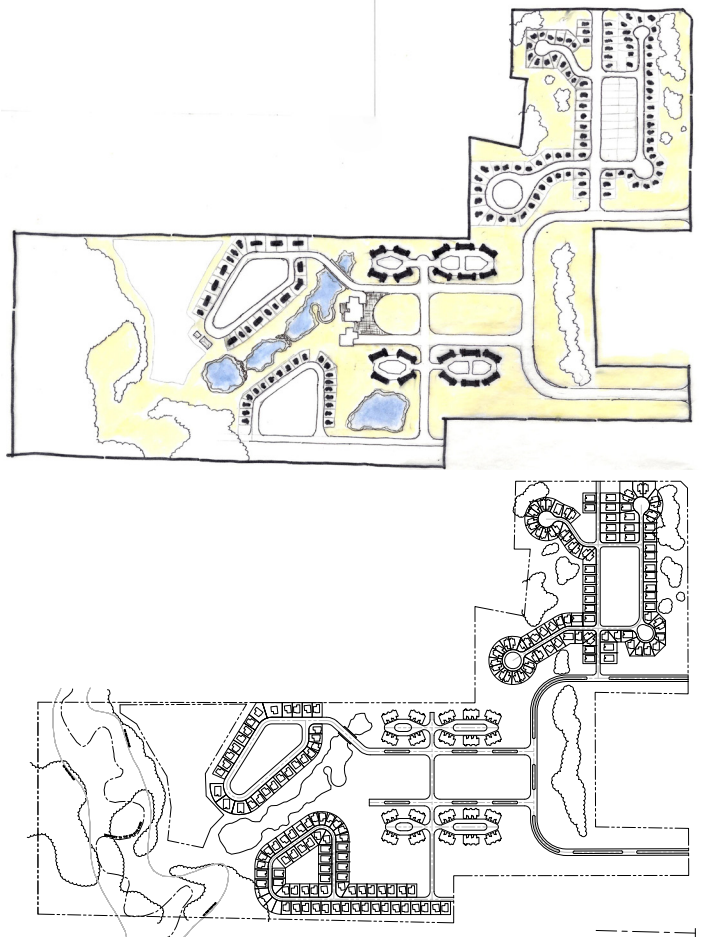


Figure 3.40 Conceptual and Final Neo-traditional Design. Author 2011.

# Conceptual Master Plan

*Figure 3.41* is the conceptual master plan for a conservation based design at Nelson's Ridge. The subdivision is accessed through multiple entry points. There are two entrances off of Green Valley Road on the east side of the property, one entrance from the north on Junietta Road, and one entrance from the south that connects to an existing subdivision.

## *Site Features*

**A** Woodlands/Adventure Trail

**B** Agriculture

**C** Greenhouses

**D** Community Center

**E** Pool

**F** Tennis Courts

**G** Fishing Dock

**H** Lake/Wetlands

**I** Orchard

**J** Gazeebo

**K** Rain Gardens

**L** Entry Gateway

**M** Shared Open Space

## *Legend*


Figure 3.41 Conceptual Master Plan. Author 2011

# Design Principles Applied

## *Cluster Development*

### *Close and Cresents*

Arendt explains that there are two positive alternatives to the typical cul-de-sac design seen in most conventional subdivision designs. These alternatives called “crescents” and “closes” are other types of residential road design solutions. The cul-de-sac is replaced with a crescent and a short connecting street which allows the green space to be used as a rain garden or an attractive planting bed. This island can slow traffic speeds and enhance the streetscape as seen by those approaching by vehicle or on foot, (Arendt 2010).

The second alternative to the typical cul-de-sac is the use of a close. A close is basically an elongated crescent, where the central island becomes a small linear park. It consists of two lanes separated by public open space and designed to be a one-way loop. Turning radius is similar to that of conventional cul-de-sacs to allow for larger vehicles such as moving vans and fire engines to turn around in, (Arendt 2010). The open space in between can be preserved with native prairie or become a formal planting area.

Because many central islands are lower in elevation than the surrounding streets and lots, these green spaces can serve as rain gardens planted with shrubs and trees that thrive in saturated soils. These rain gardens help filter polluted stormwater, reduce runoff rates, and serve aesthetic purposes for the community.

Figure 3.42 Use of close. Author 2011

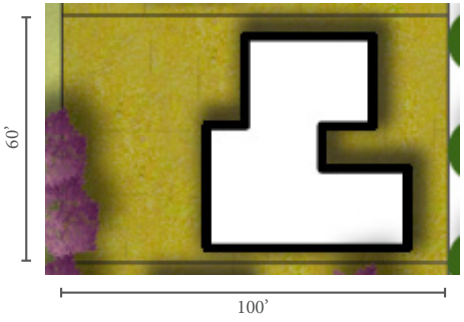



Figure 3.43 Typical lot dimensions. Author 2011

Figure 3.44 Perspective of close. Author 2011

Figure 3.45 Perspective of cluster development. Author 2011

*Housing Clusters*

Single and multi-family lots are placed in clusters to maximize amount of open space and view in and out of site. "Since the developer's fundamental motivation is to make money by selling either houselots or lots with houses newly built on them, and since it is well known that most people prefer (and are often willing to pay extra) to see open space from their windows, it makes economic sense to create as many "view lots" as possible and to ensure that usable open space is located within convenient walking distance from other houses in the subdivision" (Arendt 1996, 42). As seen in *figure 3.47*, many of the lots have views of open space, agriculture and water features.

Figure 3.47 Plan of pedestrian connections. Author 2011

Figure 3.46 Plan of cluster development. Author 2011

Figure 3.48 Perspective of multi-family cluster. Author 2011


Figure 3.49 Perspective of cluster development. Author 2011

## *Water Conservation*

### *Rain Gardens and Vegetated Swales*

One important factor that framed the design of the project was the protection of any existing drainages. By protecting drainages, roads and lots were placed in locations where little grading is needed. This can prevent flooding during or after intense thunderstorm events. By reducing the amount of impervious surfaces, there is far less concentrated runoff than other convention developments.

In order to alleviate the amount of runoff that leaves the site, special water features were created. Such features include vegetated swales, rain gardens, wetlands and lakes. These features can recharge the water table while also improving water quality in nearby streams and rivers. The lake was created utilizing existing wetlands and low points on site. The lake serves as a community amenity where residents can enjoy fishing and canoeing. The rain gardens and vegetated swales educate the residents on water conservation, ecosystems and plant species through signage and community education programs.

Figure 3.50 Rain gardens. Author, 2011

Figure 3.51 Vegetated Swales. Author, 2011


Figure 3.52 Perspective of rain gardens. Author 2011

*Lake and Wetlands*

The lake was primarily formed by an existing low point and drainage corridor. This area is regraded to form a healthier ecosystem that can support a diversity of flora and fauna. The lake provides many recreational activities such as a fishing dock, kayaking, and swimming. The lake is also an aesthetic feature for the residents to enjoy from several lookouts and trails. Fortunate homebuyers have the opportunity to enjoy the lakeviews from out their back window.

The lake is graded in terraces to allow for different ecosystems to flourish. For instance, the shoreline consist of native wetland species that create crucial habitat for fish and insects. The lake drops to a depth of 20' to allow the water to turn during seasons ensuring the fish can survive through harsh winters. The lake is circulated with bubblers to oxygenate the water and prevent the lake from becoming stagnant.

The lake's water level is maintained by redirecting most of the site's drainage into the lake area. During droughts, the lake may be filled by pumping from nearby Big Blue tributary. During heavy storm events, the lake has an overflow drain that flows back into the tributary.

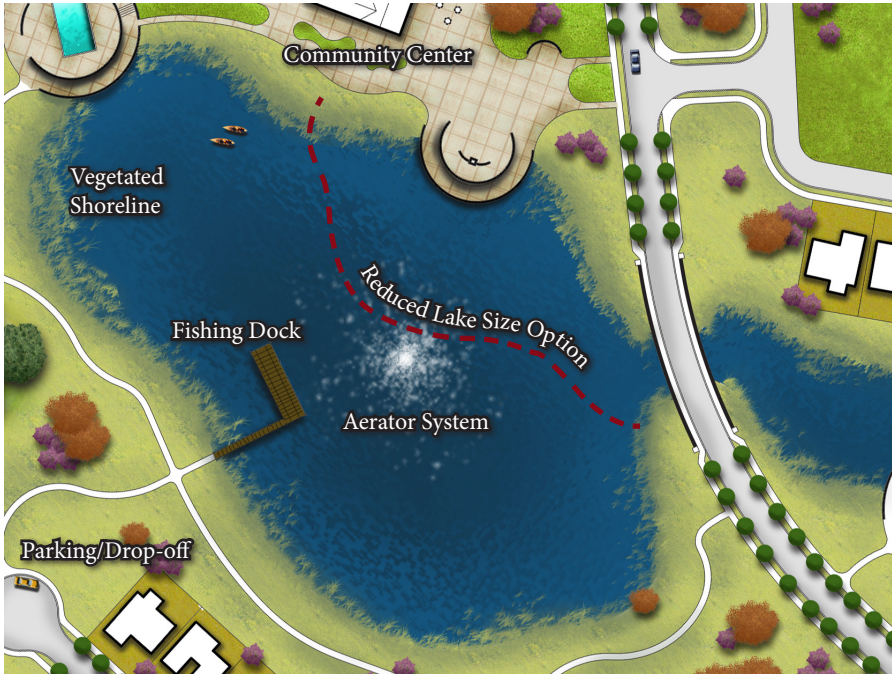



Figure 3.53 Plan of lake. Author, 2011

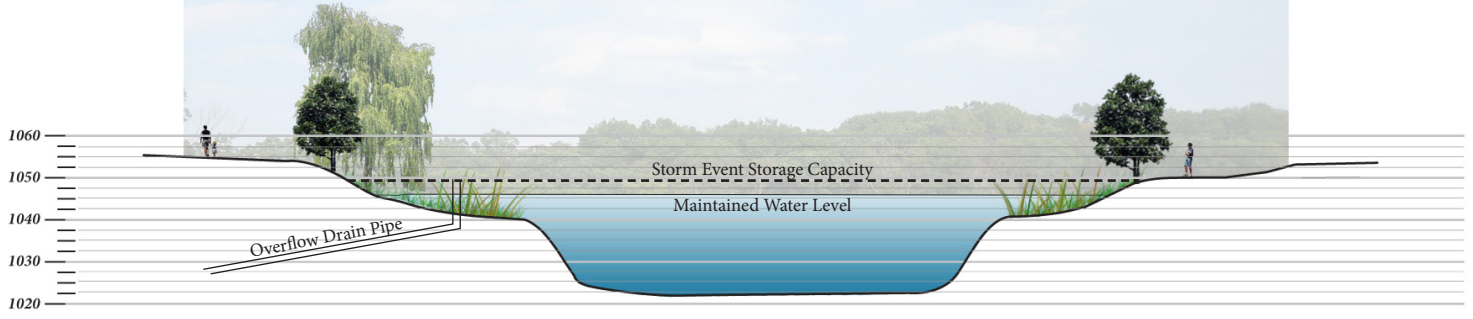



Figure 3.54 Section through lake. Author, 2011


Figure 3.55 Perspective of lake. Author, 2011

## *Green Infrastructure*

### *Hubs and Links*

"A healthy green infrastructure consists of *hubs* and *links*. Hubs anchor green infrastructure networks, providing origins and destinations for wildlife and ecological processes. Links are the connections tying the system together" (Gause 2007, 45). Hubs and links are used in the final design of the community allowing for stronger connections in the public realm and ecological realm.

