

Affordable landscapes: designing cost-effective and comfortable landscapes in Cottonwood Falls

by

Tyler Otto

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MASTER OF LANDSCAPE ARCHITECTURE

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

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Manhattan, Kansas

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Approved by:

Major Professor
Lee R. Skabelund

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Abstract

While innovative housing can be extremely beneficial for communities in need of affordable homes, these houses often ignore what can be done to make the surrounding landscape more sustainable and innovative. The outdoor living space is essential to the well-being of the residents, and a well-designed landscape can provide a multitude of benefits to the ecosystem as a whole. It can expand the home and encourage residents to be more active in their community.

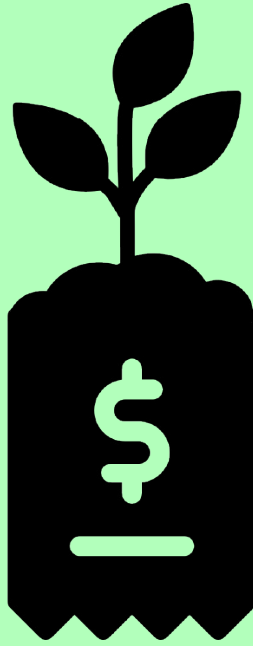
As housing in the United States is becoming increasingly unaffordable, more attention is being paid to public and private initiatives related to lowering housing costs. These strategies relate to house size, neighborhood layout efficiencies related to density and infrastructure, land acquisition costs, environmental regulation and compliance, and a host of other factors.

Establishing and maintaining the landscape surrounding residential structures can also be a dominant part of monthly housing costs. While this report primarily focuses on affordability in the landscape, decisions on housing configuration play a large role. For example, if vehicle access and parking are spatially decoupled from individual homes, more flexibility for housing clustering is possible which has implications on how the surrounding landscape is designed and maintained. This report outlines how the costs of traditional residential landscapes can be reduced yet still be environmentally responsible and visually appealing.

To best create guidelines to help these communities, it is important to assess current conditions. Forming a landscape profile of the target cities can help determine what will be needed. In addition, gathering information concerning maintenance and design services that are available, local plant nursery selection, and water usage data will help inform the guidelines.

Cottonwood Falls, Kansas was chosen as an example community to create projective designs focusing on affordability.

Traditional outdoor landscapes surrounding residential areas are typically composed of turfgrass lawns with low biodiversity, high maintenance costs, and negative environmental impacts. To assist homeowners, developers, and cities create more innovative landscapes to complement and support new affordable housing prototypes, this project will propose landscape guidelines that are aesthetic and support the enjoyment of comfortable outdoor spaces.



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Acknowledgments

This masters project would not have been possible without the help of many individuals, including my Gateway Decathlon colleagues, studio cohort, project team, and supporting faculty members.

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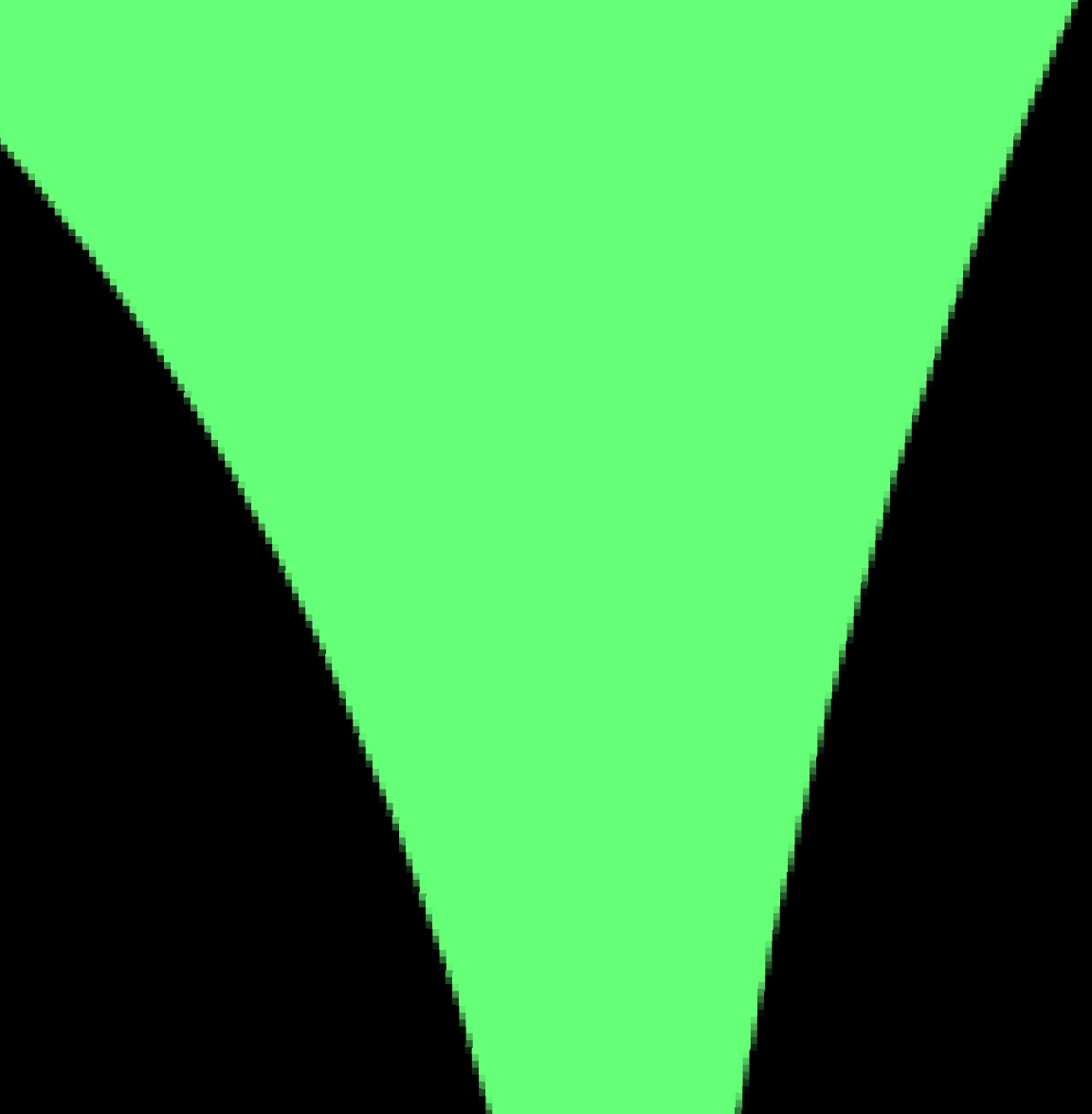
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Chapter 1: Introduction



Innovative housing can be extremely beneficial for communities in need of affordable homes, these houses often ignore what can be done to make the surrounding landscape more sustainable and innovative. Landscapes with minimal species diversity, high costs of maintenance, and low aesthetic appeal can be more detrimental than beneficial. A well-designed outdoor living space is essential to the well-being of the residents, and can provide a multitude of benefits to the ecosystem as a whole. It can expand the home and encourage residents to be more active in their community.

As housing in the United States is becoming increasingly unaffordable, more attention is being paid to public and private initiatives related to lowering housing costs. These strategies relate to house size, neighborhood layout efficiencies related to density and infrastructure, land acquisition costs, environmental regulation and compliance, and a host of other factors.

Establishing and maintaining the landscape surrounding residential structures can also be a dominant part of monthly housing costs. Many of the strategies to reduce housing costs are related to housing configuration, such as if vehicle access and parking are spatially decoupled from individual homes, more flexibility for housing clustering is possible. The greater the housing density, the more affordable housing can be. This has implications on how the surrounding landscape is designed and maintained.

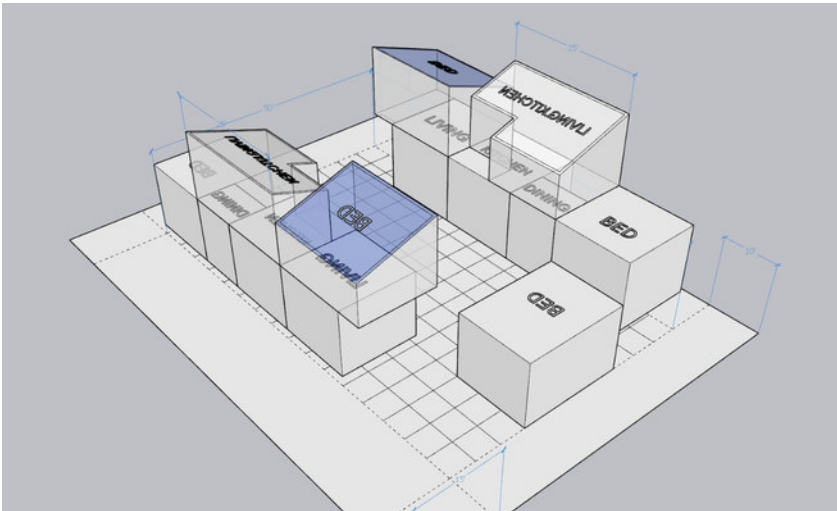
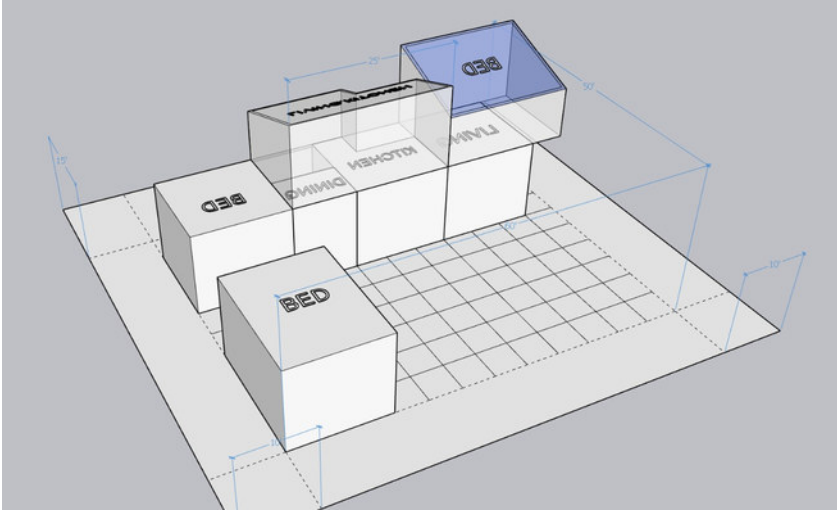


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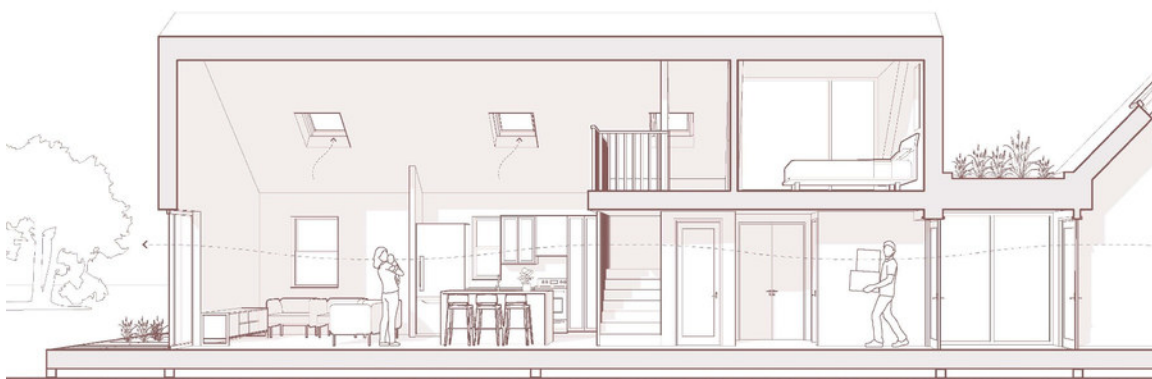


Figure 1.03



Figure 1.04

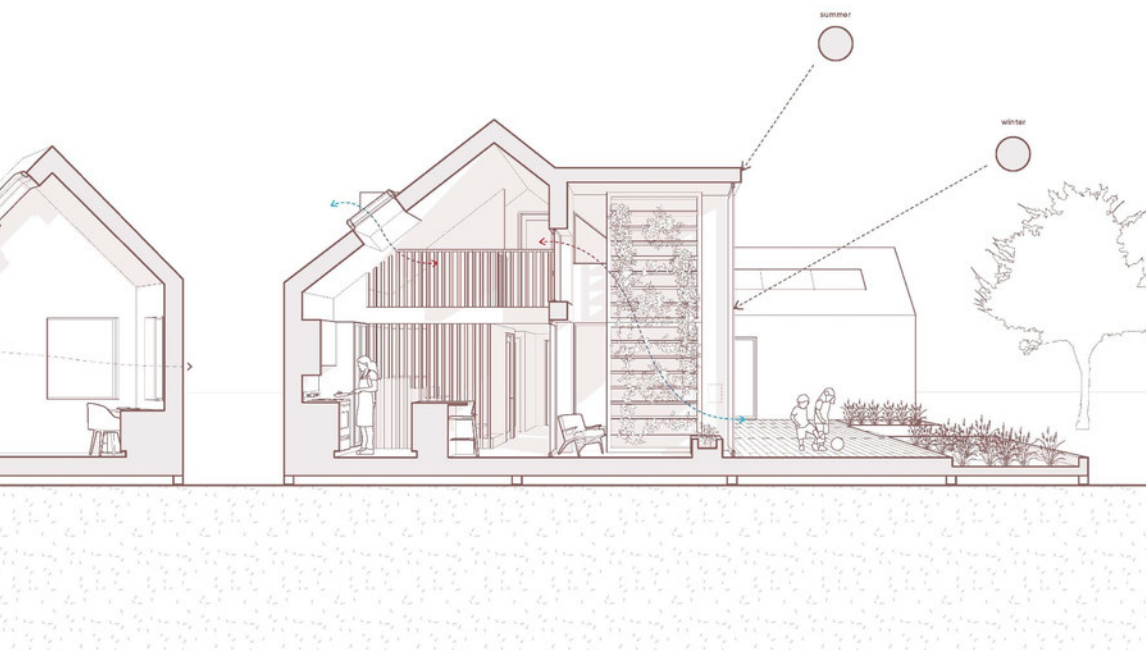


Figure 1.05

Figures 1.03, 1.04, and 1.05: "Little Hen Houses".