The design uses green infrastructure to connect the entire community. Hubs are defined by the clusters of open space wrapped in housing. The primary hub is the central park space. The largest link is the existing woodlands and tributary. Other links are provided by preserved prairie corridors with a trail system. The green infrastructure "emphasizes ecology not just recreation; it becomes part of a larger regional system; and it provides a framework to guide growth and urban form at the community and neighborhood level" (Gause, 2007, 45).

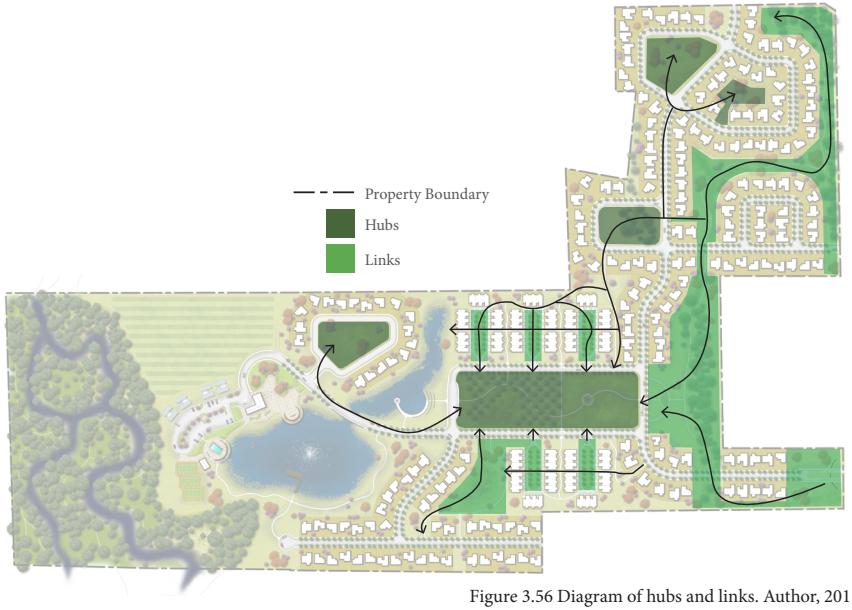



Figure 3.56 Diagram of hubs and links. Author, 2011

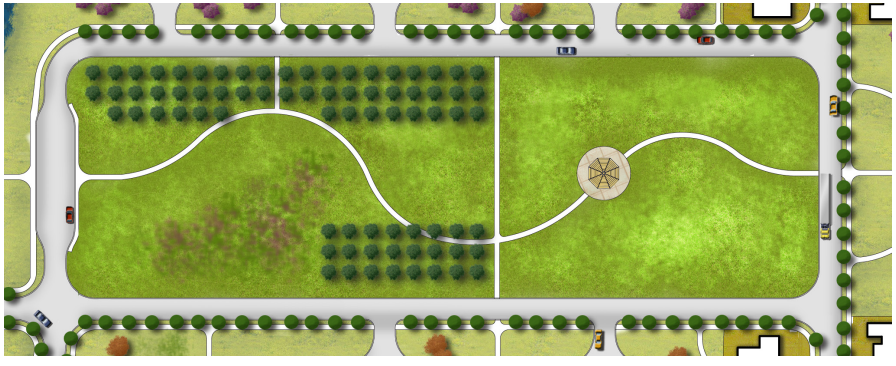


Figure 3.57 Plan of central park space. Author, 2011

Figure 3.58 Perspective of central park space. Author, 2011

*Green Infrastructure as a Recreation Amenity*

Green infrastructure provided opportunities to create several community amenities. The community is connected through sidewalks, trail system, and open spaces. All sidewalks and trails are universally accessible while a more challenging trail system interweaves throughout the woodlands and river. Like water conservation, preserving the original landscape provides a framework for development that supports recreation and circulation. (Gause 2007). The network of trails and sidewalks also provokes a healthy lifestyle for the residents as well as interaction between neighbors.

In the larger context, the proposed trails and sidewalks of Nelson's Ridge extend into neighboring communities and regional trail systems. While not set in place now, the trails can easily unite the subdivision to the much larger community. "The process for developing an open space/greenway plan should be highly participatory. By engaging public stakeholders in plan development, the plan can reflect community needs and desires and stands a greater chance of acceptance" (Randolph 2004, 96).

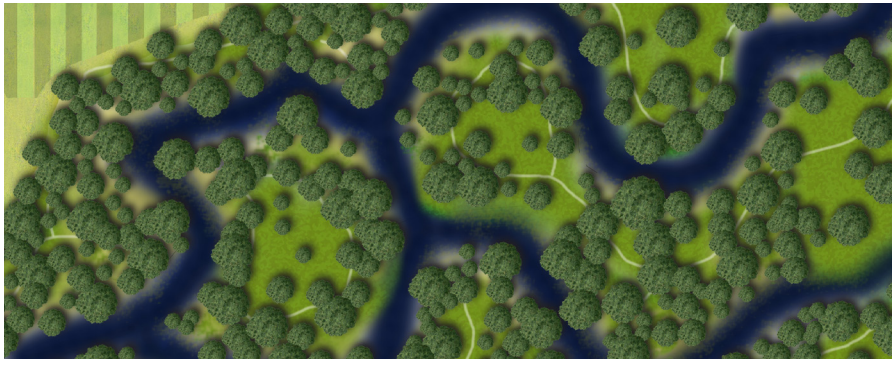


Figure 3.59 Plan of woodlands. Author, 2011

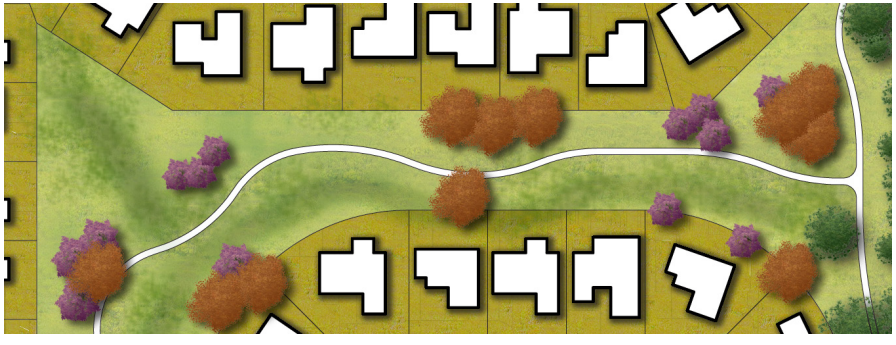


Figure 3.60 Plan of prairie trails. Author, 2011

Figure 3.61 Perspective of prairie trails. Author, 2011

## *Sense of Community/Diversity*

### *Community Based Agriculture*

Kansas ranks 45 out of 50 states for acres of vegetable production per capita. The valley used to be the "sweet potato capital" of the Midwest, producing 2549 acres in 1910. Current state- wide production is 29 acres. (Janke 2010). Over time, the amount of fruit and vegetable production has declined. Nelson's Ridge is designed to maintain the heritage of the region by protecting agriculture production. Following images illustrate the culture of farming in the Kansas River Valley.

Nelson's Ridge includes a community based agriculture system in which members of the community can interact and participate in a working farm. Produce is grown in fields, green houses and orchards. The farm is maintained by a hired experienced farmer that controls all day to day upkeep of the community wide program. The agriculture further demonstrates the "rural character" of the community. Fruiting trees are informally planted throughout the entire development as well as a centrally placed formal orchard. The orchard includes species of apple, peach, and cherry. Other proposed produce includes tomatoes, grapes, strawberries, potatoes and sweet corn.* "The academic literature in this area is generally optimistic that growing consumer awareness of the benefits of local agriculture can lead to increased community participation and help foster a local food ethos varyingly labeled among authors as food citizenship, ecological citizenship, and civic agriculture" (Macias 2008, 1086).

*Advised by Kansas State University horticulture professor Dr. Rhonda Janke.

Figure 3.62 Orchard Tour. Image courtesy Kansas State Library Special Collections.

Figure 3.63 Harvesting potatoes. Image courtesy Kansas State Library Special Collections.

Figure 3.64 Plowing the land. Image courtesy Kansas State Library Special Collections.

Figure 3.65 Harvesting the field. Image courtesy Kansas State Library Special Collections.

Figure 3.66 Picking strawberries. Image courtesy Kansas State Library Special Collections.

Figure 3.67 Perspective of orchards. Author, 2011

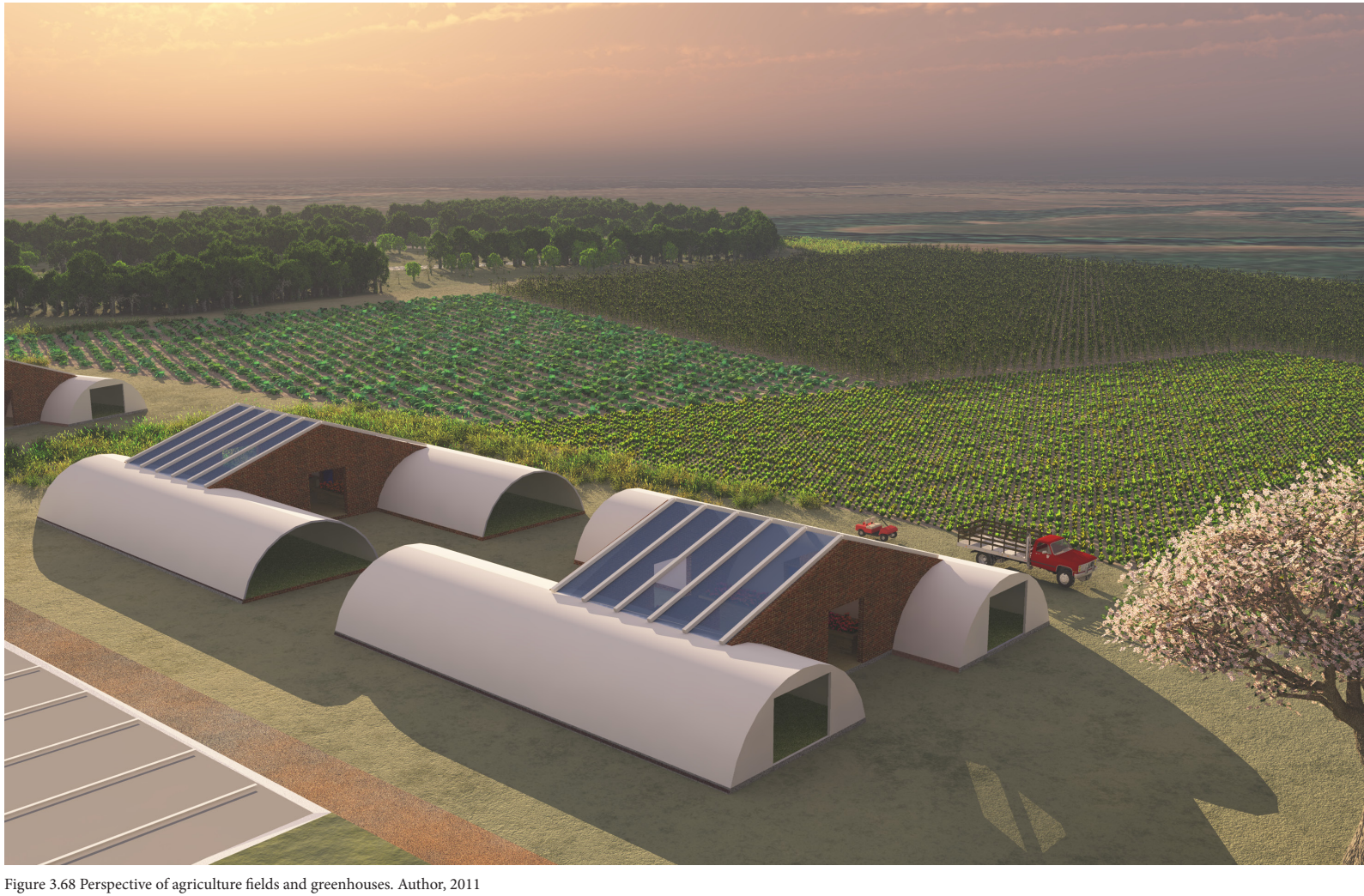


Figure 3.68 Perspective of agriculture fields and greenhouses. Author, 2011

*Community Center*

The community center is placed on the west end of the development near the agriculture so that is serves as storage as well as restaurant and daycare. A parking lot offers residents and guests easy access to greenhouses, pool and tennis courts. An access road to the agriculture fields doubles as over-flow parking for larger events which utilize the large outdoor gathering space. The gathering space is a great place for events where residents can enjoy a meal from the restaurant with views across the lake and neighborhood. A large fireplace which lies at the terminus of the primary axis of the development creates a warming environment during cooler days and nights. The community center provides daycare for families in the community where kids can learn about farming, swim in the pool, play tennis, fish or explore the woodlands.


Figure 3.69 Plan view of community center. Author, 2011

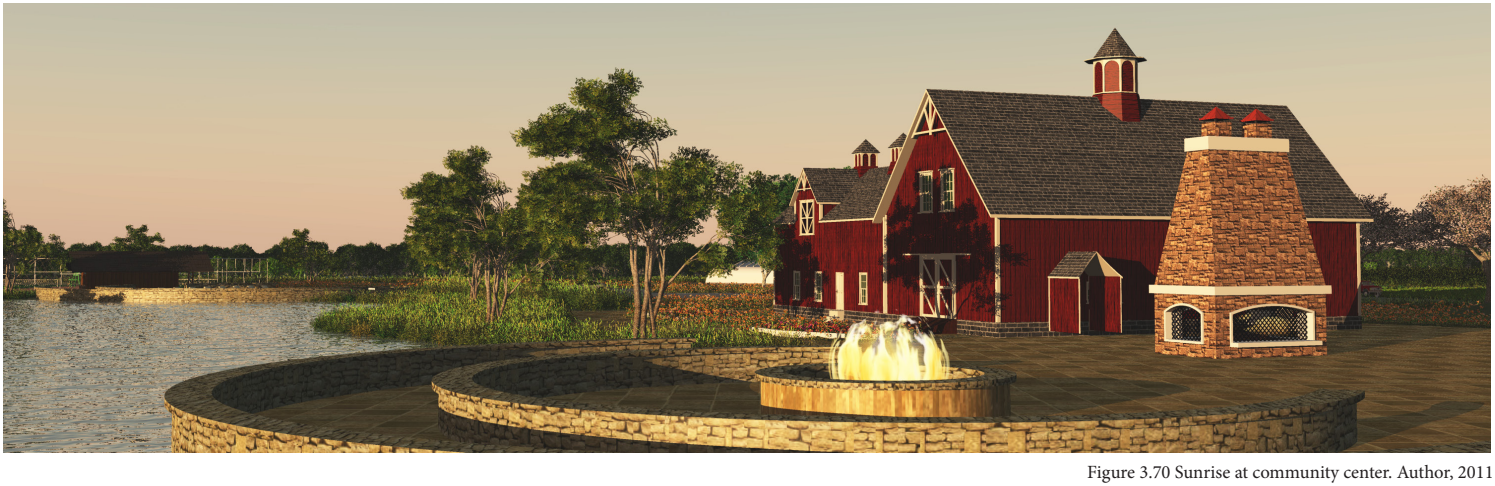


Figure 3.70 Sunrise at community center. Author, 2011

Figure 3.71 Perspective view of community center. Author, 2011

Figure 3.72 Perspective view of community tennis courts and pool. Author, 2011

## *Economic Viability*

### *Reduced Infrastructure*

One main concept in reducing cost of development is reducing amount of infrastructure in the project. If single-family houselots can be narrowed, or that multiple unit dwellings can be incorporated, it allows for street and utility runs to be shortened (Arendt 1996, 10). As shown in *figure 3.43*, the typical lot size is 60' x 100'. The conventional lot size proposed by Schwab-Eaton is approximately twice the size with little or no views of open space. The conservation design not only exceeds the number of units proposed by Schwab-Eaton, but smaller lots ensure a larger amount of shared acreage for the residents. Another reduction in infrastructure cost is associated with drainage. There is far less cost for erosion control and construction of concrete swales that are typically built in conventional developments in the area.

### *Marketing and Sales Advantages*

Another advantage occurs during the marketing and sales period, when developers and realtors can capitalize on the amenities that have been preserved or provided by the development (Arendt 2010). Because Nelson's Ridge has several housing styles and costs, it can attract a larger homebuyer market. By creating a stronger sense of community, homeowners will not be willing to sell and in turn, drives up selling prices. On average, homes within conservation communities sell over time at a higher price than those of conventional subdivisions. "Conservation subdivisions are vastly more appealing to consumers, have much faster resale rate and higher resale value, and that is a fact," says Joe Flaherty, the developer of Jarvis Farm, a conservation community in Massachusetts (McMahon 2010, 40).

## *General Development Cost- Schwab-Eaton Design**

| Site Construction | Unit quantity | Unit | Unit Price | Total Cost |
|---|---|---|---|---|
| *Road* | 54212.79 | S.Y | $18.58 | $1,007,273.64 |
| *Water* | 16264 | L.F. | $51.05 | $830,277.20 |
| *Sanitary Sewer* | 16264 | L.F. | $95.00 | $1,545,080.00 |
| *Storm Drainage* | 4103 | L.F. | $13.75 | $56,416.25 |
| *Finish Grading* | 54212.79 | S.Y. | $2.74 | $148,543.04 |
| **Total Cost** | | | | **$3,587,590.13** |

Table 3.2 General development costs for Schwab-Eaton Design. Author, 2011

## *General Development Cost- Conservation Design**

| Site Construction | Unit Quantity | Unit | Unit Price | Total Cost |
|---|---|---|---|---|
| *Road* | 37431.63 | S.Y | $18.58 | $695,479.69 |
| *Water* | 14037 | L.F. | $51.05 | $716,588.85 |
| *Sanitary Sewer* | 14037 | L.F. | $95.00 | $1,333,515.00 |
| *Storm Drainage* | 790 | L.F. | $13.75 | $10,862.50 |
| *Finish Grading* | 37431.63 | S.Y. | $2.74 | $102,562.67 |
| **Total Cost** | | | | **$2,859,008.70** |

Table 3.3 General development costs for Conservation Design. Author, 2011

***Total savings on development costs= $728,581.43***

*All unit prices taken from RSMeans "Site Work and Landscape Cost Data. 2007


KOMATSU

# Part 4
## Comparative Analysis

**Comparative Analysis**
**Comparative Analysis Summary**
**Comparative Analysis Conclusions**

Figure 4.1 Road preparation. Author, 2010

# Comparative Analysis

## *Development*

Because housing was placed in clusters, there is far less developed acreage in the conservation design than that of Schwab-Eaton. *Figures 4.2 and 4.3* show diagrammatically just how much of the site is developed for housing. Although Schwab-Eaton's preliminary plat shows 293 dwelling units for the subdivision, about 43 of the lots either can or should not be built due to mass grading over existing drainages as well as having close proximity to 100 year flood plain. The engineered design ignores the fact that these drainage areas are sensitive to erosion and can cause further cost to developer and/or homeowner.

As seen in *table 4.1*, Schwab-Eaton design includes only single-family housing options while the conservation design offers both single and multi-family housing. The engineered approach maximizes the amount of land that can be developed (over 80%) and only the woodlands and tributaries were considered undevelopable lands. On the contrary, the alternative conservation design shows that only 26% of the site was developed allowing for less disturbance to the existing landscape of the site.

*Tables 4.1 and 4.2* explains the dwelling unit counts for single and multi-family housing and the gross densities for both design approaches. The table shows that the amount of dwelling units in the conservation development is approximately the same, yet the density increases due to a decrease in developable area calculations by incorporating both primary and secondary conservation areas. Schwab-Eaton did not consider any secondary conservation areas and therefore all 111 acres of "developable" land is considered in the calculations. Both plans considered the woodlands and tributaries primary conservation areas. The conservation design also incorporates secondary conservation areas such as major drainages and agricultural lands as "undevelopable" lands.

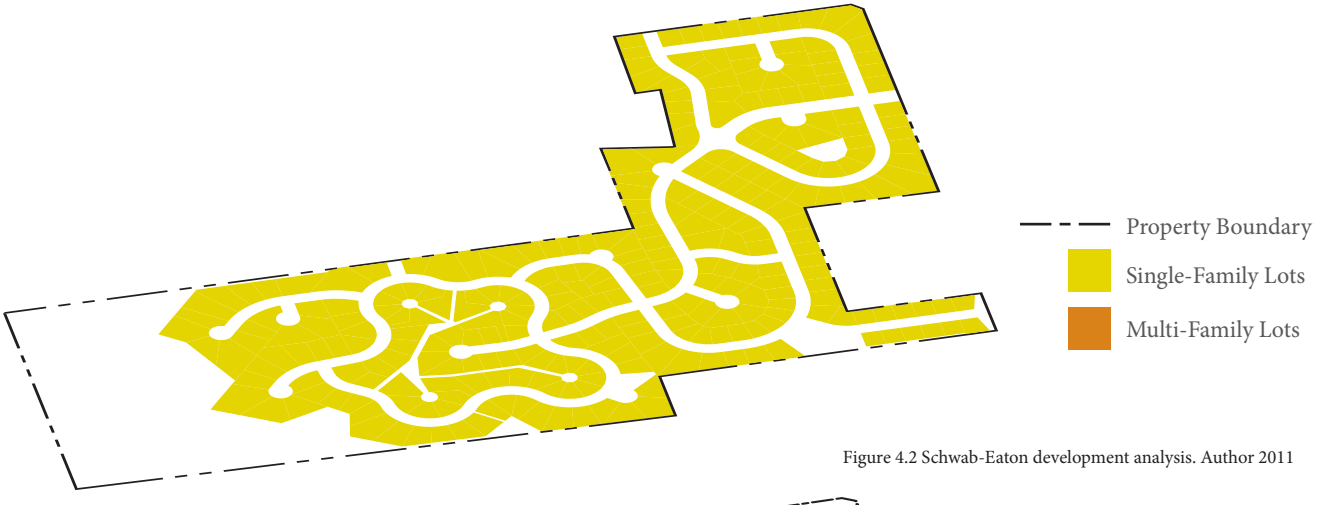



Figure 4.2 Schwab-Eaton development analysis. Author 2011

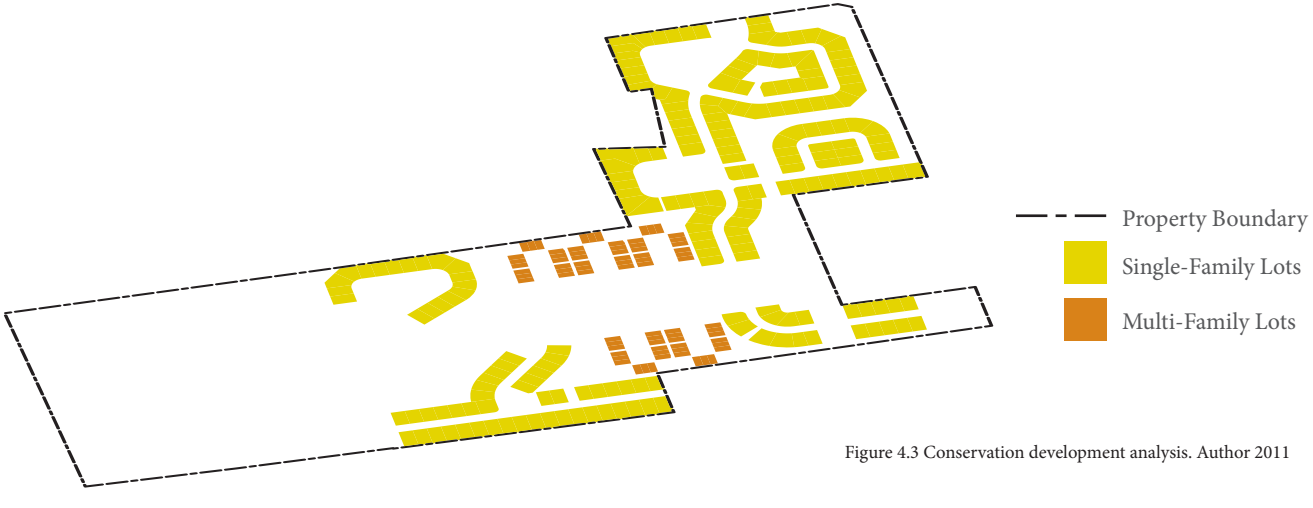



Figure 4.3 Conservation development analysis. Author 2011

## *Infrastructure*

Infrastructure is an important comparative factor when comparing the two alternatives. Infrastructure usually has the highest associated development costs. Infrastructure is compared through amount of acreage taken by roads because most utilities are directly correlated with the length and right-of-way of roads. Other than the roads, other infrastructure includes sewer, water, gas, electric and possibly others. *Figures 4.4 and 4.5* show the differences in amount of roads in each alternative to the subdivision design.