This is a project showcasing what more affordable modular houses can look like. Renderings by Sydney Tucker (2024), used with permission.

Intent of this Project Report

This report primarily focuses on how the landscaping costs surrounding these more affordable homes can be reduced, yet still be environmentally responsible and visually appealing.

To best create guidelines to help these communities, it is important to assess current conditions. Forming a landscape profile of the target cities can help determine what will be needed. In addition, gathering information concerning maintenance and design services that are available, local plant nursery selection, and water usage data will help inform the guidelines.

Traditional outdoor landscapes surrounding residential areas are typically composed of turfgrass lawns with low biodiversity, high maintenance costs, and negative environmental impacts. To assist homeowners, developers, and cities create more innovative landscapes to complement and support new affordable housing prototypes, this project proposes landscape guidelines that are aesthetic and support the enjoyment of comfortable outdoor spaces.



Fig 1.06: Residential landscape at Jackson Meadow, Minnesota. A great example of housing clusters with a more naturalistic landscape. Photo by Lee Skabelund, used with permission.



Chapter 2: Background



Need for Affordable Landscapes

In today's housing landscape, there are many issues affecting costs and environmental sustainability. Working class Americans increasingly cannot afford a home, and the homes that are affordable lack essential greenspace. Often residential landscapes are characterized by the ever prevalent turfgrass lawn which pose high costs and environmental impacts.

Residential landscapes are planted primarily for aesthetic and functional benefits. Functional benefits of landscape plantings are related to the reduction of soil erosion and surface runoff, sequestering carbon, and protecting water quality (Philocles et al. 2023). Additionally, outdoor spaces also engender quality of life, mental health, and social harmony issues that should be considered. There are many correlations between green spaces and a reduction in several determinants of health, such as physical activity, reduction of obesity, and lower stress among users (Philocles et al. 2023). However, the near-exclusive use of traditional turfgrass narrows this spectrum of functional and aesthetic benefits.

Of course, these benefits apply to almost all plant material, such as tall grasses, trees, and shrubs. However, to maintain their aesthetic and functional values, lawns tend to require heavily subsidized inputs (e.g., fertilizers, pesticides, water), which can be detrimental to environmental and human health if overused. In addition, fast growing turfgrasses require a high frequency of mowing, which results in an increase of fossil fuel consumption and subsequent emissions (Philocles et al. 2023).

All of these inputs cost money as well, which is contrary to the idea of making owning a home more affordable. In addition, the prevalence of turfgrass lawns has caused many issues. Turfgrass is considered the single largest crop and covers more than 31 million acres of the United States (Bormann et al. 2001, 67). These turfgrass landscapes can cause issues in water from over fertilizing, have low species diversity and minimal environmental benefits, cause increases in fossil fuel emissions from constant maintenance, and have many other problems.

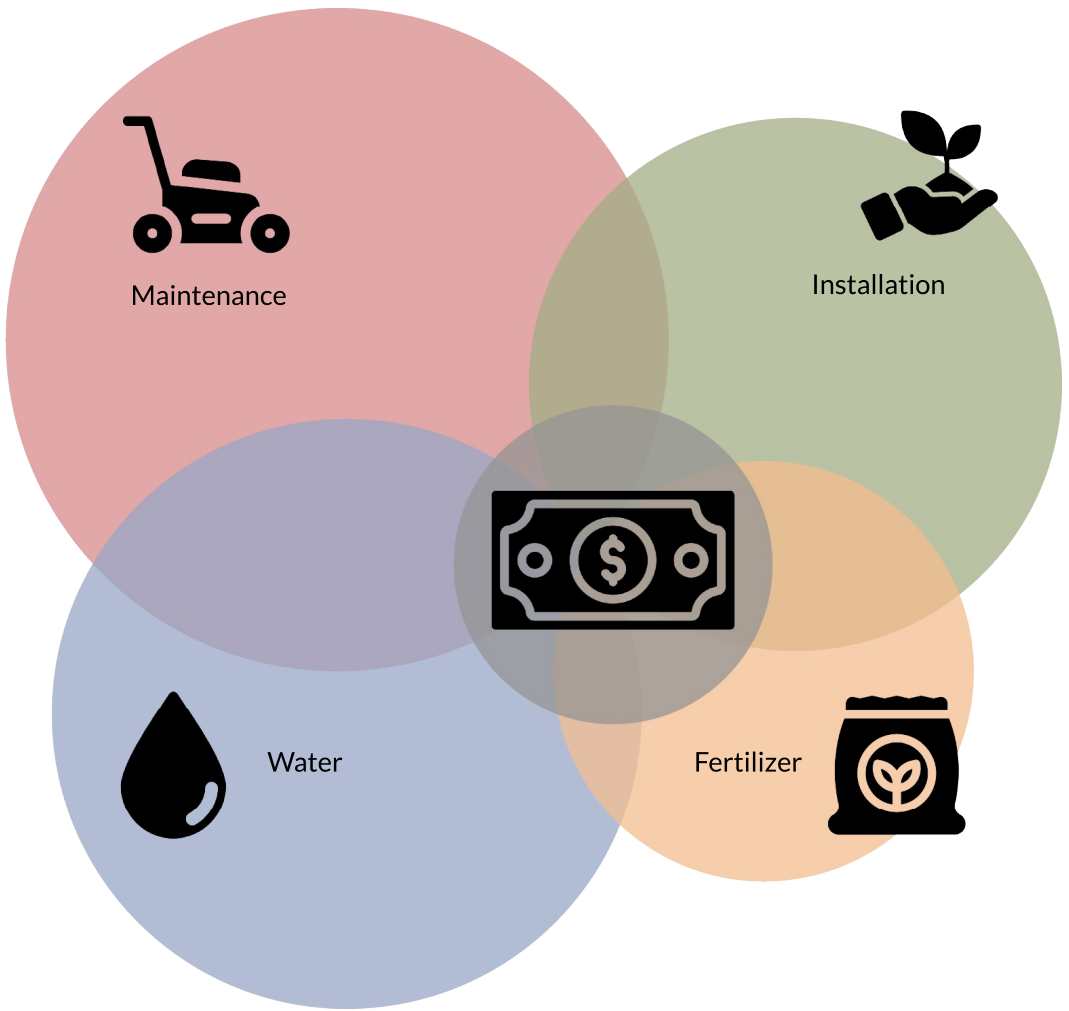


Fig 2.01: Installing and maintaining a residential landscape can make up a large part of a homeowners budget (Otto, Tyler. 2025).

With these issues in mind, it is essential to develop alternatives to turfgrass landscapes in order to create more affordable, beautiful, and comfortable outdoor living spaces for residents.

Benefits of Green Spaces

Well-designed and maintained green infrastructure and landscapes within residential areas are considered environmental amenities since they provide climate and water cycle regulation, phytoremediation of contaminated land, sequester carbon emissions, lower near-surface temperatures, and help clean the air (Schwarz et al. 2015; Sass et al. 2019; Li and Ping 2023; Speak et al. 2018, 544). Because they lower temperatures and clean the air, researchers have found that cardiorespiratory-related mortalities are significantly reduced (a potential reduction of 73%) (Dardir and Berardi 2022, 295).

Heat related issues are reduced substantially when the area has appropriate green infrastructure. For example, a green facade of a building, created by a climbing plant such as a vine, can provide many benefits to the building such as reduced energy use, reduced temperature, reduced air pollution and wastage, improved stormwater management, and enhanced quality of life (Sultana and Satyanarayana 2022, 82). Figure _ summarizes the research done on how green infrastructure can reduce the impacts of urban heat islands.

Green spaces provide many mental and emotional benefits. There have been studies done that show decreased cognitive fatigue, improved worker attitudes, reduced stress, reduced negative feelings such as anger and depression, and generally increased happiness, all due to trees in the environment (Schwarz et al. 2015; Sass et al. 2019). In addition, green spaces can provide improved aesthetics, noise reduction, and community unity (Speak et al. 2018, 544, Schwarz et al. 2015).

With this in mind, it is essential to create affordable, sustainable, comfortable green spaces for Kansas residents.

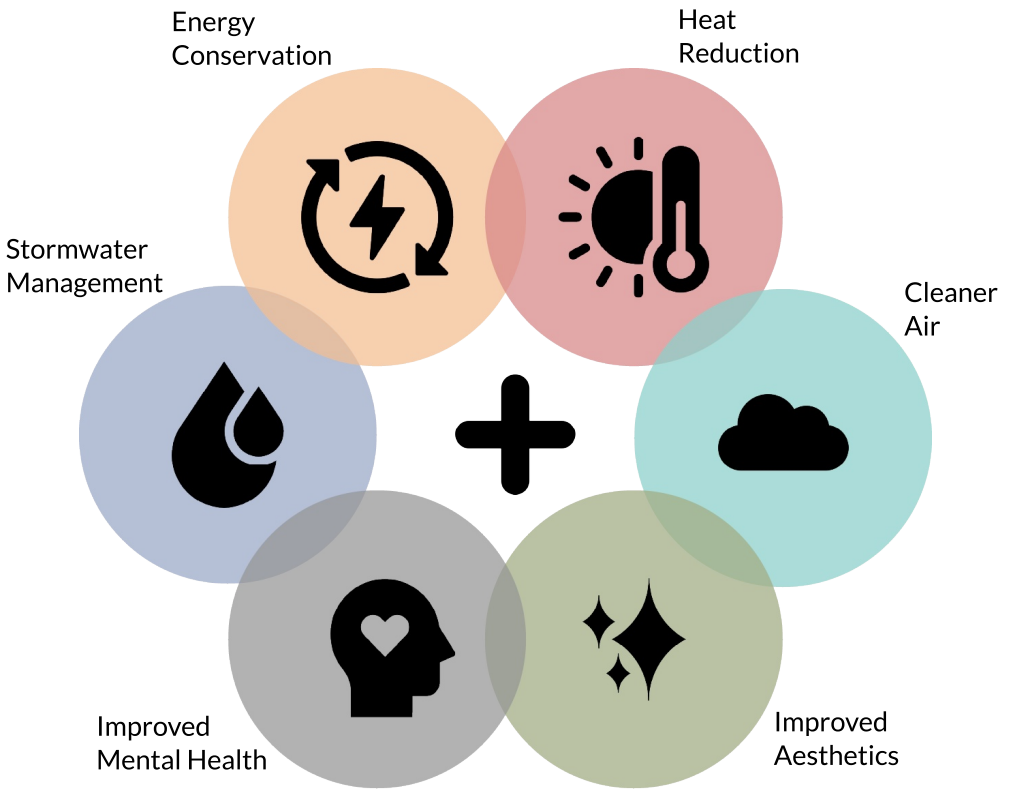


Fig 2.02: Well-Designed and Maintained Green Infrastructure and Landscape Benefits (Otto, Tyler. 2025).



Chapter 3: Methods



In the quest to create more cost-efficient and sustainable homes for future residents, enhancing landscape affordability is essential. This should be looked at in many ways, such as determining what cost-efficient plant species can be sourced locally, reducing the cost of landscape maintenance, and providing links to available financial aid, such as governmental grant programs.

Research

Initial Installation

Plant Availability

Some research has already been done on how the availability of plant material affects how plant choices are made. It is expected that larger agribusinesses are more likely to innovate than smaller ones. In the example of buying low-input turfgrass sod, plant material that can decrease the maintenance budget of landscapes, business size positively impacted sod buyers to purchase low-input turfgrasses. (Philocles et al. 2023)

The relationship between distance to nearest market and innovation has been reported in the literature. Studies have found that if new crops are available closer to the buyer, it will be adopted more. Distance from the buyer affects the cost due to lower survivorship rates, higher transportation costs, and lower access to market information. (Philocles et al. 2023). Thus we can see that adoption of plant choices that are more beneficial for ecosystems and landscapes is dependent on availability.

The same principle can be applied to any sort of plant material that isn't commonly accepted amongst businesses and homeowners, including more environmentally friendly, cost-effective selections. Thus, if local nurseries carry these selections, it would incentivize local companies and homeowners to experiment with introducing a more sustainable landscape around their homes and businesses.