*Table 4.2* illustrates that the conservation design alternative has about the same amount of roads although the conservation design calculations include a large parking lot which most likely does not have other utilities associated with. In reality, the conservation design does have less amount of infrastructure. The conventional design also has wider roads which increases the cost of construction.

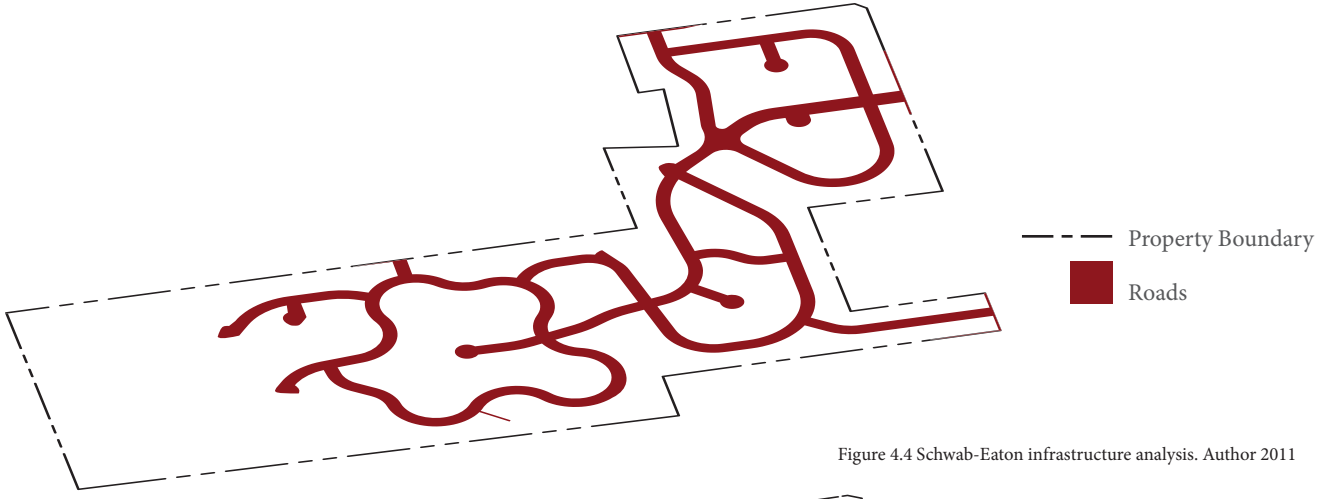



Figure 4.4 Schwab-Eaton infrastructure analysis. Author 2011

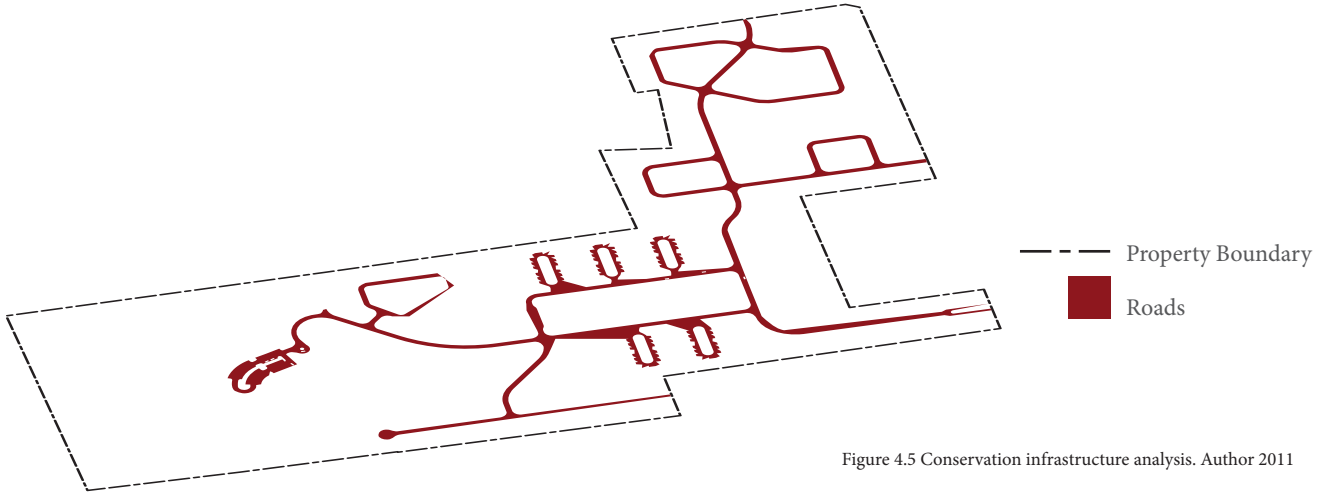



Figure 4.5 Conservation infrastructure analysis. Author 2011

## *Open Space*

With less amount of acreage devoted to development, the amount of open space increases. As shown in *figures 4.6 and 4.7*, there is a noticeable difference in the amount of public open space for the community. Amount of open space becomes one of the more influential factors in differentiating the two alternatives. Economically, cost to build concrete swales is offset by cost of maintaining open space. As mentioned previously, shared open space becomes a primary amenity to the community and the Schwab-Eaton lacks open space almost entirely. The only areas considered to be public in Schwab-Eaton's design are constructed drainages that will most likely be consumed by concrete ditches and detention basins.

*Table 4.2* shows that the conventional alternative has about 1% of the site reserved for open space. The conservation design preserves more than 60% of the "developable" area for shared open space. The open space includes landscaped open space/amenities, trails, preserved prairie, and water features.

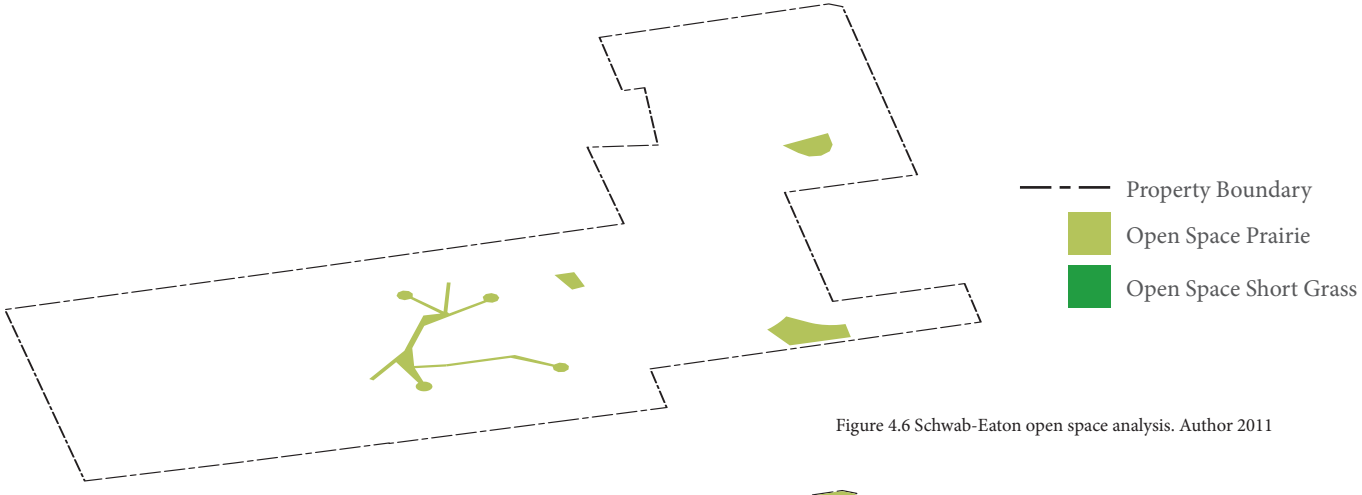



Figure 4.6 Schwab-Eaton open space analysis. Author 2011

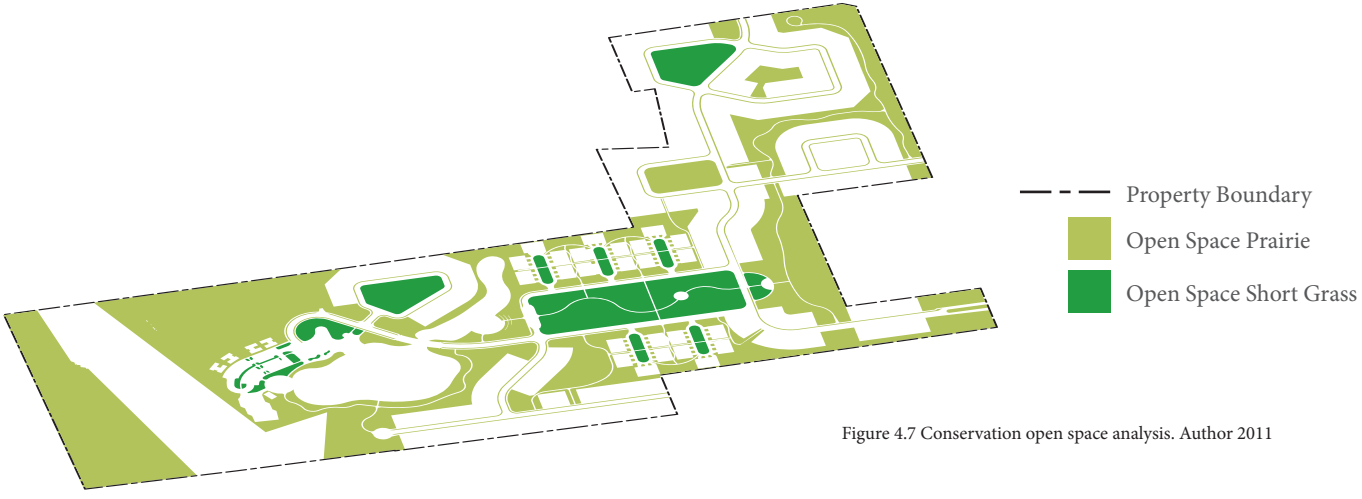



Figure 4.7 Conservation open space analysis. Author 2011

# Comparative Analysis Summary

The comparative analysis allows the reader to better understand the actual statistics associated with the development alternatives. By comparing the two designs, one can make a more logical assessment of how goals were accomplished or disregarded.

*Development*

Most importantly, the amount of dwelling units is close to the preliminary plat proposed by Schwab-Eaton. By accomplishing this, it ensures that the developer is able to sell the same amount of lots as previously planned in order to pay for upfront costs like constructing roads and bringing utilities to the development. The conservation design is able to meet the required amount of dwelling units, yet increase the density. As a result, more land is preserved for open spaces and shared amenities.

*Infrastructure*

While the total acreage of roads is similar between the two alternatives, the conservation design road layout "sits light on the land," allowing for less grading than that of the conventional design. The cost of constructing the roads in the conventional design will require more site preparation and will undoubtedly disturb the existing landscape, especially the drainage corridors.

*Open Space*

Acreage dedicated to open space differs drastically between the two alternatives. The conventional subdivision has practically no public open space while the conservation design exploits open space as a primary design consideration to serve as a community amenity. The lack of open space in the conventional subdivision design further exploits a loss of character and place. On the contrary, the conservation designs provides more than 60% of the "developable" land to open space that residents can enjoy. Open space amenities include prairie trails, agriculture and orchards.

*Figure 4.8* shows Schwab-Eaton preliminary plat with lots identified as being unsuitable for building or any type of earthwork. There are 43 lots that are either too close to the 100 year flood plain or are within existing drainage corridors.

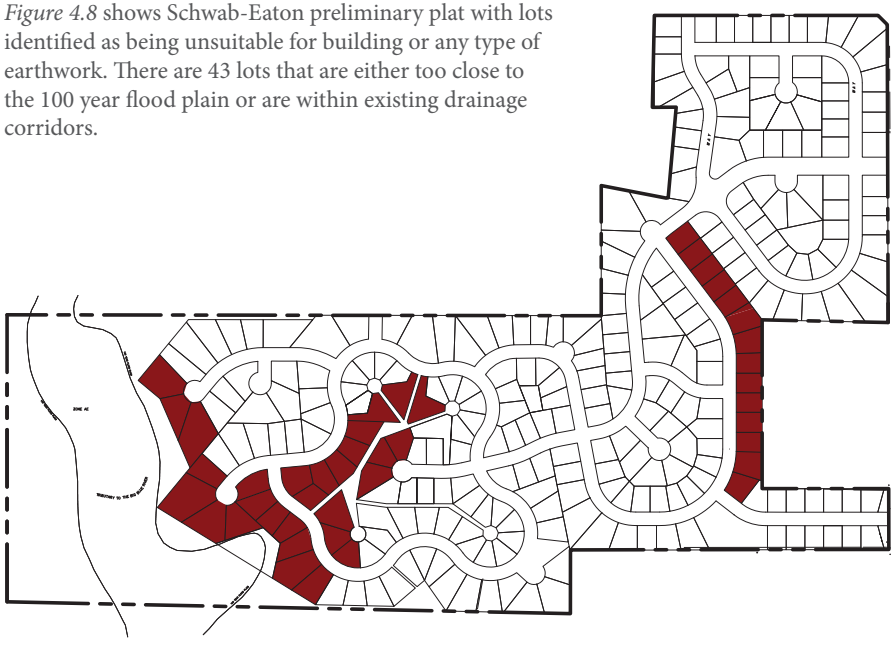


Figure 4.8 Lots considered unbuildable. Plan courtesy of Schwab-Eaton modified by author 2011

## Site Metrics

**Project:** **Nelson's Ridge Subdivision**

City/County Pottawatomie County State: KS

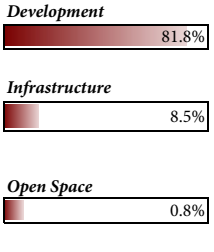
**Designer** Schwab-Eaton Engineering

**Concept Title:** Preliminary Plat

| **Existing Site Breakdown** | Area (Ac) | % of Site |
|---|---|---|
| Total Site Area (Gross) | 132 | 100.0% |
| Non-developable Area | 20.6 | 15.6% |
| Developable Area (Net) | 111.4 | 84.4% |

| **Slope Categories** | Area (Ac) | % of Site | Comments |
|---|---|---|---|
| 0 - 15% | 111.4 | 84.4% | 10% = max road gradient |
| 15-25% | 0.0 | 0.0% | Precautionary |
| >25% | 20.6 | 15.6% | Prohibitive |
| *Total* | *132* | *100.0%* | |

| **Proposed Development Breakdown** | Area (Ac) | % of Site |
|---|---|---|
| Total Residential (excluding roads) | | 81.8% |
| Estate Residential | 0 | 0.0% |
| Single Family Residential | 108 | 81.8% |
| Multi-Family Residential | 0 | 0.0% |
| Roads/Public Parking (paved) | 11.2 | 8.5% |
| Dedicated Utility/Transit Easements | 0 | 0.0% |
| Landscaped Open Space/Amenities (parks, playfields, streetscape, etc.) | 0 | 0.0% |
| Trails (compacted unpaved) | 0 | 0.0% |
| Preserved Natural Open Space | 1 | 0.8% |
| Water Features | 0 | 0.0% |
| *Total* | 120.2 | 91.1% |




| | **Density (Gross)** | **Net Units*** |
|---|---|---|
| **Units** | DU/Ac | DU |
| | | |
| 293 | 2.6 | 247 |
| | | |

*Adjusted # units based on developable area



Table 4.1 Schwab-Eaton site matrix. Howard Hahn modified by author, 2011

Note: This matrix describes the preliminary plat designed by Schwab-Eaton and does not account for the 43 lots that are considered unbuildable. The elimination of those lots could decrease the percentage of development and increase the amount of open space.

## Site Metrics

**Designer** Felipe DeNarvaez

**Project:** **Nelson's Ridge Subdivision**

**Concept Title:** Conservation Design

City/County Pottawatomie County State: KS

| **Existing Site Breakdown** | Area (Ac) | % of Site |
|---|---|---|
| Total Site Area (Gross) | 132 | 100.0% |
| Non-developable Area | 20.6 | 15.6% |
| Developable Area (Net) | 54.47 | 41.3% |

| **Slope Categories** | Area (Ac) | % of Site | Comments |
|---|---|---|---|
| 0 - 15% | 111.4 | 84.4% | 10% = max road gradient |
| 15-25% | 0.0 | 0.0% | Precautionary |
| >25% | 20.6 | 15.6% | Prohibitive |
| *Total* | *132* | *100.0%* | |

| **Proposed Development Breakdown** | Area (Ac) | % of Site |
|---|---|---|
| Total Residential (excluding roads) | | 26.4% |
| Estate Residential | 0 | 0.0% |
| Single Family Residential | 31.21 | 23.6% |
| Multi-Family Residential | 3.64 | 2.8% |
| Roads/Public Parking (paved) | 7.07 | 5.4% |
| Dedicated Utility/Transit Easements | 0 | 0.0% |
| Landscaped Open Space/Amenities (parks, playfields, streetscape, etc.) | 9.67 | 7.3% |
| Trails (compacted unpaved) | 6.57 | 5.0% |
| Preserved Natural Open Space | 56.93 | 43.1% |
| Water Features | 6.79 | 5.1% |
| *Total* | 121.9 | 92.3% |

***Development*** 26.4%

***Infrastructure*** 5.4%

***Open Space*** 60.6%

| **Units** | **Density (Gross)** DU/Ac | **Net Units*** DU |
|---|---|---|
| | | |
| 206 | 3.8 | 85 |
| 75 | 1.4 | 31 |
| **Total Units** | | |
| 281 | 5.2 | 116 |

*Adjusted # units based on developable area



Table 4.2 Conservation design site matrix. Howard Hahn modified by author, 2011

## Comparative Analysis Conclusions

Overall, the conservation development has been able to preserve the existing landscape, reduce the amount of infrastructure, and allow for more public open space. As seen in the previous matrices, the conservation design was within 12 units of the Schwab-Eaton preliminary plat, but was able meet this number while still conserving more than 60 percent of the site as open space. Developers should notice that not only a decrease in infrastructure reduces the cost of construction, but also the reduction in stormwater infrastructure costs.

The preliminary plat proposed by Schwab-Eaton may need revisions due to home being located too close to the flood plain and/or require extensive fill to create building pads. Although the 43 lots considered unbuildable were conceptual, it is aknowledged that many of the lots will be eliminated.

# Part 5
## Conclusions

**Further Research**
**Reflection**
**References**

Figure 5.1 www.prairiecrossing.com

# Further Research

## *Full Cost Analysis*

The project could be further understood financially by developing a full cost analysis of the both project proposals. While this report generalizes how many financial development costs may be offset by applying conservation design principles, it is not fully supported by hard evidence. To continue this report with a detailed analysis of cost in building roads, utilities, grading, home and community center construction would ensure the developer that a conservation community is or is not financially feasible.

## *Community Involvement*

This report demonstrates one alternative to a designed conservation community. Even though there was a preliminary design, the proposed design was influenced only by the committee members and myself. The overall design lacked community involvement and feedback. Many design considerations were based on generalizations supported by literature and some local opinions (professors and real estate brokers). The types of amenities and housing types could have been more locally supported by informally interview or providing a questionnaire to some of the local homeowners in Pottawatomie County and residents of nearby Manhattan.

## *Environmental Assessment*

Because the site was in need of moderate restoration in the wetlands, prairie and woodlands, a thorough assessment of existing and proposed changes to the environment would be needed. This could influence many factors including housing layout, site preparation and associated costs.

## Reflection

This project is just one example of applying conservation design principles as an alternative to conventional subdivision design. With development encroaching the rural landscapes outside of America's cities, it is critical that planners, city officials and developers work together to create valuable communities that benefit the residents and the landscape.

### *Future Development in Pottawatomie County*

According to Jack Ryan of Ryan & Sons Realty, "acceptance of this type of development is still ten to fifteen years down the road." While conservation is not a primary concern today, developers in the area are already under scrutiny for building too close to flood plains resulting in washed stream banks and loss of property. I believe that efforts must be made in the near future by developers and planning officials to apply conservation principles into subdivision development.

Although a thorough financial breakdown of the proposed designs is absent, built projects such as Prairie Crossing and many others have proven to be far more profitable than conventional development approaches.

# References

## *Books*


Arendt, R. 1996. *Conservation Design for Subdivisions.*

Arendt, R. 2010. *Envisioning Better Communities. Seeing More Options, Making Wiser Choices.*

Balmori, D. 2007. *Land and Natural Development (LAND) Code: Guidelines for Sustainable Land Development.*

Burchell, R. W. 1972. *Planned Unit Development: New Communities American style.*

Condon, P. M. 2010. *Seven Rules for Sustainable Communities: Design Strategies for the Post Carbon World.*

Duany, A. 2009. *The Smart Growth Manual.*

Galston, W. A. 1995. *Rural Development in the United States: Connecting Theory, Practice, and Possibilities.*

Gause, J. A. 2007. *Developing Sustainable Planned Communities.*

Jarvis, F. D. 1993. *Site Planning and Community Design for Great Neighborhoods.*

Leopold, A. 1970. *A Sand County Almanac: With Essays on Conservation from Round River.*

Longley, P. 2005. *Geographical Information Systems and Science {2Nd ed.}.* Chichester: John Wiley Sons, Ltd.

McMahon, Edward, T. 2010. *Conservation Communities: Creating Value with Nature, Open Space, and Agriculture.*

Randolph, J. 2004. *Environmental Land Use Planning and Management.*

Spencer, Eugene R. *2007. Site Work & Landscape Cost Data. Kingston, MA: R S Means.* 27th Annual Edition.

Strom, S. 2004. *Site Engineering for Landscape Architects.* Fourth Edition.

*Site Work & Landscape Cost Data. Kingston:* R S Means, 2007.