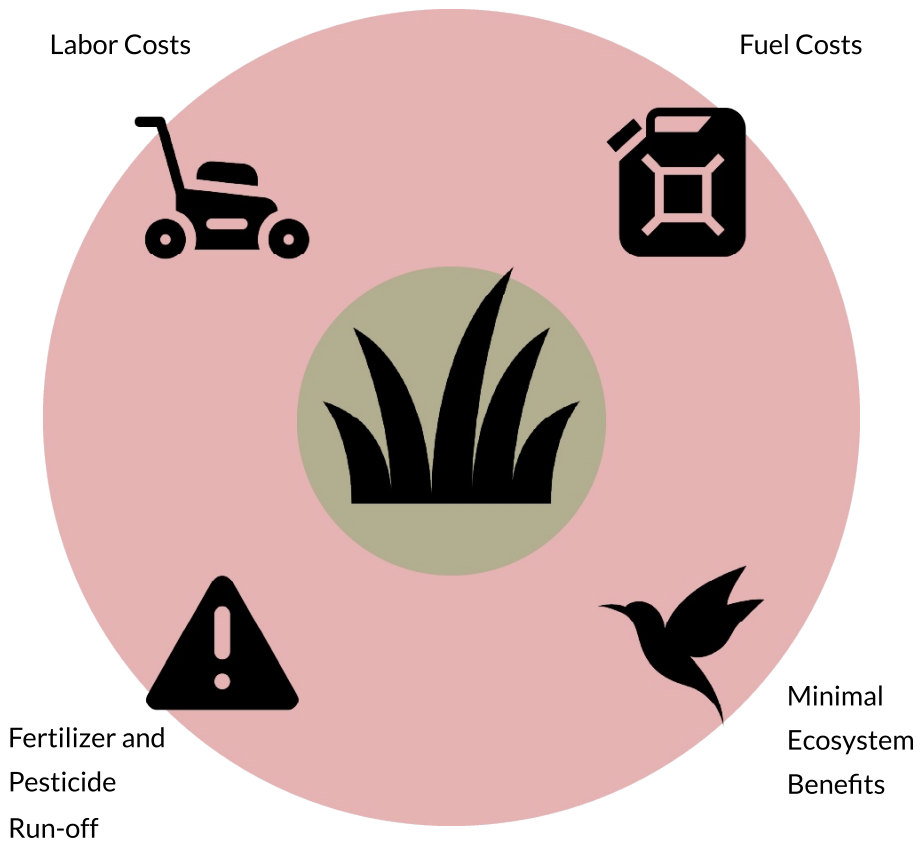


Fig 3.01: Issues with Typical Turfgrass Lawns (Otto, Tyler. 2025).

Maintenance Requirements

On-Going Inputs

The typical landscape surrounding homes in the United States consists of turfgrass lawns, which have numerous disadvantages that have been already described. However, when considering the switch to more environmentally and cost friendly plants, there are many benefits, including: lowering resource usage, reducing maintenance costs, improving the landscape aesthetic, and contributing to residents' health and general wellbeing (Philocles et al. 2023).

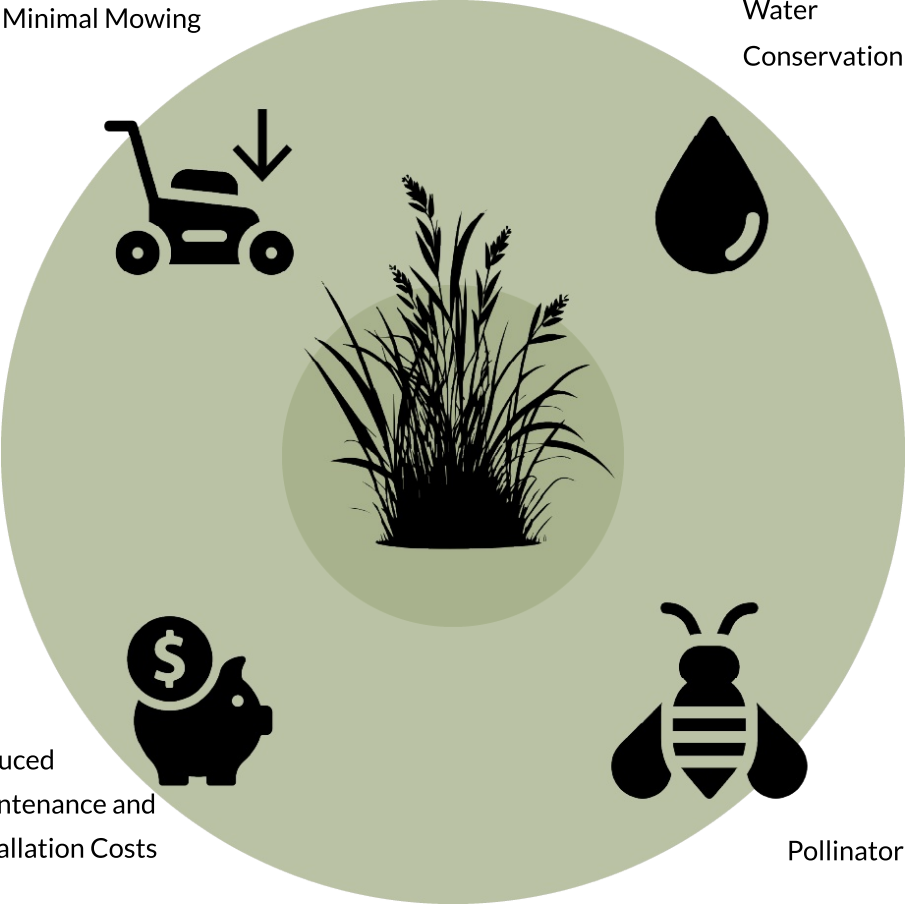
On-Going Maintenance

In addition to requiring constant watering, fertilizing, and other inputs, most conventional lawn grasses need 30 to 40 mowings a year to maintain their manicured appearance (Greenlee 2009). Lawn maintenance takes up an increasing amount of time and money, inflicting environmental consequences (Weigert 1994). Labor is the largest cost in both home and commercial lawn care (Bormann et al. 2001, 62). The constant refueling of lawnmowers and other garden equipment uses seventeen million gallons of gasoline each summer (Steinberg 2005). In addition, because many homeowners dump their grass clippings, it accounts for around 20% of all garbage generated in the U.S. (Shern & Slocum 1996).

Constant lawn upkeep and maintenance are not only costly, but pose environmental impacts. Different decisions such as amending soil by adding mulch and compost can more than double CO₂ respiration rates compared to nearby rural forests (Hundertmark et al. 2021, 2). These increased rates of soil respiration due to landscape "beautification" along with fossil fuel emissions from operating maintenance equipment can have a huge impact on the environment (Hundertmark et al. 2021, 2). The frequency in which we maintain the landscape along with the type of maintenance that happens is increasingly important in protecting the environment and creating more affordable landscapes.

Minimal Mowing

Water
Conservation



Reduced
Maintenance and
Installation Costs

Pollinator Support

Fig 3.02: Naturalized Meadow Benefits (Otto, Tyler. 2025).

Economic Aid

Environmentally friendly landscapes are encouraged by many local, state, and federal programs throughout the country. For example, there is a rebate program for buying water-wise irrigation controllers. The *Rain Gardens at 900 Block* is a sustainable landscape that entirely used grant money to renovate the landscapes surrounding houses at 900 block. The *One Drop at a Time* program is also an excellent example of how grant money can greatly reduce the cost of building sustainable landscapes. The list of available grants, tax incentives, and other monetary aid changes every year, so designers should look into it often. The *Conservation Assistance Directory* online and the *Kansas Water Office Grant Programs* website both offer lists of government aid available in Kansas to incentivize conservation.

A sustainable landscape is one that implements many different functions, both economic and ecological. Structurally integrating ecosystem services into landscape management holds important opportunities for improving sustainability and resilience (Di Lucia, Usai, and Woods 2018). Some of these ecosystem services include increasing pollinator activity, improving stormwater systems, and improving the overall health and wellbeing of the residents.

Land Cover Alternative to Turfgrass

One of the best ways to reduce costs and provide a more environmentally sustainable landscape is implementing alternatives to the common turfgrass lawn. One of the most cost-efficient ways to do this is by implementing native grass meadows. There was a study done where the landscape was redone surrounding a factory in Europe. They tested three different types of ground cover: a natural meadow groundcover, labeled the “eco” area, an area using drought tolerant, low-input turfgrass such as fescue, labeled the “extensive” area, and a plot with the classic turfgrass lawn, labeled the “intensive” area. The team then researched the amount of maintenance and inputs required to maintain these areas, along with the potential benefits they provided.

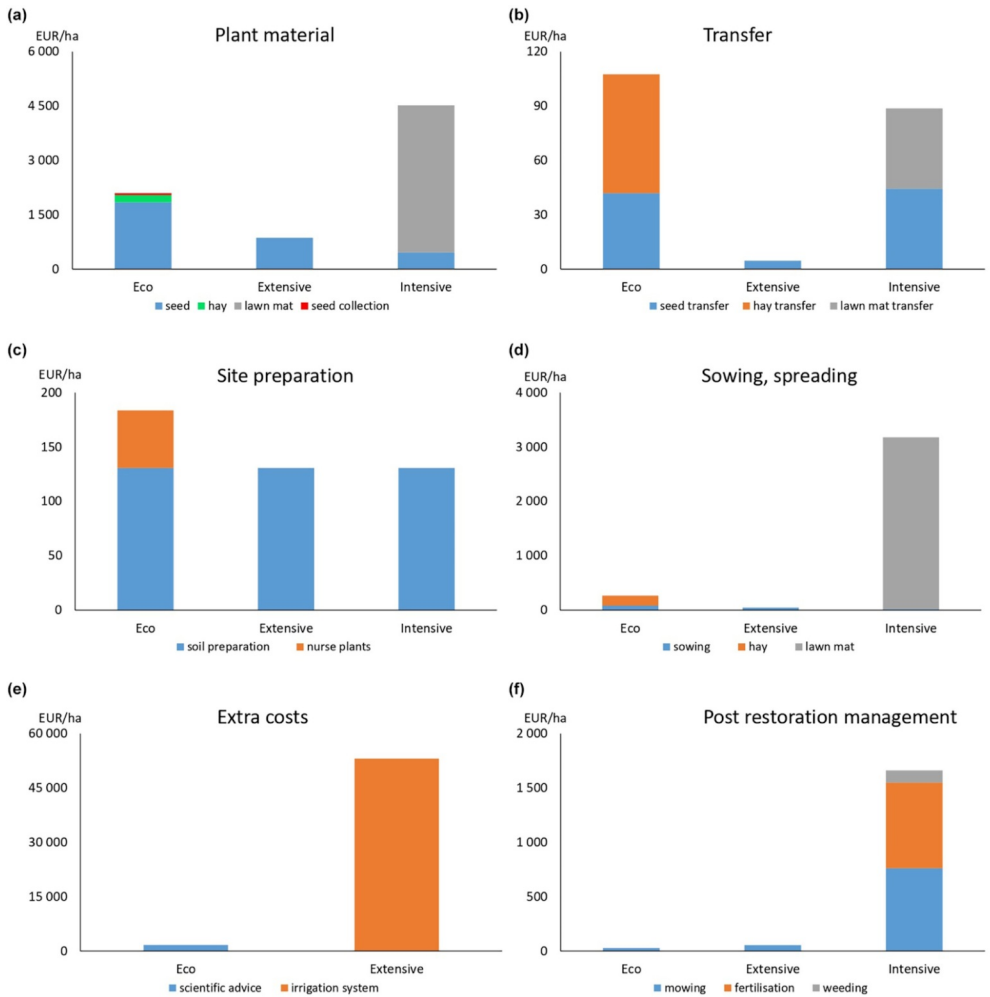


Table 3.1: Cost Comparisons of Different Grasses (Csonka et al. 2023, p. 8).

The implementation and maintenance costs of the extensively managed park lawn were more than ten times higher than the eco area, even though native plant material was more expensive to install (Csonka et al. 2023). The construction of the extensive park lawn turned out to be the cheapest, but the “eco” area pays off in around 1.5 years compared to it, considering the lower maintenance costs. In addition, the eco area became the most species-rich, with the highest number of natural constituent species. The amount of legumes and forbs was also higher in the eco area, providing food sources for pollinators (Csonka et al. 2023).

They divided the installation and maintenance costs into six categories that served as basis for the comparison between the intensive, extensive, and eco area: plant material, transfer costs, site preparation, planting, post-restoration management, and extra costs (Csonka et al. 2023).

The eco area was significantly cheaper than both the extensive area and the intensive area. In addition, the significantly higher proportion of forb species and legumes in the eco area can provide food sources for pollinators, thus contributing to pollination, an important ecosystem service, and the surrounding agricultural areas can benefit from the presence of a larger number of pollinators (Csonka et al. 2023). This is especially important in rural areas such as Kansas that rely on pollination.

Not only do native grassland areas provide ecosystem and monetary benefits, but also social and emotional ones. For example, it has been proven that daily short periods of time spent in nature have a positive effect on the well-being of people living in urban environments. Therefore, by creating diverse grasslands that require less regular mowing, homeowners can save money and have a beneficial effect on nature and human health (Csonka et al. 2023).

After conducting this research, the team suggested that restoration activities that include creating these “eco” areas of diverse grasslands should be implemented not only in nature reserves, but to public and private lands (Csonka et al. 2023). One of the ways to do this is by promoting the costs and return on investment that semi-natural ecosystems can provide, in addition to their ecological benefits (Csonka et al. 2023).

Replacing the classic turfgrass lawns with more naturalistic native grasslands is one of many ways we can implement a more sustainable landscape in commercial and residential properties throughout Kansas. The picture below shows how incorporating these native grasses might look in a residential setting.



Fig 3.03: Residential landscape in Bryn Mawr, Minnesota. A great example of how native grasses, wildflowers, and rocks can be incorporated into residential landscapes. Photo by Lee Skabelund, used with permission.

Precedents

When innovating on design principles that have been in place for many years or centuries, it is important to show that it not only can be done, but should be done. Using precedents to help support the research and craft better guidelines for affordable landscapes help give validity to the conclusions.

Rain Gardens at 900 Block

One great example of low cost landscaping with a big impact is the Rain Gardens at 900 block in Lexington, Kentucky. In this project, the area was plagued with flooding and safety issues due to drainage. The property site showcases how sustainable design benefits not only the site, but the entire city of Lexington.

The project gained public grant money to fund retrofitting the site with stormwater management tools such as pervious pavement and rain gardens. They also used native planting masses and smaller plugs to create a cost-effective and easy-to-maintain landscape.

The Rain Gardens at 900 Block is a great example of how to build an affordable landscape using solely grant money, which also greatly benefits the surrounding neighborhood with stormwater management, pollinator habitat, and beautification.



Fig 3.04: Example of pollinator habitats benefiting community in water walk. Water is moved away from the homes by a slight incline into beds of flowering plants. Photos by Gresham Smith, used with permission.