## *Articles*


Arendt, R. 2004. Linked Landscapes: Creating Greenway Corridors Through Conservation Subdivision Design Strategies in the Northeastern and Central United States. *Landscape and Urban Planning 68 (2-3): 241*

Austin, M. E. 2004. Resident Perspectives of the Open Space Conservation Subdivision in Hamburg Township, Michigan. *Landscape and Urban Planning 69 (2-3): 245*

Plantinga, A. J. 2001. Agricultural Land Values and the Value of Rights to Future Land Development. *Land Economics 77 (1): 56.*

Yeh, A. G. O. 1998. Sustainable Land Development Model for Rapid Growth Areas Using GIS. *International Journal of Geographical Information Science 12 (2): 169.*

*Hill, James. "What Are the Positive Aspects of Solar Power?" Efficient Home Energy Saving. Web. 01 May 2011. <http://efficienthomeenergysaving.org/what-are-the-positive-aspects-of-solar-power/>.*

Macias, T. 2008. *Working Toward a Just, Equitable, and Local Food System: The Social Impact of Community-Based Agriculture.* Social Science Quarterly, Vol. 89, number 5, December 2008.

## *Websites*

Pottawatomie County. www.pottcounty.gov

Conservation Design Forum. www.cdfinc.com

Local Harvest. www.localharvest.org

Prairie Crossing. www.prairiecrossing.com

U.S. Census Bureau. www.census.gov

City-Data. www.city-data.com

## *Presentations*

Janke, R. "Economic Potential". 2010. Kansas State University.

Janke, R. "Food Meals". 2010. Kansas State University.

Janke, R. "The Kansas River Valley Survey". 2010. Kansas State University.

# Appendix

**Appendix A - Precedent Study of Prairie Crossing**
**Appendix B - Design Process**
**Appendix C - Literature Review and Map**
**Appendix D - Glossary**

Figure 6.1 www.planningwithpower.org

# Appendix A - Precedent Study

## *Project Information*

Project Name:

*Prairie Crossing*

Location:

*Grayslake, Illinois*

Date Design/Planned:

*Site acquired: 1987*

*Planning started: 1987*

*Construction started: 1992*

## *Project Team*

Developer:

Prairie Holdings Corporation, Grayslake, Illinois. www.prairiecrossing.com

Land Planners:

Skidmore, Owings & Merill, Chicago, Illinois. www.som.com.

Calthorpe Associates, Berkeley, California. www.calthorpe.com.

Architects:

Tigerman McCurry, Chicago, Illinois. www.tigerman-mccurry.com.

Worn Jerabek Architects, Chicago, Illinois. www.wwapc.com.

Serena Strum Architects, Northbrook, Illinois. www.serenastrum.com

Landscape Architects:

William Johnson, FASLA. Bainbridge Island, Washington.

Peter Lindsay Schaudt Landscape Architecture, Inc. Chicago, Illinois. www.schaudt.com.

## *Physical Context and Site Analysis*

The 678-acre site, which is located 40 miles north of downtown Chicago, is one of the nation's first conservation developments. The site was formerly farmland and most of the site was kept in a naturalized setting. The site consists of productive agriculture as well as wetlands and natural open space. The development is surrounded by "conventional subdivisions", but many developers in the area are looking to Prairie Crossing as an alternative approach to subdivision development. The community demonstrates how ecologically sensitive development can be used as a tool for the conservation of land that is threatened by inappropriate uses, (Gause 2007, 202).

## *Theoretical and Historical Context*

The site was purchased by Gaylord Donnelley, a Chicago printing executive who lived nearby, and seven neighboring families. The group formed Prairie Holdings (PHC) in 1987, following a 15-year battle over the development of the former farmland, (Gause 2007). The new owner wanted to create a community that would leave a substantial portion of the property in a natural or agricultural condition. This would be accomplished by clustering houses on small lots and trading off private acreage for shared ownership of open space, (Gause 2007). After the passing of Donnelly in 1992, George A. Ranney Jr. and wife Victoria Ranney, members of the original investment group and officers of PHC, led the planning and development for the project (Gause 2007). They were convinced that home buyers would pay a significant premium (some 30 percent more) to live in a conservation community. They planned accordingly by having 359 single family homes and 36 condominiums. "Nearly 70 percent of the community is devoted to open space. This open space includes 70-acre working farm and more than 10 miles of trails through a landscape of restored prairie, lakes, pastures and farm fields" (Gause 2007, 204).

Figure 6.2 Community gathering area. www.prairiecrossing.com

## *Master Plan and Housing Types*

An important aspect of the planning process was the decision to "adopt a set of ten guiding principles for Prairie Crossing: environmental protection and enhancement, a healthy lifestyle, a sense of place, a sense of community, economic and racial diversity, convenient and efficient transportation, energy conservation, lifelong learning and education, aesthetic design and high-quality construction, and economic viability" (Gause 2007, 204). Preservation of open space was the primary organizing framework for the conservation community, especially the protection of existing farmland with the use of conservation easements.

Prairie Crossing worked with multiple architects to develop over 20 house plans, creating visual variety and diversity throughout the community (Gause 2007). By having diversity in housing cost, it allowed for a larger market which was important especially in the beginning phases of the project due to untested market. Architectural firms were directed to emphasize Midwestern vernacular architecture and energy conservation in their designs (Gause 2007). "When potential residents were asked to select the types of landscapes they preferred, most of them said they would select the farm views if they were ensured that it would remain farmland in perpetuity" (Gause 2007, 205).

Figure 6.3 www.prairiecrossing.com

Figure 6.4 www.prairiecrossing.com

Figure 6.5 www.prairiecrossing.com

## *Program Elements*

### *Land Use Information:*

*Total site area (acres/hectares)- 678/274*

*Total number of dwelling units completed- 359*

*Gross residential density (units per acres/hectare) - 1.7/0.69*

*Average net residential density (units per acres/hectare)- 3/7.41*

*Nonresidential development (roads, streets, parks/open space per acre/hectare)- 470/190*

*Total office space square feet/meters) – 20,000/1,858*

*Total retail space (square feet/meters) – 52,500/4,877*

### *Land Use Plan:*

*Residential – 135 acres, 55 hectares, 20% of site*

*Open space – 470 acres, 190 hectares, 69% of site*

*Other (planned communities) – 73 acres, 30 hectares, 11% of site*

Table 6.1 Program elements. www.prairiecrossing.com

Figure 6.6 www.prairiecrossing.com

### *Significance and Uniqueness of the Project*

Prairie Crossing is one of the nation's first conservation developments. The project demonstrates how ecologically sensitive development is used as a tool for the conservation of land that is in danger of improper uses. What makes this project unique is the fact that the developers decided to leave a substantial portion of the property in a natural or agricultural condition. Most developers these days are more concerned about maximizing the development with disregard to natural system/features/amenities and productivity of the land such as agriculture.

### *Relevance/Application to Capstone Project*

Prairie Crossing is a relevant project to the master's report due to the developers approach to creating a conservation community that incorporates restoration of wetlands and preservation of productive agriculture lands on site. Even though Prairie Crossing is larger than the site chosen for the master's report, the program elements and overall size of the developments are similar. Similar program elements include environmental protection and enhancement, healthy lifestyle, sense of place/community, and economic viability.

### *Application of Planning and Design Principles*

There are several important planning and design principles shown in the Prairie Crossing development. These principles are shown graphically in the following pages. Principles inventoried and analyzed are road and trail layout, preserved open space/agriculture, wetlands, and residential/commercial clustering.

Figure 6.7 Prairie Crossing boundary. Google Earth modified by author, 2010.

## *Roads and Trails*

The first principle of conservation development is the minimal extent of infrastructure. Prairie Crossing has concentrated most of the roads in a compact layout allowing for more space devoted to shared open space. The development's roads are positioned to allow housing to have views over the open space and the use of eyebrows instead of cul-de-sacs allows for ease of access and turn around capabilities. Trails throughout the site allow for resident to easily access all amenities and travel through open space, commercial areas and residential clusters. There are over 10 miles of trails at Prairie Crossing.

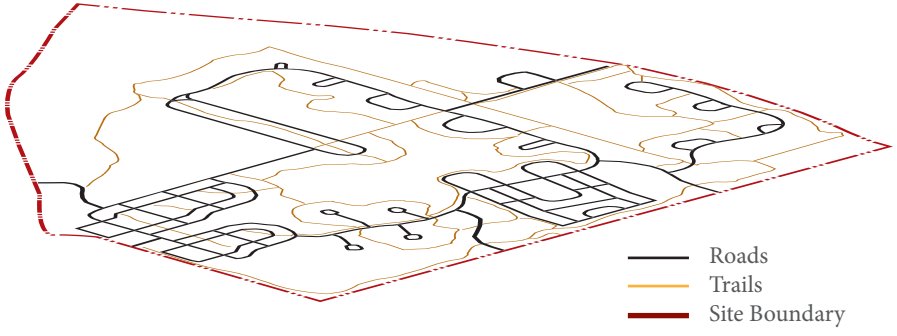



Figure 6.8 Roads and Trails. Author, 2010

## *Residential and Commercial Cluster Development*

A major design principle for Prairie Crossing and most conservation communities is the compact or clustered development areas. Housing in Prairie Crossing is arranged to maximize views to and from adjacent open space and lots are smaller in size than conventional development. Minimized lot setbacks also allows for increased number of dwelling units and higher densities. Commercial areas are centralized to allow all members of the community equal distance and access to commercial and shared amenities.

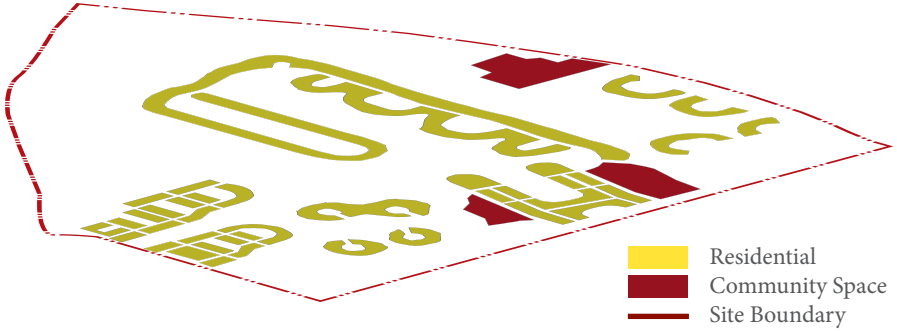



Figure 6.9 Residential and Commercial Development. Author, 2010

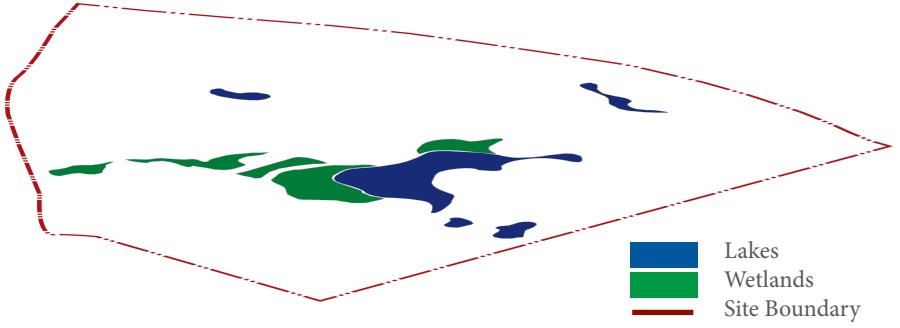



Figure 6.10 Lakes and Wetlands. Author, 2010

## *Lakes and Wetlands*

Prairie Crossing has incorporated a natural stormwater treatment system that is used instead of conventional storm sewers. Referred to as a water "treatment train", rainwater and snowmelt is channeled through open swales and wetlands into lakes, ponds, and streams in order to reduce the volume of runoff. This system allows for greater infiltration and evaporation as well as the removal of pollutants. Water is cleansed before reaching Lake Aldo Leopold, an artificial feature, and three other ponds which act as detention basins.

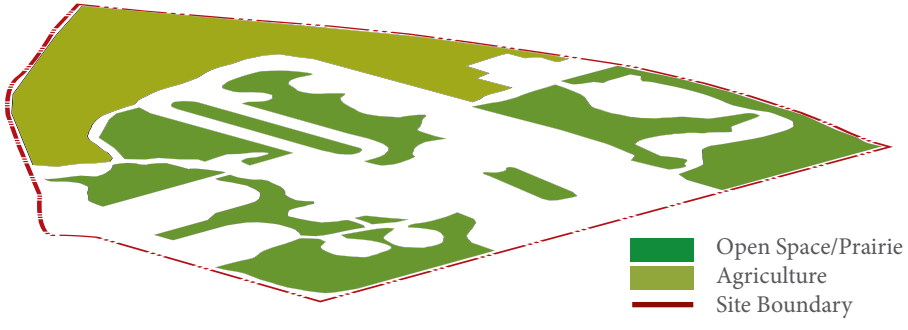



Figure 6.11 Open Space and Agriculture. Author, 2010

## *Open Space and Agriculture*

More than 70 percent of the property is devoted to open space including a 70 acre working farm. Conservation easements have permanently protected 193 acres of the original parcel. Open space at Prairie Crossing includes restored prairie, wetlands, lakes, ponds, park and agricultural lands. There are 70 acres of working agricultural lands in which the community is actively involved with. The farm was turned into an organic operation, grows vegetables, fruits, herbs, and flowers.

# Appendix B - Preliminary Design Drainage Study

The drainage studies were created using ArcScene. The program provided a 3-D perspective of the two alternatives overlaid on existing topography. These perspectives support how conservation design protects existing conditions, especially drainage.

*Note that illustrations are vertically exaggerated.

*Schwab-Eaton Drainage Conclusions*

The preliminary plat proposed by Schwab-Eaton has little to no consideration for existing drainages on the site. Most of the roads cross over drainage swales in several areas. There is a proposed road where the existing wetlands is located. This would undoubtedly require extensive grading and fill.

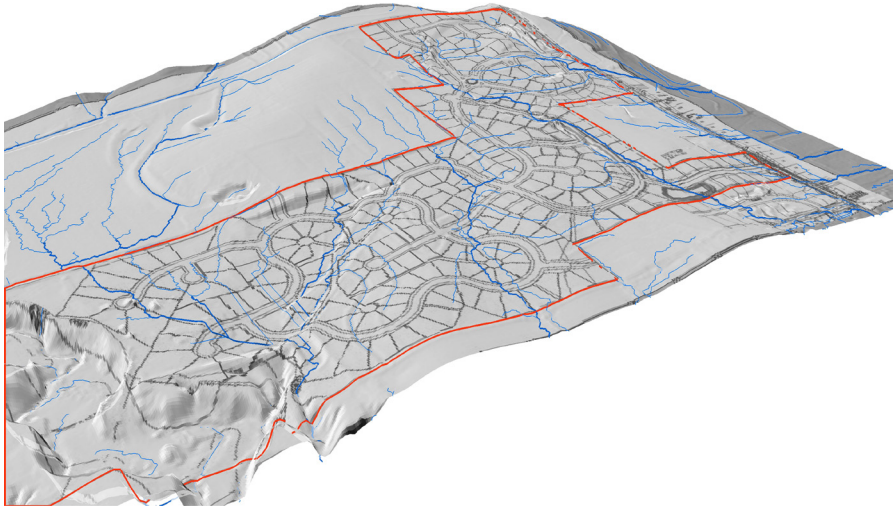


Figure 6.12 Schwab-Eaton design drainage perspective. Modified by author, 2011

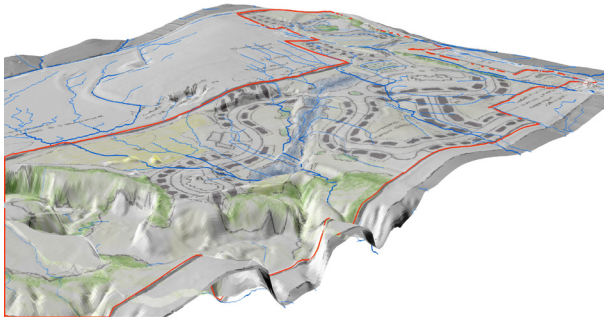


Figure 6.13 Contemporary design drainage perspective. Author, 2011

*Contemporary Design Drainage Conclusions*

The contemporary conservation design is able to align the roads to mend more with the existing topography. There is far less grading involved with a contemporary approach and the curvilinear roads allows for reduce driving speeds and enhance the driving experience. Existing drainage is conserved and enhanced by created healthier wetlands and riparian habitat. Minimal alterations to the site would be needed.

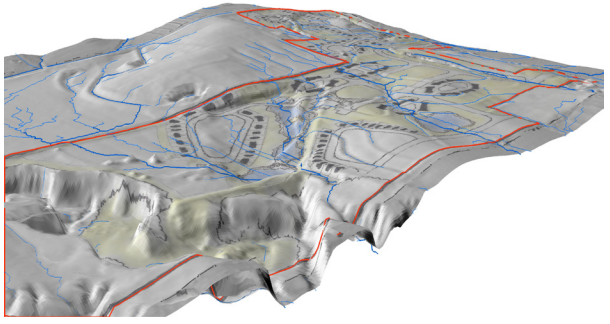


Figure 6.14 Neo-traditional design drainage perspective. Author, 2011

*Neo-traditional Design Drainage Conclusions*

The neo-traditional design is able to conserve many of the drainages on site while also reducing amount of grading needed for road construction. The design is used more commonly on flat sites. The design uses the clusters to protect low points and frame open spaces.

# Appendix C - Design Process

## *Process Philosophy*

The current design process for the master's report is displayed in *Figure 6.16*. This diagram illustrates my "linear" approach to moving through the multiple objectives and goals set forth for the completion of the project. While predominantly linear in production, the process is also cyclical because revisions must be made in all phases of the process. The diagram is a composite of process tasks and timeline. Included in the diagram is draft deadlines, final deadlines, scheduled meetings, months of the year and calendar year. The process is broken down into three major phases.

The process begins by gathering information about relevant issues in landscape architecture and topics of interest. Gathering literature came from several media types including books, magazine articles, websites, and public presentations.

The second phase of the process is program development. During this phase, the project site was selected, analyzed, and program elements defined. Literature was collected based on relevance to community development, agriculture and other significant topics. Program development also includes inventory and analysis and precedent studies.

The third phase was the design of Nelson's Ridge. This phase was completed during the spring semester of 2011. Building on the site analysis and suitability maps, conceptual designs were revised throughout the phase.

The final phase is production. Production includes final illustrations and conclusions to the design of the subdivision. The final book will be submitted in May of 2011.

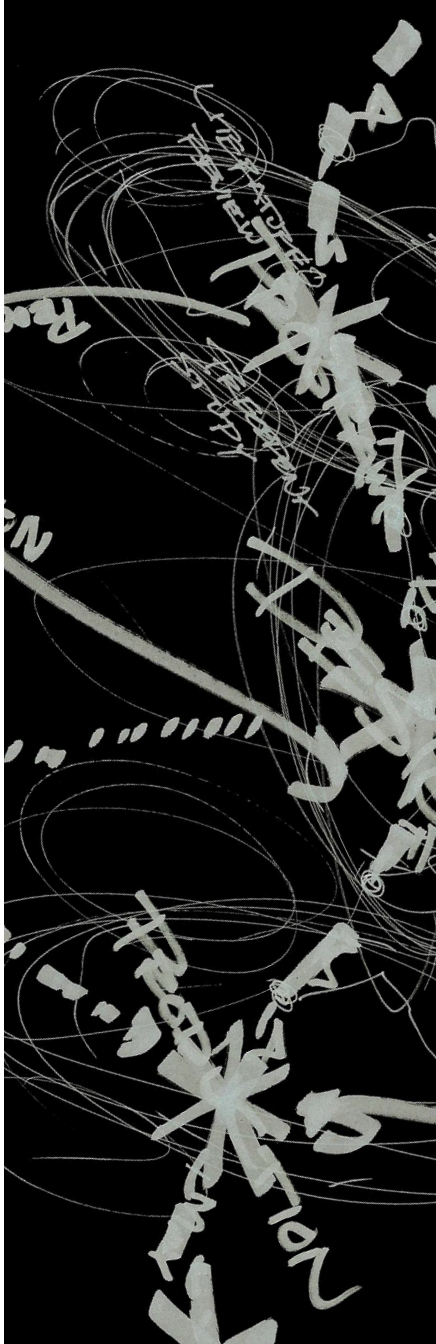


Figure 6.15 Conceptual process diagram. Author, 2010

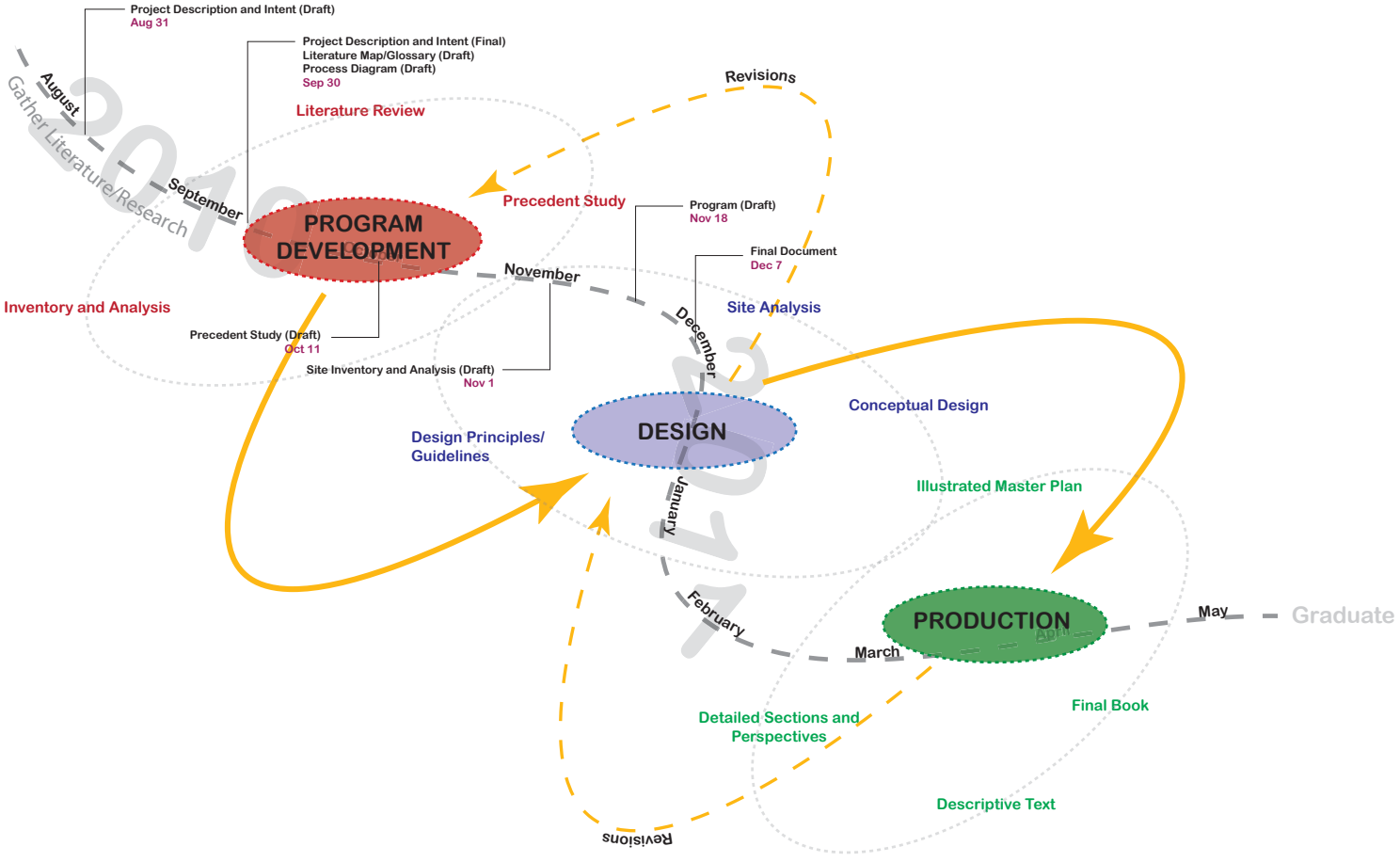



Figure 6.16 Process Diagram. Author, 2011

# Appendix D - Literature Review and Map

The literature map researched to this date focuses on two main aspects of landscape architecture and design: 1) conservation development and design, and 2) natural systems/agriculture. *Figure 6.17* on page 105 displays the current literature map for the master's report. Each of the main topics includes relevant sources that apply to each respectively. Each aspect is placed in the middle of an elliptical dashed line that encircles the references. Significance and relevance is indicated by the weight of the dashed line. Each of the references is also color coordinated to reinforce which aspect it relates to.