Fig 3.05: Plan view of Rain Gardens at 900 Block detailing the many stormwater management systems. Photo by Gresham Smith, used with permission.

900 Block - Site Photos



Fig 3.06: Maintenance manuals for the gardens are a great addition to help owners care for an uncommon garden type. Photos by Gresham Smith, used with permission.

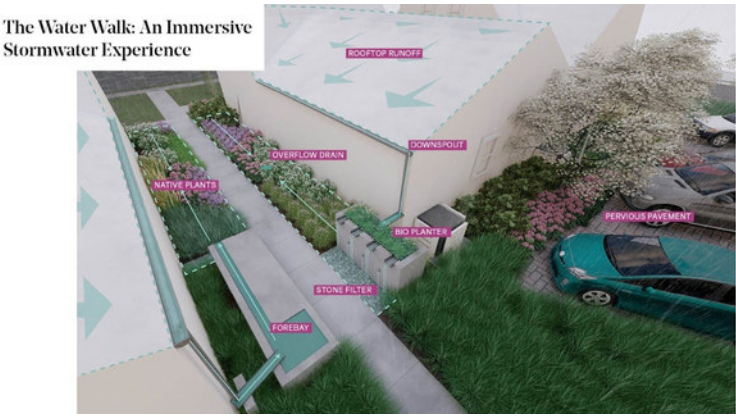


Fig 3.07: A diagram detailing all the great ways to manage stormwater helps communicate benefits to developers. Photo by Gresham Smith, used with permission.



Fig 3.08: Using spreading grass is a great way to reduce initial installation costs. Photo by Gresham Smith, used with permission.

Implementing stormwater management strategies can be **affordable, attractive, and benefit the entire community.**

One Drop at a Time

One Drop at a Time is a pilot project focused on integrating stormwater management strategies in residential areas. An excellent example of this project is at 168 Elm Ave, Elmhurst, IL. Designed for a pre-existing property, this 7,500 sq ft retrofit vision focuses on the integration of a green roof, rain barrels, rain gardens, porous pavement, gravel grass, a cistern and a bioswale which significantly improved the stormwater performance of the property, increased biodiversity of the site, and served as a showcase and pilot project to the community.

The homeowner wanted flexible spaces, so the property included preservation of a small turfgrass area for play and spillover space from the patio, small vegetable garden plots, and a gravel grass parking area. Similar to The Rain Gardens at 900 Block, this project was largely funded by grant money. The cost of the project was less than \$10,000, with \$7,500 of that being grant funding.

While the initial cost impact of the project only slightly reduced costs compared to typical landscaping methods, the researchers assume that the landscape improvements will provide cost benefits for the long term, such as reducing flooding and the associated problems.



Fig 3.09: Flourishing front yard and green roof. Photo by Marcus de la Fleur, used with permission.



Fig 3.10: Backyard with permeable paving and rain gardens. Photo by Marcus de la Fleur, used with permission.

One Drop at a Time - Site Photos



Figures 3.11, 3.12, and 3.13 : This project helped raise public awareness for sustainable rain water, stormwater, and runoff treatments for a homeowner's landscape by incorporating tours and signage. Photos by Marcus de la Fleur, used with permission.



Figures 3.14 and 3.15: Thin strips of land on the sides of building can be transformed into a beautiful bioswale and rainwater collection system. Photos by Marcus de la Fleur, used with permission.



Fig 3.16: Gravel grass is a permeable paving type that allows for a flexible turfgrass lawn to be used as parking if needed. Photo by Marcus de la Fleur, used with permission.

One Drop at a Time - Vegetation

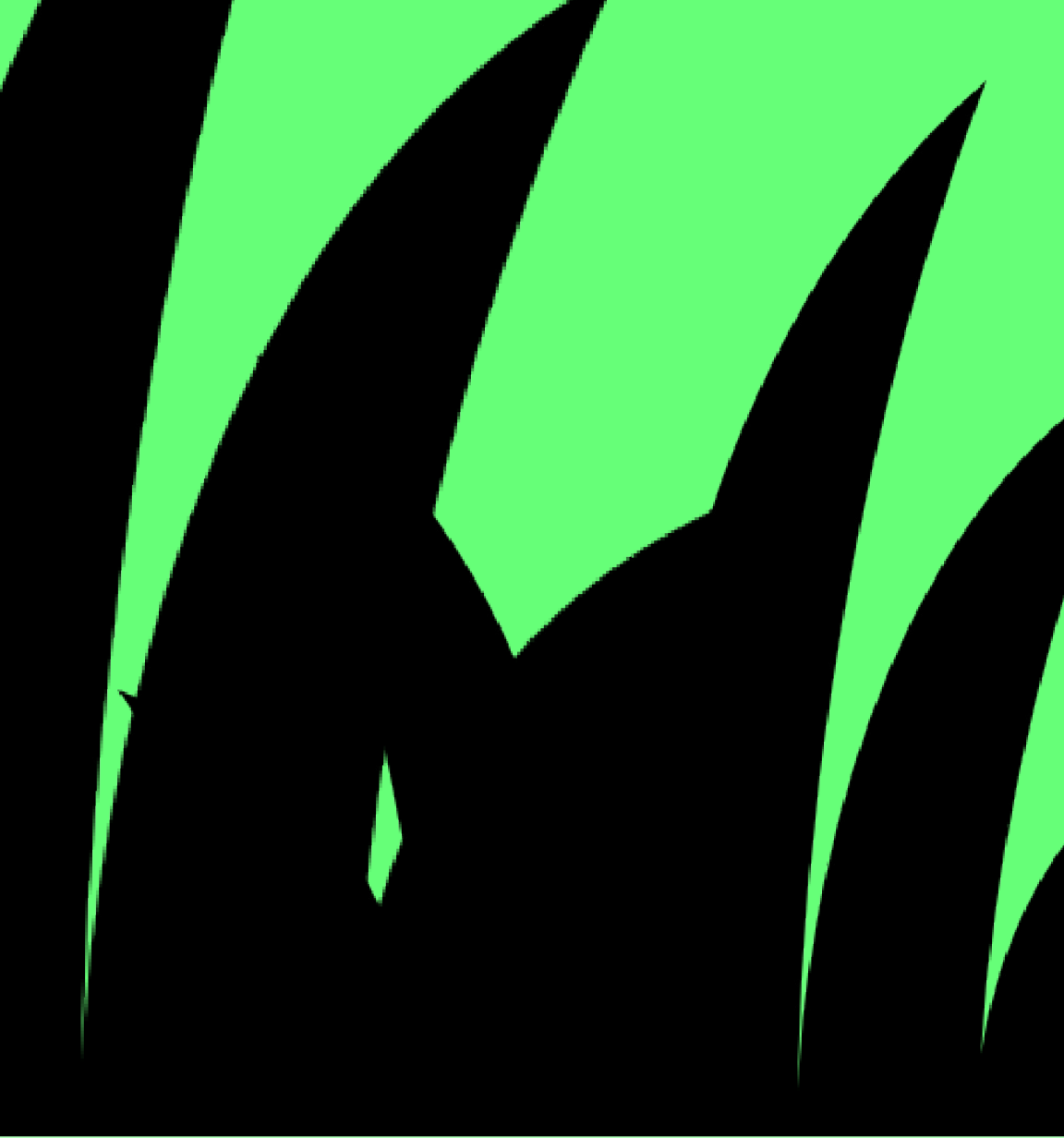


Figures 3.17 and 3.18: Varieties of forbs and native grasses help boost biodiversity along with capturing and cleaning stormwater. However, flammable meadow plants (especially taller native grasses and wildflowers) should be kept away from the home to reduce fire hazards and/or clipped back near homes during dry periods. Photo by Marcus de la Fleur, used with permission.

By implementing a variety of green infrastructure such as rain **gardens**, **green roofs**, and **bioswales**, along with tools such as **rain barrels** and **porous pavement**, properties can capture and clean stormwater on site. This leads to **less damage** due to flooding, **cleaner water**, and a **healthier ecosystem**.



Chapter 4: Findings



Plant Selection

While there are many considerations when choosing the plants for an affordable landscape, such as hardiness zone, microclimate conditions, and availability, there are some key characteristics that one should look for when selecting plants.

In general, one should buy plants when they are young. The older they are, the more expensive the plants will be. Native plants are already accustomed to the region's climate, and are often drought-tolerant and beneficial for the surrounding ecosystem. Buying young, native plants hardy enough to grow without constant attention will help lower watering, maintenance, and other costs.

Grasses: ornamental grasses are a cheap way of introducing biodiversity, beauty, and interest in your landscape. Most varieties only need to be mowed once a year and can be used to implement a meadow or prairie area in your landscape. Focusing on varieties that can spread is a way of reducing the cost of the initial installation as well. Depending on how large the grass or meadow is, one should be careful of fire hazards during dry seasons.

Trees and shrubs: trees can be a great way to reduce energy costs by providing shade and protection, assuming they are placed correctly. Trees that do not require constant pruning or clean up can help lower maintenance costs. In addition, trees and shrubs that produce fruit or nuts can help lower food costs.

Perennials: choosing perennial wildflowers and other herbaceous plants are a great way of reducing landscaping costs because they come back every year. Choosing a wide variety of perennials can help create blooming times or seasonal interest that last the entire year. Choosing varieties that require annual maintenance instead of weekly or monthly maintenance can help reduce costs.

Turfgrass: while many homeowners want a section of turfgrass for recreating, most turfgrass varieties are expensive to install, require weekly maintenance, and need high amounts of water and fertilizer. If needed, it is best to use drought-tolerant turfgrass that covers only a small portion of the landscape. Varieties that focus on hardiness, such as Zoysiagrass, Bermuda grass ‘tiftuf’, or a fescue mix can help reduce watering costs.

The following pages show plants that are native to Kansas that can help reduce watering and maintenance costs while offering many more benefits than your typical turfgrass lawn.



Fig 4.01: K-State (Kansas State University) Gardens. Botanical gardens can provide great examples of native plants used in the region. Photo by Lee Skabelund, used with permission.

Fig 4.02:
Little Bluestem



Fig 4.03:
Prairie Dropseed



Fig 4.04:
Switchgrass

Fig 4.05:
Side-Oats Grama



Fig 4.06:
Zoysia Grass

Fig 4.07:
Buffalo Grass

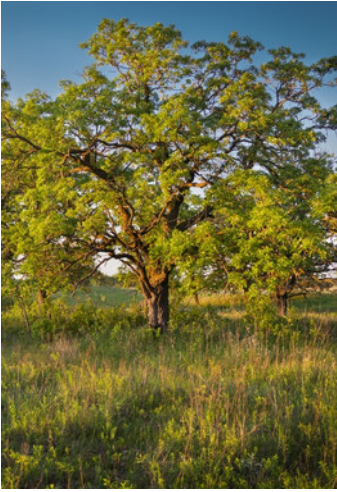


Fig 4.08:
Bur Oak



Fig 4.09:
Caddo Sugar Maple



Fig 4.10:
Eastern Redcedar



Fig 4.11:
Honey Locust



Fig 4.12:
Black Chokeberry



Fig 4.13:
Black Raspberry

Stormwater Management

In addition to promoting affordability through the use of drought tolerant and native plant species in the landscape, costs can be further reduced by implementing good stormwater management systems. “Lawns, including residential and commercial, are the largest irrigated crop in America in terms of surface area totaling about 128,000 square kilometers” (Lindsey 2006, 2). In many parts of the United States, more than 50% of water use is used for outdoor purposes, much of it for the turfgrass lawns (Greenlee 2009). Reducing the amount of turfgrass lawn while also creating systems in which rainwater can be captured and reused can not only reduce flooding and runoff pollution, but reduce irrigation costs.

These features or systems such as rain gardens, bioswales, and permeable paving can be implemented to capture water on site to reduce the strain on a city’s stormwater infrastructure, in addition to cleaning the water as it enters the watershed. Less water damage to the property, less irrigation costs, and cleaner water are a few of the many benefits proper stormwater management can offer.

Implementing stormwater management systems on site will be a key component of reducing landscaping costs. For example, it will be important to direct water away from the building to prevent flooding and other damages. The water can be captured in slightly recessed areas in the landscape that will filter the water on site. This stored water can be used to nurture plant species that may need more water such as taller grass varieties or rain garden plants.

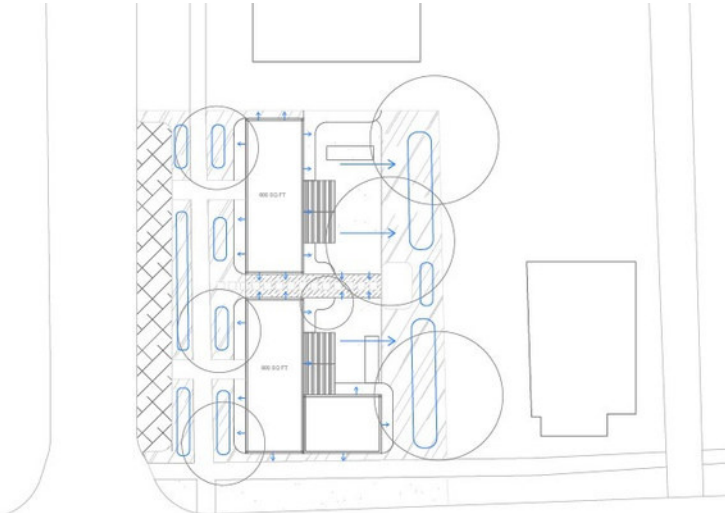


Fig 4.14: Stormwater management diagram. Water flows away from the houses into slightly depressed areas for use by vegetation and infiltration into soil (Otto, Tyler. 2025).



Fig 4.15: International Student Center Rain Garden, Kansas State University (2015). This garden, designed, created, and maintained by K-State faculty, students, and staff, is an excellent example of how to integrate stormwater management into the landscape. Photo by Lee Skabelund, used with permission.

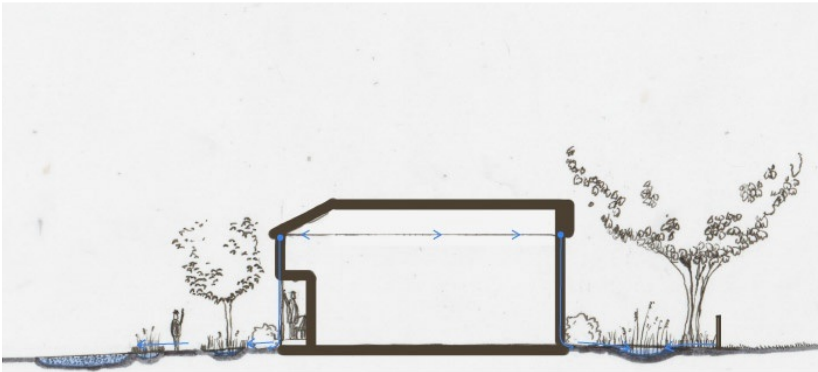


Fig 4.16: Section showing how stormwater is diverted off the roof and away from a home.

This section shows how stormwater is diverted from the roof and away from the house. The landscape at the base of the house is slightly sloped to prevent water pooling at the base. Instead, the stormwater is diverted into slightly recessed rain gardens or bioswales. If there is additional water on site, it is carried into the permeable parking area and onto the street (Otto, Tyler. 2025).

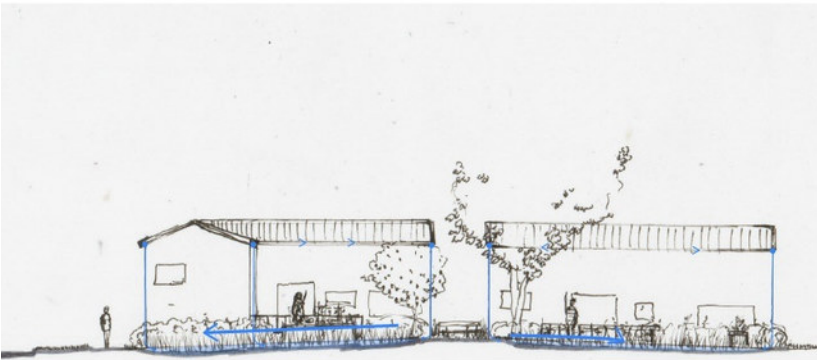


Fig 4.17: Section showing stormwater management looking from the back of two homes.

This section shows the stormwater management design from a different angle. Once diverted away from the house, the water enters the rain gardens. These slightly recessed rain gardens have a four to six inch depression which allow them to hold rain water from the surrounding landscape. This allows larger plants that need more water, such as big bluestem, to grow (Otto, Tyler. 2025).



Chapter 5: Designs



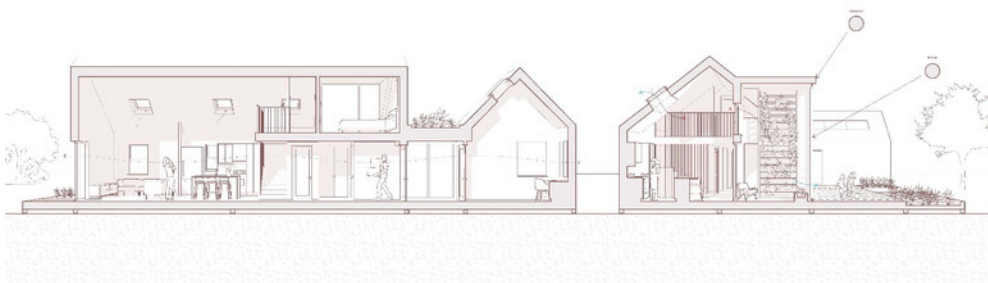
Projective Design

These projective designs will be an example of how innovative housing can best employ guidelines to create more affordable landscapes and living conditions for the residents. In order to do this, there will have to be many things that should be taken into account and analyzed:

- Zoning requirements
- Availability of local plants
- Affordable land cover alternatives
- Sample plant palettes
- Surrounding neighborhood aesthetics
- Potential financial resources
- Maintenance requirements
- Targeted landscape budget
- Other stakeholder and neighbor concerns

By detailing these considerations, the projective design seeks to demonstrate how to create more affordable landscapes in whatever location. Taking into account what plant species are more affordable, along with the availability in local nurseries and the local landscaping companies' expertise, guidelines can be made to create the best projective design possible.

The design itself should implement many methods of introducing cost-saving strategies to the site. For example, proper stormwater management can help support affordability by reducing flooding risks and conserving water, among other things. The projective designs seek to show how these strategies can be implemented on the site. Some guidelines, such as purchasing younger plants to reduce initial landscape installation costs, are assumed to be followed.



Figures 5.01 and 5.02: Section and Exterior of Little Hen Houses.

When creating projective designs, it is important to understand how new housing types could fit into existing neighborhoods. Modular homes and landscapes can and should be designed to fit within the context of the community. However, that does not mean they need to look or function identical to existing structures and landscapes. Resilient, sustainable, energy-conserving, livable, and ecologically appropriate designs that are affordable is the goal. This project showcases what more affordable modular houses can look like. Renderings by Sydney Tucker (2024), used with permission.

Cottonwood Falls

The location for the projective designs is the rural town of Cottonwood Falls. Located just south of the Tallgrass Prairie National Preserve, Cottonwood Falls is a small town full of charm.

This area has a high rate of home ownership, with an average household size of 2. Two empty plots were selected for this projective design. The project site is close to downtown and within walking distance of parks, the high school, and walking trails.

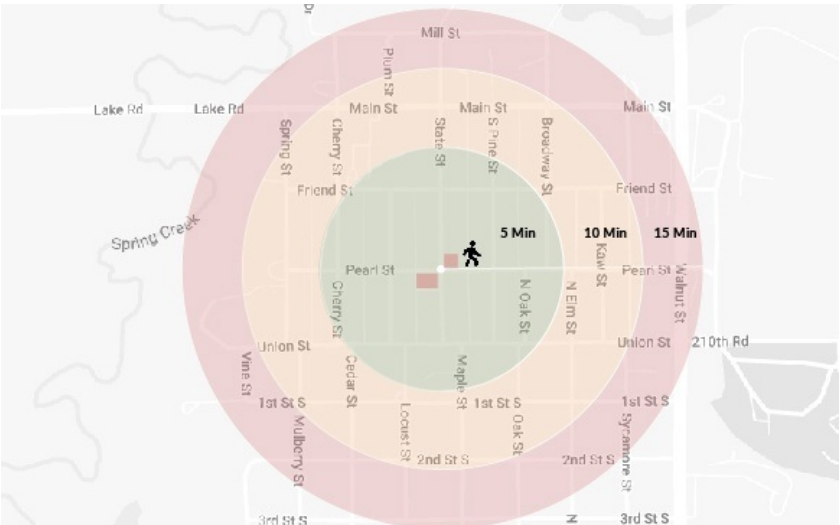


Fig 5.03: The whole town is accessible from a 15 minute walk (Otto, Tyler. 2025).



Fig 5.04: The selected sites are close to the local school, walking bridge trail, Broadway Street, and parks (Otto, Tyler. 2025).

Neighborhood Context

Cottonwood Falls is a small town with a population of just under 900. The median household income is less than \$50,000, so affordable home ownership is important.

The town is just south of the Tallgrass Prairie National Preserve, and is home to walking trails and a quaint downtown, Broadway Street. The average house is under 1,500 square feet.

The area has a yearly average rainfall of 33 inches. Currently, Cottonwood Falls is in the USDA plant hardiness zone 6b, with winter low temperatures ranging from 0°F to -5°F.

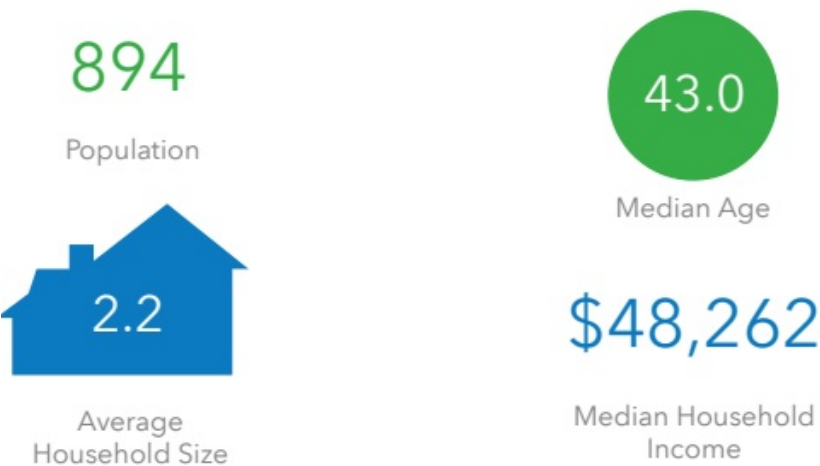


Fig 5.05: Key facts about Cottonwood Falls, Kansas (Otto, Tyler. 2025).



Fig 5.06: Cottonwood Fall's commercial area along Broadway Street. Photo by Alison Snawerdt, used with permission.



Fig 5.07, 5.08 Typical houses in Cottonwood Falls. Photos by Alison Snawerdt, used with permission.

Northeast Plot

North of Pearl street, the typical houses and plots are smaller than the Southern neighborhood. The plot chosen for this projective design is approximately 7,500 square feet.

This site is also very flat, draining towards the streets. There is one mature tree in the northeast corner of the site.



Fig 5.09, 5.10: Northeast Plot site photos.
Photos by Alison Snawerdt, used with
permission.

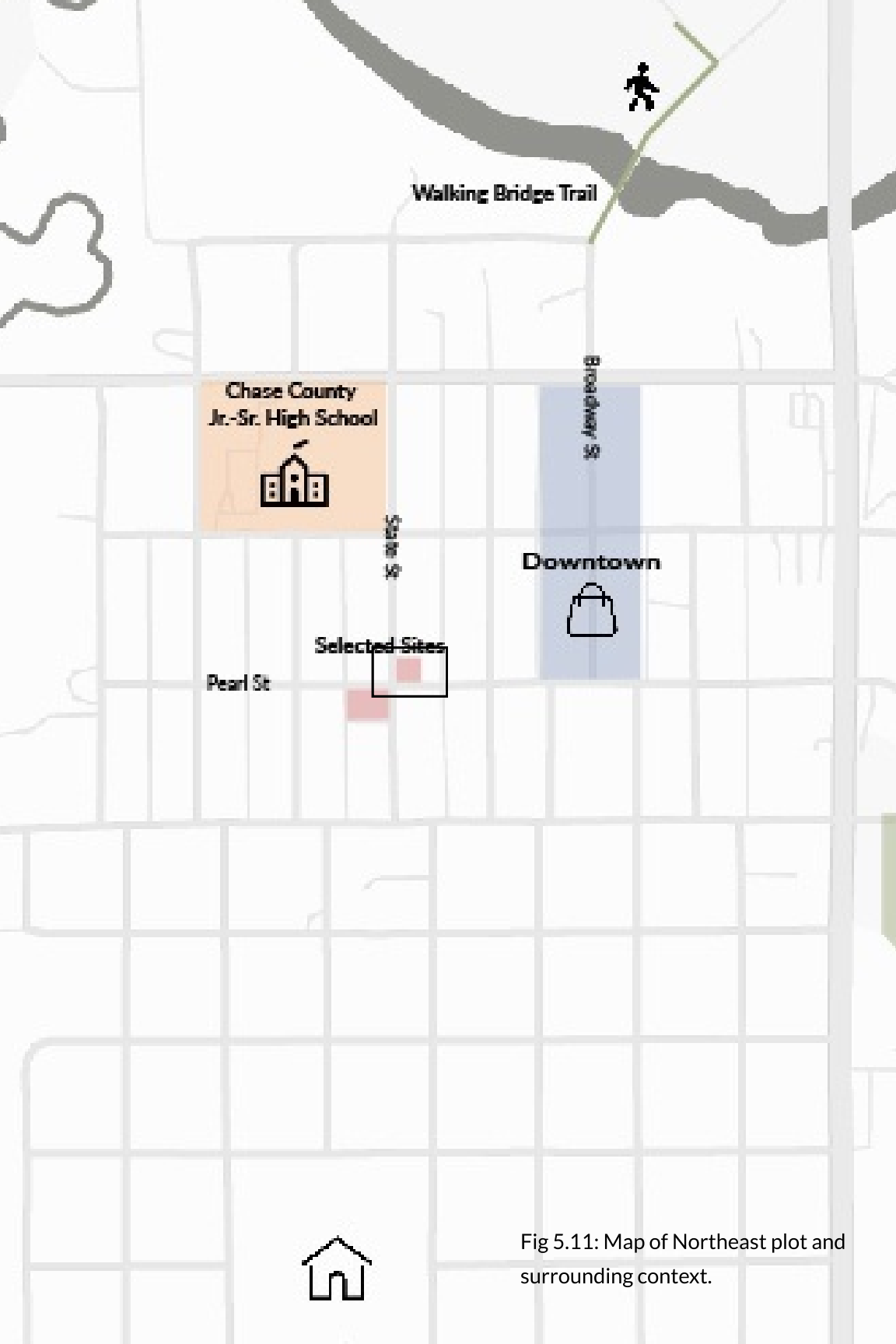


Fig 5.11: Map of Northeast plot and surrounding context.

Southwest Plot

South of Pearl Street, the typical houses and plots are larger than the northern neighborhood, with homes often being two stories. The plot chosen for this projective design is approximately 20,000 square feet.