## *Conservation*

*Conservation Communities: Creating Value with Nature, Open Space, and Agriculture* by Edward T. McMahon

This book is considered a primary reference for the master's report. This book covers topics such as benefits/limitations of conservation development, feasibility, planning, design, marketing, management, and several case studies. Some of the more relevant chapters include Chapter 2: "Benefits and Limitations of Conservation Development", Chapter 3: "Assessing the Feasibility of Conservation Development", and Chapter 4: "Conservation Development Planning, Design, and Marketing". The book applies to both the developer as well as the land owner.

In Chapter 2, McMahon explains many benefits of conservation development including ecological, health/social and economic benefits. The essence of the chapters is summed up on page 4 when McMahon states, "Further enabling of the sprawling, haphazard pattern that has characterized America's approach to development-and to conservation-will exacerbate many of the problems sprawl has already created, including less functional open spaces, degraded watersheds, fragmented wildlife corridors, deteriorated working lands, and increased air and water pollution. People living in sprawling neighborhoods also feel the impacts of increased traffic congestion, longer commutes, and little sense of community." The chapter talks about benefits and limitations not only for the developer, but to residents, investors, architects, engineers and many other professions.

Chapter 3 discusses how to assess the feasibility of conservation developments. There are several case studies that are broken down into successes and failures. It has an important chapter explaining landscape suitability and how conservation developers approach it differently than that of conventional developments. Other topics guiding principles, zoning, cost factors, financing, and determining the market.

Chapter 4 begins with discussions on site selection and creating a vision and goals, then follows with explaining the importance of identifying natural, cultural, and historic features. The most influential section breaks down the design process into four steps with clear examples of each. Some of this literature will be focused on during the design process of the master's report.

*Conservation Design for Subdivisions* by Randal Arendt

This book is considered a primary source for the master's report. This reference is valued for it's in depth analysis of subdivision design principles with comparisons of conventional vs. conservation approaches. The handbook covers topics such as advantages, roles and responsibilities of various parties, linking conservation

lands to create interconnected open space networks, regulatory improvements, and management techniques. Most significant chapters in this handbook are Chapter 2: "Conventional Layout versus 'Conservation Designs': Comparisons and Contrasts" and Chapter 5: "Steps Involved in Designing Conservation Subdivisions". This handbook has been one of the most prominent references for understanding the concepts of conservation subdivision development for the last decade.

Chapter 2 has comparative illustrations of conventional and conservation approaches to designing subdivisions. These illustrations help the reader visually understand the concepts while accompanying text helps further explain differences between the two approaches.

Chapter 5 explains to the reader steps that must be taken when considering a conservation design for subdivisions. The process in explained in two phases. The first phase includes information collection and analysis, and the second is organizing information and making judgments about the shape of the development. The chapter also mentions all the factors that a developer must include in the site analysis such as soils, wetlands, floodplains, slopes, wildlife habitats, woodlands, viewsheds, and farmland. In the section titled "Design Stage", Arendt details a four step process for designing a conservation subdivision and how to execute these steps.

*Developing Sustainable Planned Communities* by Jo Allen Gause

This is the third primary source for the master's report research. The book is relevant to conservation development by covering issues of sustainability, integrated planning and design, costs and benefits, and green building design. While previously mentioned sources include aspects of sustainability, Gause's book addresses the concepts in further detail. The book also analyzes important case study projects that have been proven to be successful conservation developments. This book was the primary source of information for understanding successful projects around the U.S. While there are several relevant chapters in the reading, most significant is Chapter 3: "Integrated Planning and Design". This chapter includes issues of site selection, holistic development, and sustainable community form.

*Linked Landscapes* by Randal Arendt

The article was published in Landscape and Urban Planning 68 (2004). The purpose of this article is to further develop the concepts on how greenway corridors can be created through conservation subdivision design strategies in the northeast and central United States. The reading explains how "local land-use regulations can be written and implemented to pre-identify potential open space within each new residential subdivision in such a manner that every development contributes a segment to the community-wide conservation network envisioned in its comprehensive planning documents" (page 241). Nelson's Ridge development offers an opportunity to create a linked greenway to adjacent lands, trail systems, and open space.

## Natural Systems/Agriculture

*Environmental Land Use Planning and Management* by Randolph, J.

This valuable reference covers several topics. The book's in-depth analysis of land conservation for working landscapes, open space, and ecological protection has provided much knowledge and insight to the balance of development and conservation. The book also covers incentives, government programs, and other national and state focused development issues.

Chapter 5 covers the many federal, state and local programs and the many tools available for land conservation. Randolph talks specifically about collaborative conservation and development and provides several tools for conserving the working landscape, open space, green ways, and green infrastructure.

*Land and Natural Development (LAND) Code: Guidelines for Sustainable Land Development* by Diana Balmori and Gaboury Benoit

Balmori and Benoit created this book as a research-based guide to ecological and sound land development. It is intended for architects, landscape architects, engineers, city planners and students. The reference is primarily useful for understanding protection of water conservation, restoring habitat, landscape connectivity, road placement and design. The technical advice will become increasingly important as design decisions are made throughout the project.

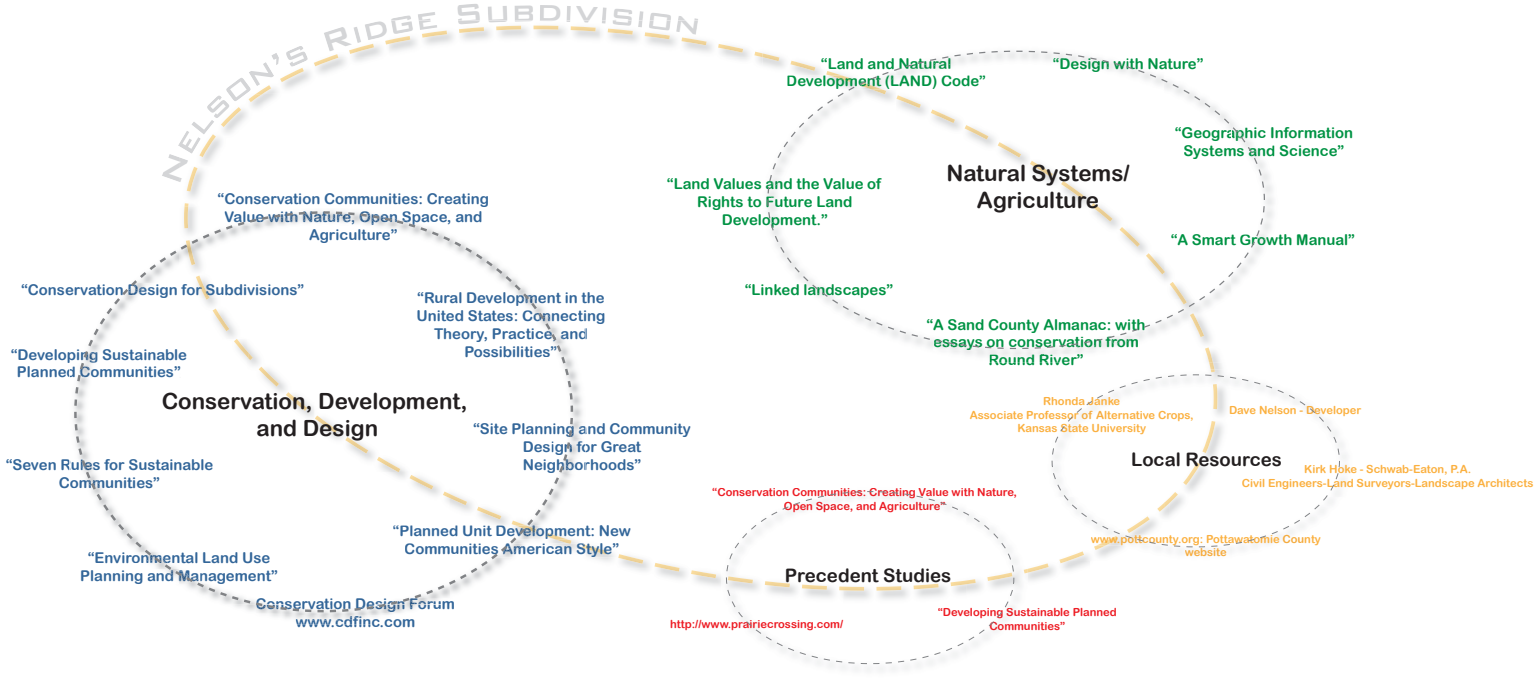



Figure 6.17 Literature Map. Author, 2011

# Appendix E - Glossary

*Cluster development-* "Planning strategy that aggregates development into discrete zones of interdependent land uses so that the remaining land can be conserved as green space" (McMahon 2010, 12).

*Conservation development-* "Defines the process of planning, designing, building, and managing communities that preserve landscapes or other community resources that are considered valuable for their aesthetic, environmental, cultural, agricultural, and/or historic values" (McMahon 2010, 7).

*Diversity-* A mixture of uses that provides something for everybody, resulting in activity and vitality (Hall and Porterfield 2001).

*Economic Viability-* "Conservation development provides a means for land to be preserved voluntarily, while owners and developers can still realize the fair market value of their property" (McMahon 2007, 30).

*Green Infrastructure-* "Green infrastructure functions as a framework for both conservation and development. By making green infrastructure the framework for conservation, communities can plan for interconnected, green, open space systems" (Gause 2007, 45).

*Land conservation-* The permanent protection of land areas by withdrawing them from development. It is conducted by diverse public, private, and non-profit participants, employing a number of tools for a variety of purposes (Gause 2007).

*Landscape suitability-* Evaluation of the landscape's different characteristics and conditions to identify the types of activities that are most appropriate for a particular landscape condition, such as woodlands, farmland, floodplains, wetlands, and so forth (Arendt 1996).

*Productive lands-* Land that provide local food production, conserves the open space and rural character of agriculture lands, and keeps a viable agricultural economy sector (Randolph 2004, 93)

*Water conservation-* "Reduces withdrawals from the water supply reservoirs or groundwater for maintenance of healthy aquatic environments and human recreational uses" (Balmori and Benoit 2007, 42)