The site is very flat, with a drainage ditch in the south. On the west side, there is an alleyway with unkempt vegetation. There are two mature trees on site. These trees should be saved and the roots protected (if the trees are in good health) at the time the new residences will be built and the landscape redone.



Fig 5.12, 5.13: Southwest Plot site photos.
Photos by Alison Snawerdt, used with
permission.

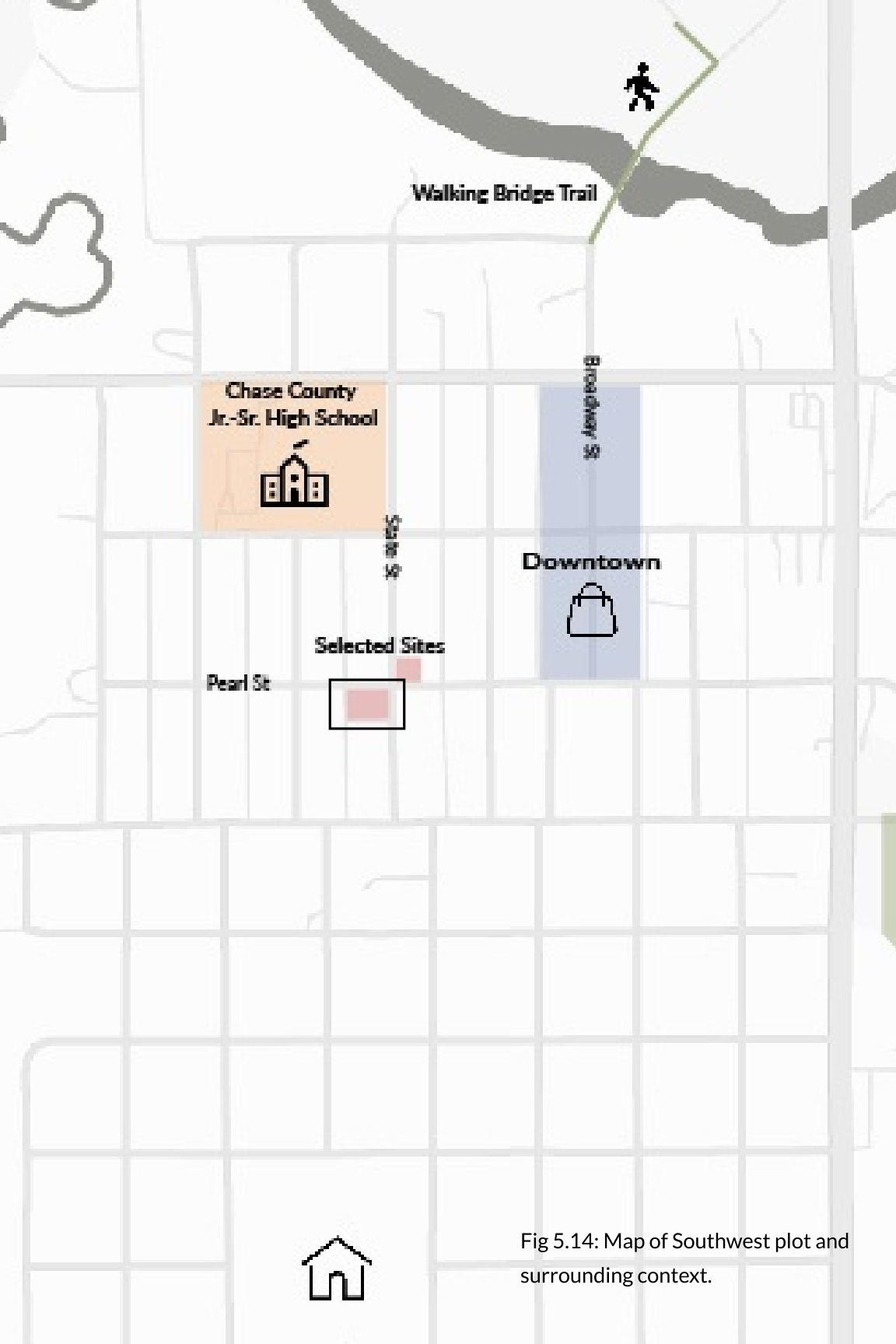


Fig 5.14: Map of Southwest plot and surrounding context.

Regulations and Codes (City & HOA)

Part of the problem with creating affordable housing and landscaping is how regulations and city code can impact development. In Cottonwood Falls, for example, the two selected sites fall under the R-1 Single-Family Residential zoning. Under this zoning law, only one house can be built on the property. This severely limits how affordable the houses can be. In addition, there are required setbacks that can restrict where the buildings are placed, thus restricting the arrangement and placement of the landscape as well.

By requesting a variance to the zoning code, one can create more affordable housing, with landscapes that are more beneficial. For example, zero lot line homes are a planning technique in which the houses are placed close to or on the property line. By doing this, small, inaccessible sections of land between property lines can be combined to create more usable spaces. While this would not normally be allowed due to a minimum setback requirement in the zoning code, an exception can be requested.

If one were to follow the city code exactly, the resulting housing and landscaping would not be affordable. Thus it is important to request a variance to accommodate more houses and different arrangements on the property.

When adding more houses to a plot, subdividing and creating new property lines will be important in case of individual ownership. This can impact the surrounding greenspace, depending on who maintains and cares for it. It may be necessary to have a small homeowners association that contracts a landscaping crew to come and mow a meadow once or twice a year. The newly subdivided property could be legally tied to the land deed. Overall, coordinating and determining who is responsible for what, in addition to what portions of the landscape are shared, is important.

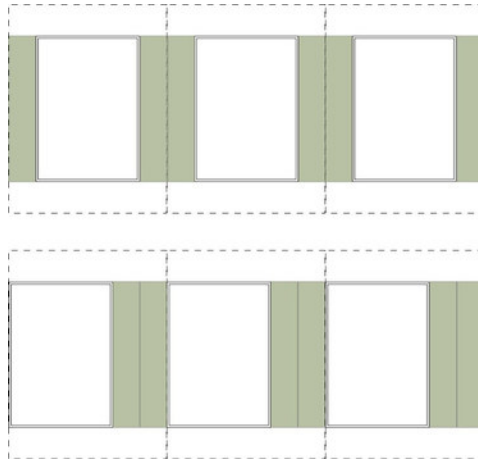
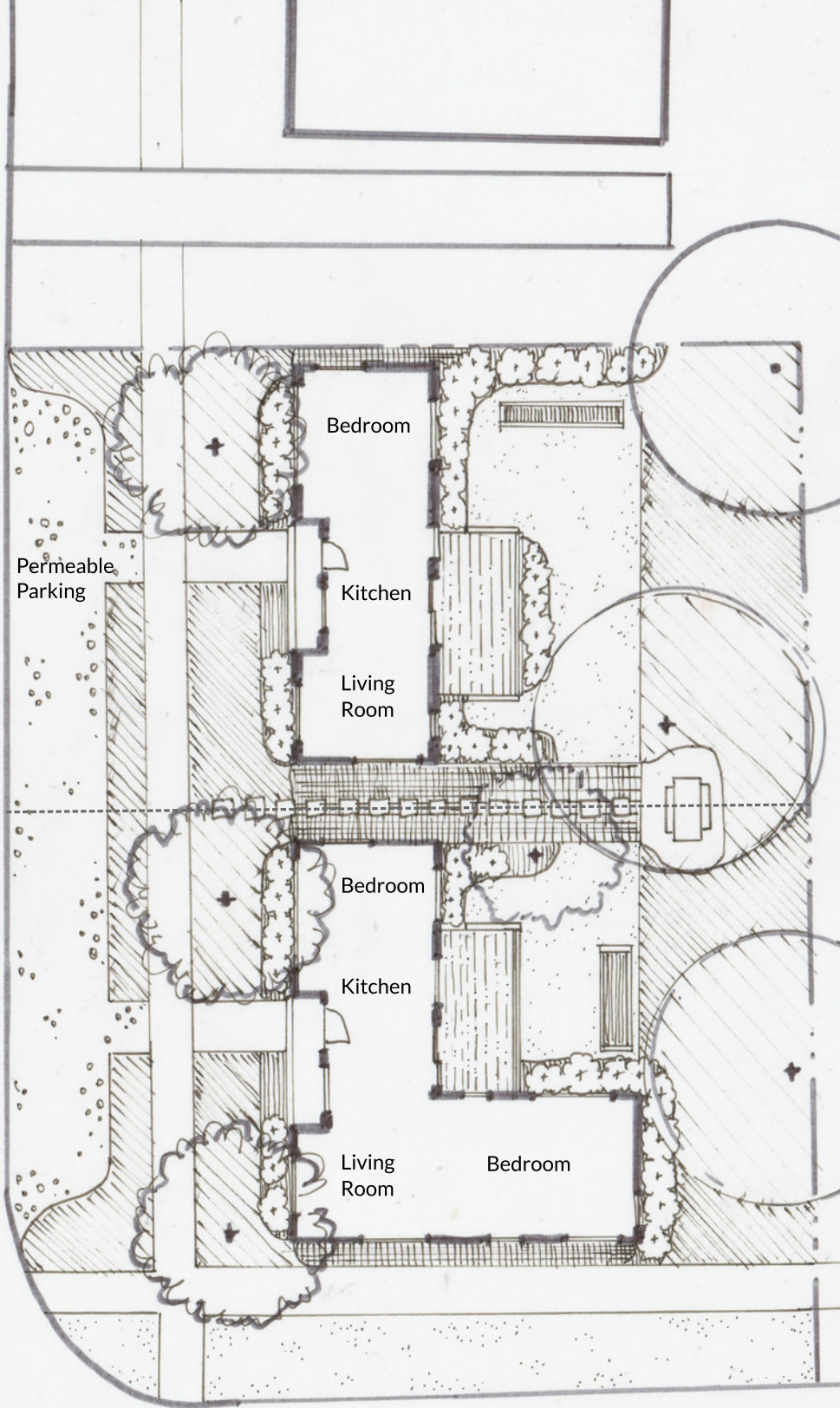


Fig 5.15: Plots with traditional property lines compared to zero lot line homes. The greenspace between homes is often an unusable side yard. The side yards are combined by shifting the homes to the property lines in zero lot line homes. (Otto, Tyler. 2025).



Fig 5.16: Following city code only allows for one building on a plot with limited configuration (Otto, Tyler. 2025).

State
Street



Permeable
Parking

Bedroom

Kitchen

Living
Room

Bedroom

Kitchen

Living
Room

Bedroom

Pearl Street

Northeast Plot

Example Design 1

Doubling the housing density allows for more affordable housing, but still offers ample greenspace and privacy.

The dotted line in the center is a potential property line to divide the plot. The path and communal space in the middle could be a fence line if more privacy is desired.

Permeable gravel parking spaces allow for greater stormwater retention on site while providing parallel parking along the street.

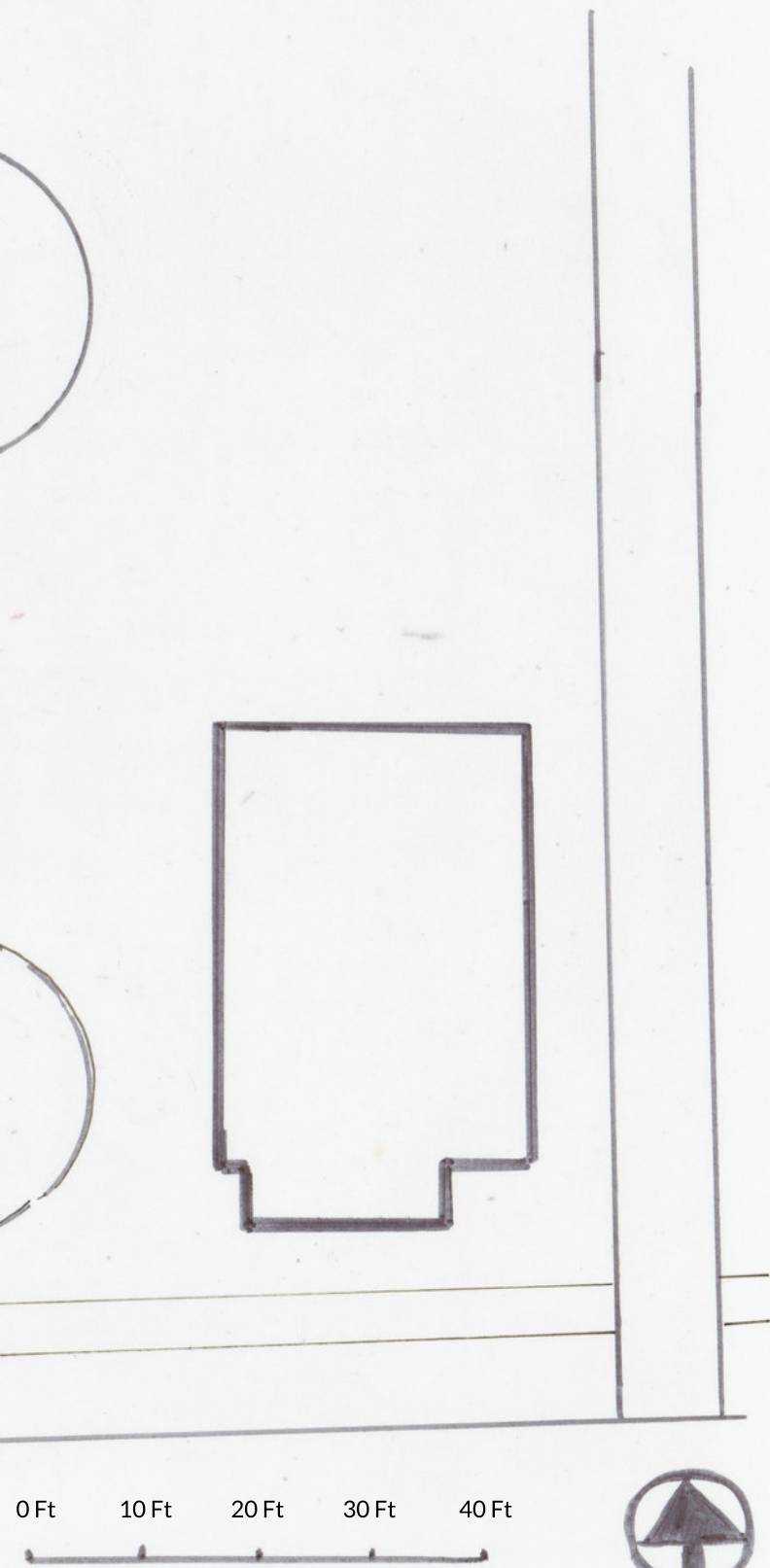


Fig 5.17: Plan View of
Northeast Plot
Example 1



Fig 5.18a: Prairie
Dropseed

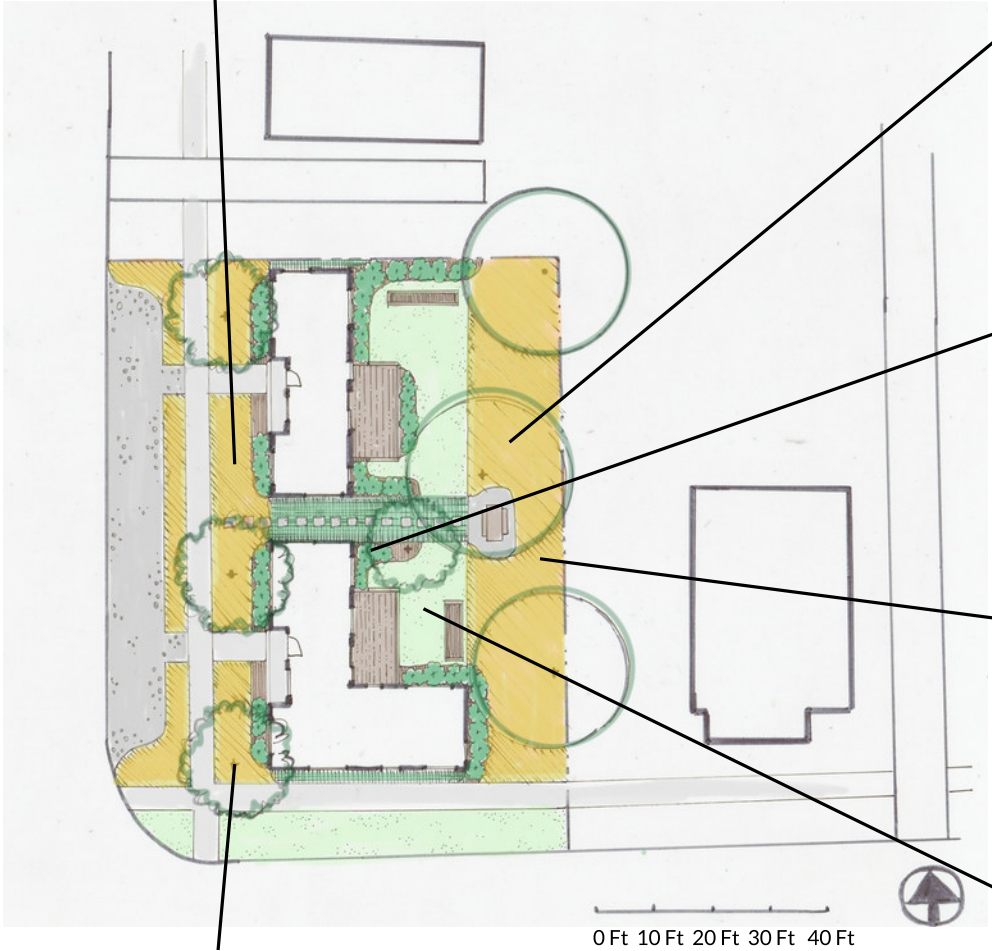


Fig 5.18f: Caddo
Sugar Maple

Northeast Plot

Example Design 1 Planting Choices

This design proposes native prairie grass species such as little bluestem, prairie dropseed, and switchgrass to cover the majority of the site. Requiring only one mowing per year, these grasses greatly reduce average maintenance costs compared to a typical turfgrass lawn.

Trees were chosen for their hardiness. Native, drought-tolerant sugar maples such as the "Caddo" can be used.

The planting design requires occasional maintenance such as weeding, but greatly reduces the financial burden on the homeowners while providing even greater ecosystem benefits.



Fig 5.18b:
Bur Oak



Fig 5.18c: Black
Chokeberry



Fig 5.18d: Little
Bluestem



Fig 5.18e:
Zoysia Grass

Fig 5.18: Northeast Plot
Example 1 Plantings.



Fig 5.19: Perspective view of backyard.



Fig 5.20: Section view of design.

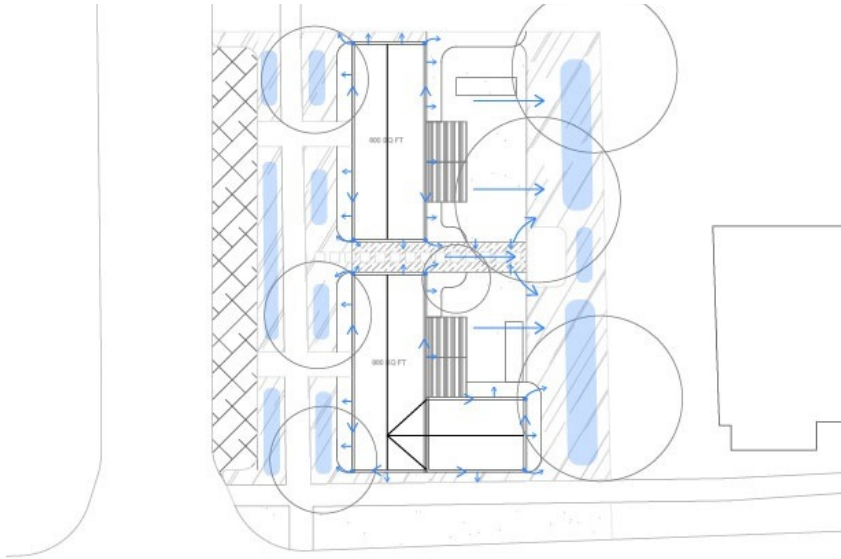
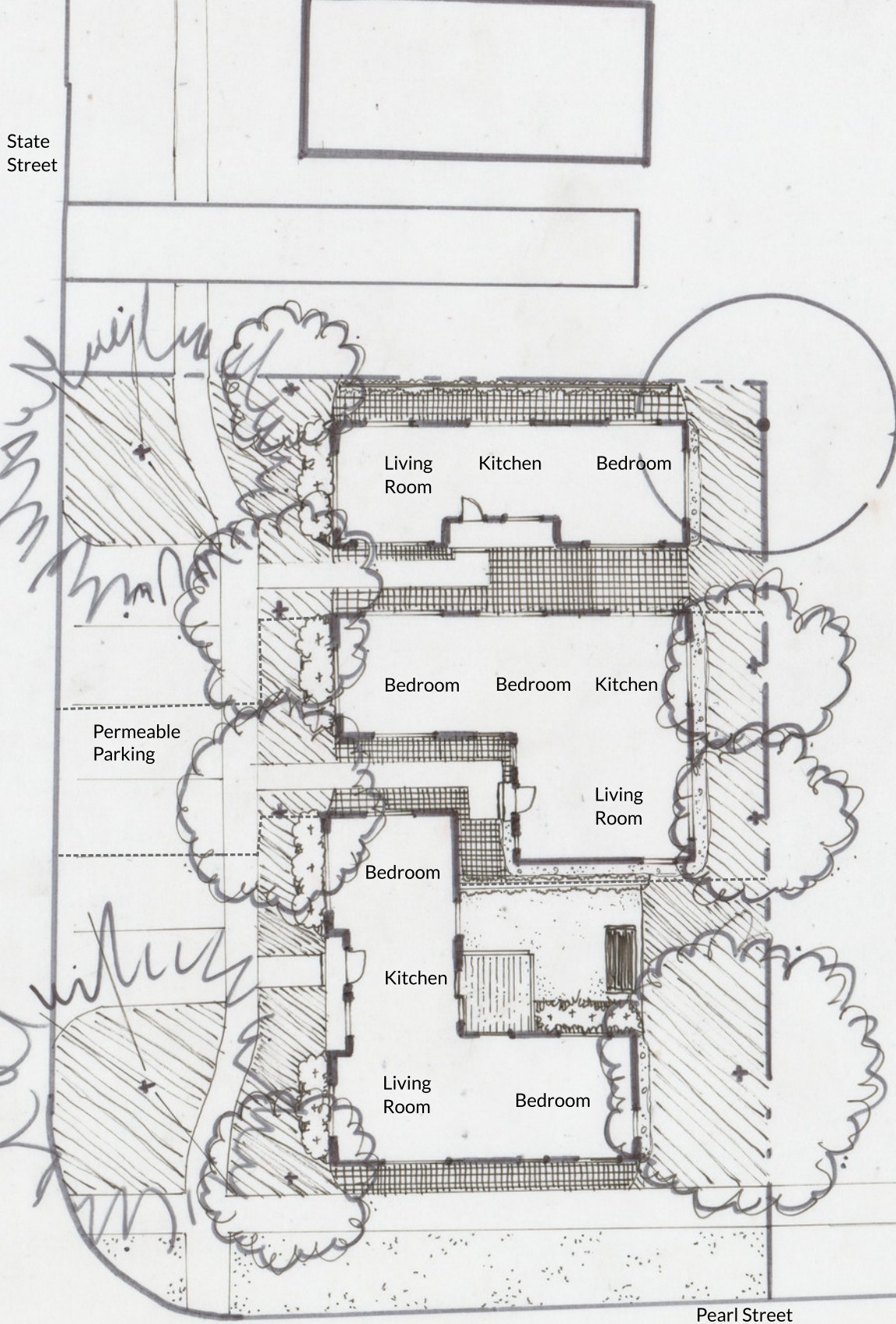


Fig 5.21: Rainwater Flow Diagram.

Stormwater management is essential in affordable designs, as it captures water on site to reduce watering costs, while also preventing flooding damage. This diagram shows how stormwater on site is directed away from the buildings into bioswales and raingardens. These areas can be four to six inches lower than the surrounding landscape to aid in water retention. Plants that require more water can be placed in these areas to benefit from the design.

These bioswales carry water to the eastern and western portions of the landscape. Although this system is expected to capture all potential runoff for most storms, any further stormwater is then directed to the permeable parking area or onto the street. If basemats are used (although not recommended to keep construction and housing costs lower), stormwater collection features should be at least 10-15 feet away from any foundation, with positive flow away from all parts of the home.

State
Street



Pearl Street

Northeast Plot

Example Design 2

Triple the housing density allows for even more affordable housing, but cuts back on the amount of privacy and greenspace.

Fencing or a trellis can help screen the buildings from their neighbors. This is especially important on the northern border of the plot and in between the southern two homes.

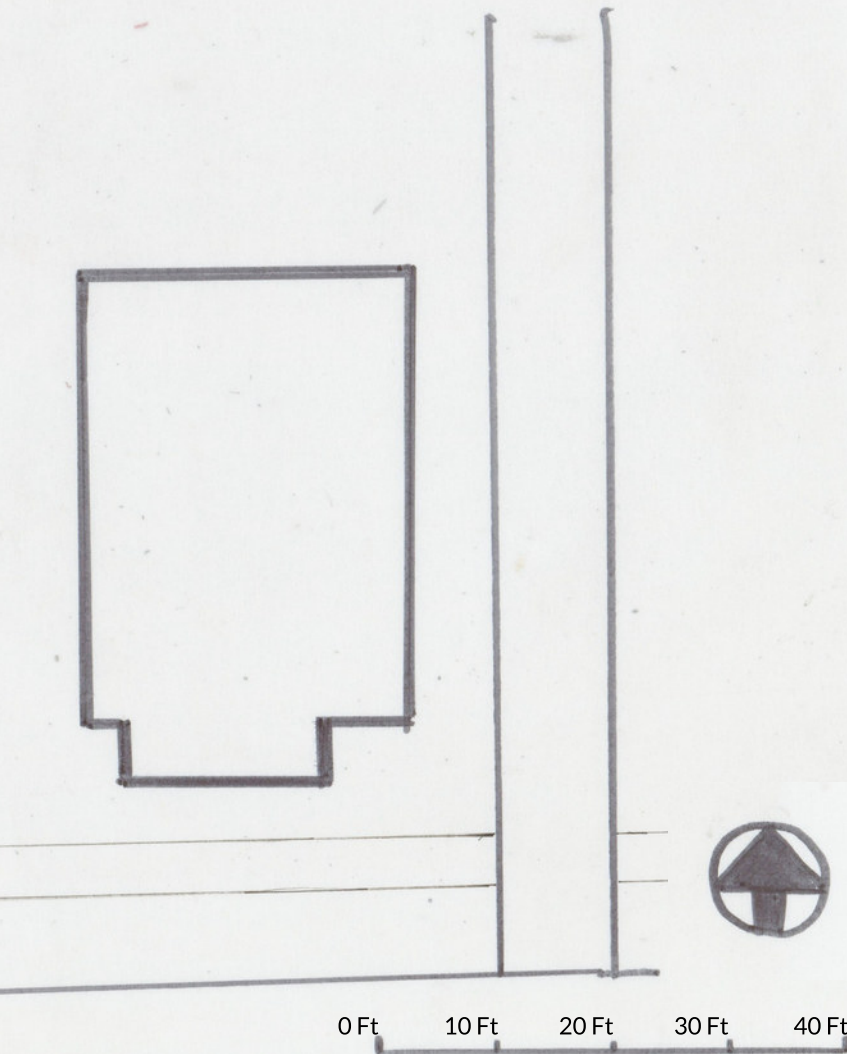


Fig 5.22: Plan View
of Northeast Plot
Example 2



Fig 5.23a: Eastern Redcedar

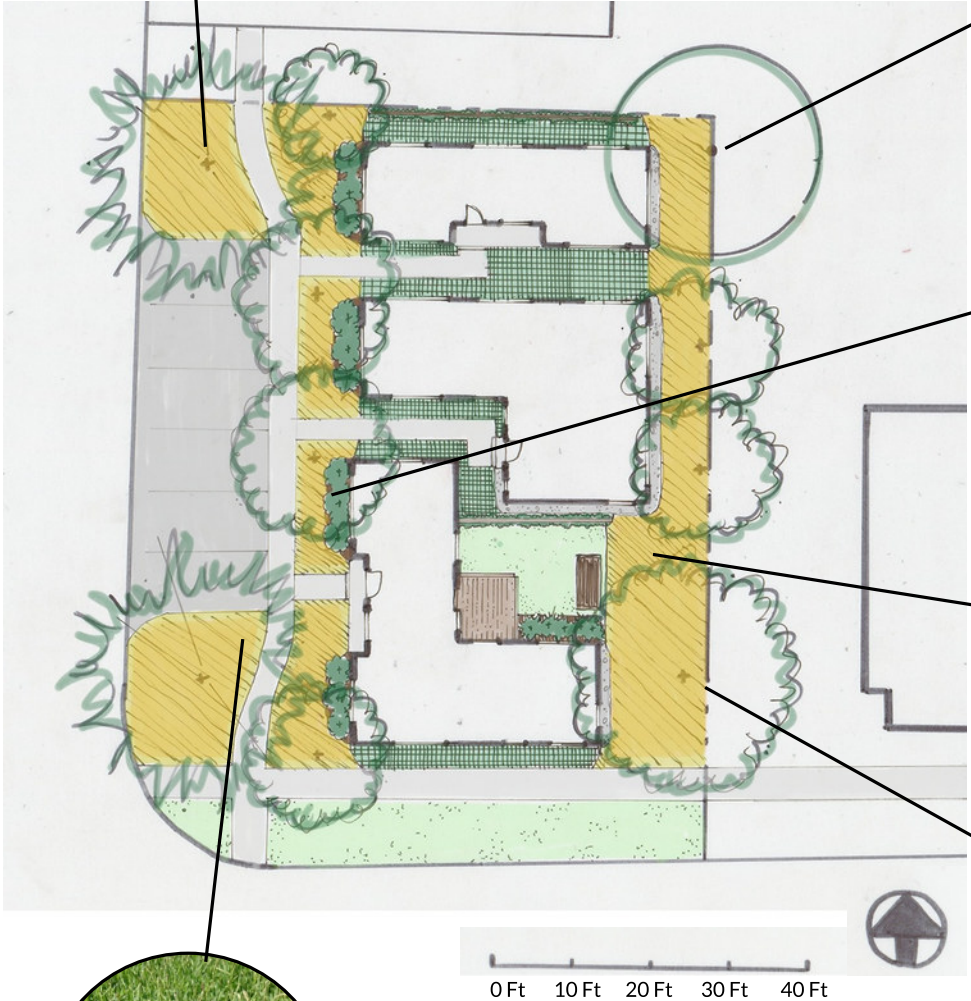


Fig 5.23f:
Buffalo Grass

Northeast Plot

Example Design 2 Planting Choices

This design also proposes native prairie grass species such as little bluestem, prairie dropseed, and switchgrass to cover the majority of the site. Buffalo grass is used to the north and south of the permeable parking area to maintain a clean and typical neighborhood front appearance.

Evergreen trees like the eastern redcedar are chosen due to their hardiness. Trees such as the redcedar can help reduce heating and cooling costs by providing protection from wind and providing shade.

Plants such as black chokeberry are used as foundation plantings but also provide spring flowers and edible summertime berries, thus increasing ecosystem benefits.



Fig 5.23b:
Bur Oak



Fig 5.23c: Black
Chokeberry



Fig 5.23d:
Sideoats Grama



Fig 5.23e:
Honey Locust

Fig 5.23: Northeast Plot
Example 2 Plantings.



Fig 5.24: Perspective of parking area and front walkway.



Fig 5.25: Section view of design.

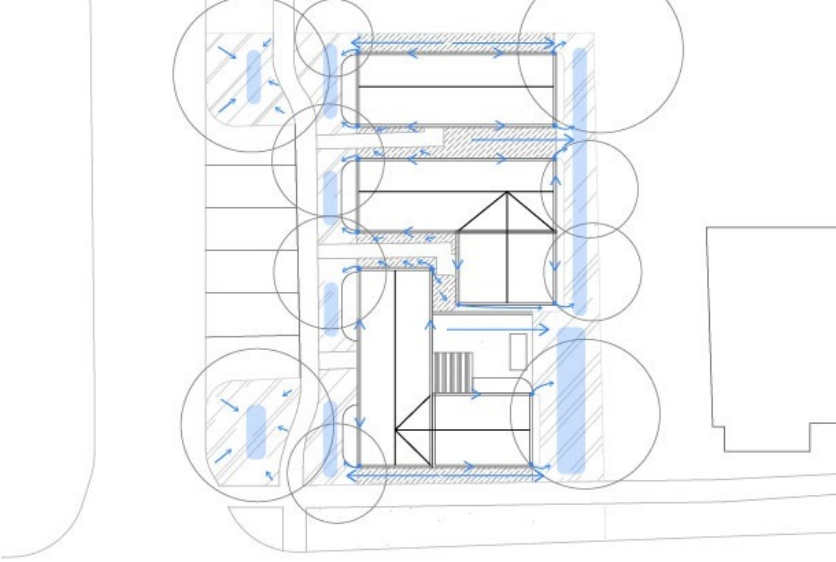


Fig 5.26: Rainwater Flow Diagram

This design focuses on carrying stormwater out the gaps in between buildings to bioswales on the eastern and western landscapes. The denser housing program in this design create shady areas in between buildings, so rain garden plants that are able to tolerate shady, temporarily wet areas are planted there. The slight depressions in the prairie grass that capture stormwater from the surrounding landscape allow for planting of varieties such as big bluestem, wild rye, moisture-loving sedges, milkweed, liatris, and common spiderwort, which need the additional moisture.

Pearl Street

Alleyway

Permeable
Parking

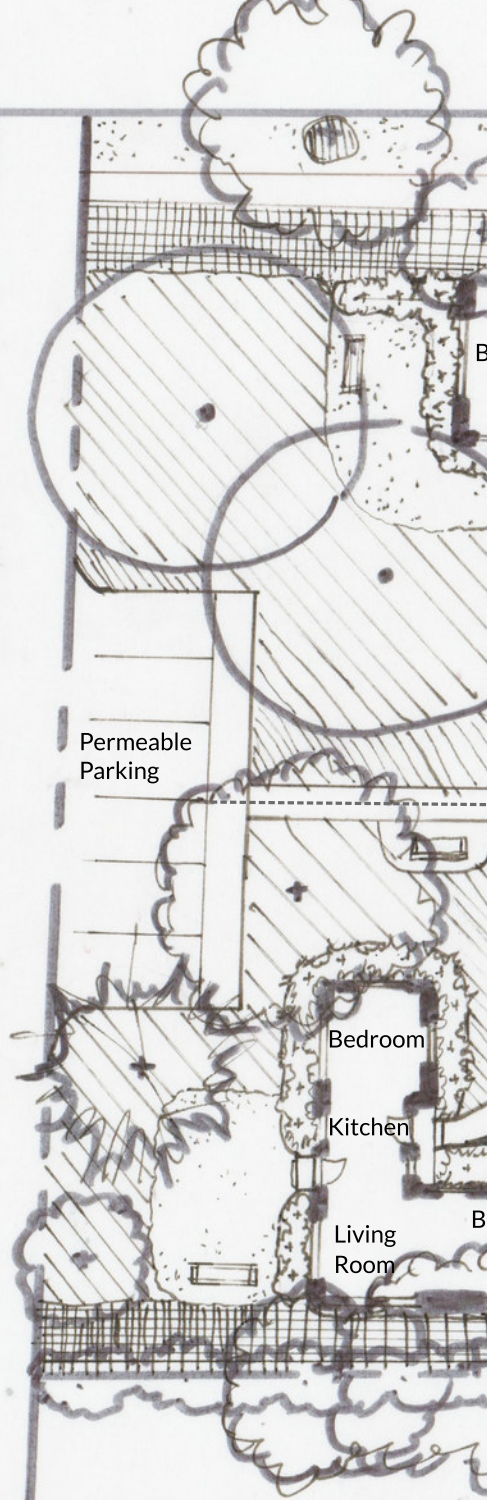
Bedroom

Kitchen

Living
Room



0 Ft 20 Ft 40 Ft 80 Ft



Southwest Plot

Example Design 1

This larger plot allows for a greater number of buildings on the property. This design triples the housing density to offer better affordability. Each building has its own private greenspace.

One of the key features of a site are the existing trees. When possible, developers should aim to keep existing mature trees as they provide many benefits while already being established. This design protects the two large trees in the northwest corner.

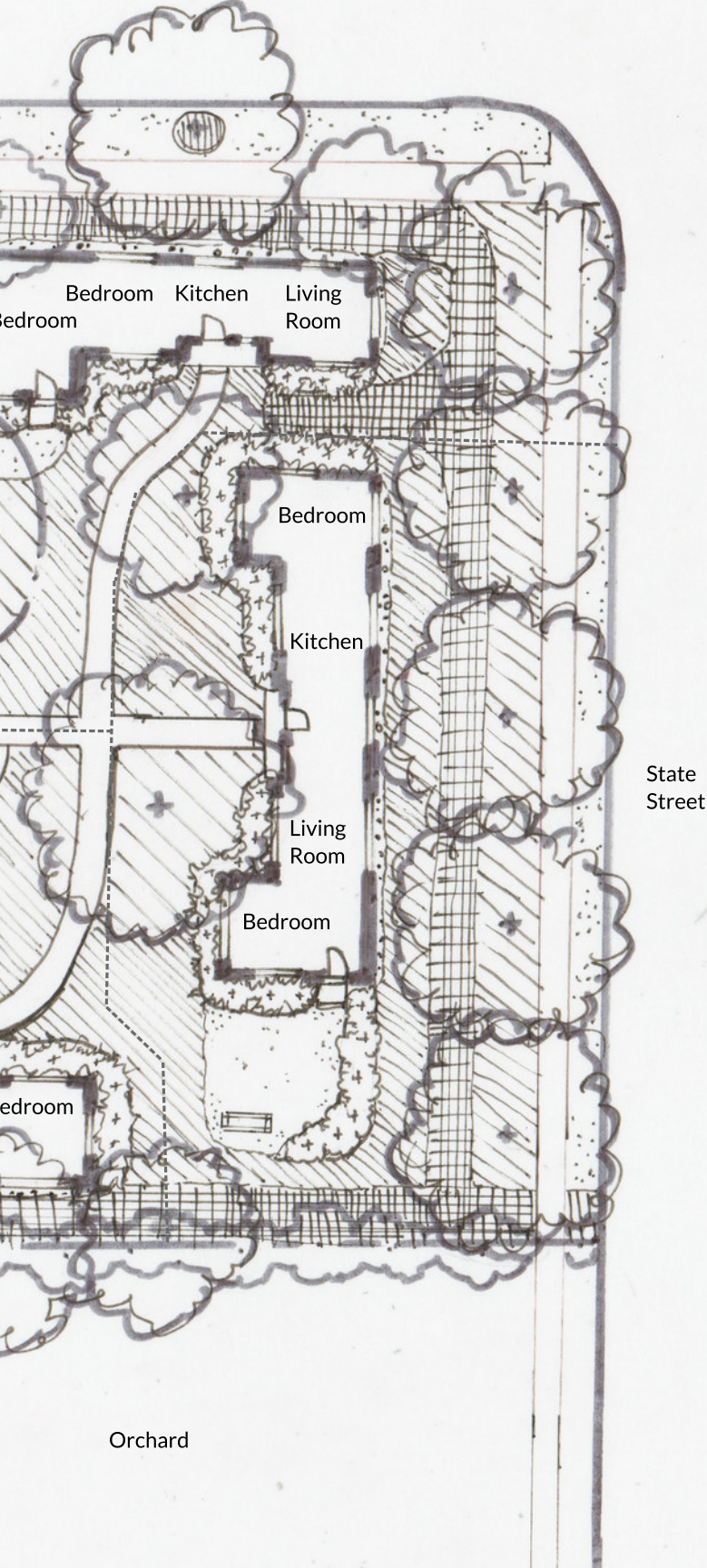


Fig 5.27: Plan View of Southwest Plot Example 1



Fig 5.28a:
Bur Oak



0 Ft 20 Ft 40 Ft 80 Ft



Fig 5.28f:
Eastern Redcedar

Southwest Plot

Example Design 1 Planting Choices

This design also proposes native prairie grass species such as little bluestem, prairie dropseed, and switchgrass to cover the majority of the site.

Trees such as the Chinkapin oak and bur oak were chosen due to their hardiness and ability to support native birds and other wildlife. In addition, they provide ample shade and protection while reducing energy costs.

Plants such as black raspberry are used as foundation plantings but also provide fresh berries in early summer.



Fig 5.28b:
Switchgrass



Fig 5.28c: Prairie
Dropseed



Fig 5.28d:
Chinkapin Oak



Fig 5.28e:
Black Raspberry

Fig 5.28: Southwest plot
Example 1 Plantings.



Fig 5.29: Perspective of entrance to house.



Fig 5.30: Section view of design.

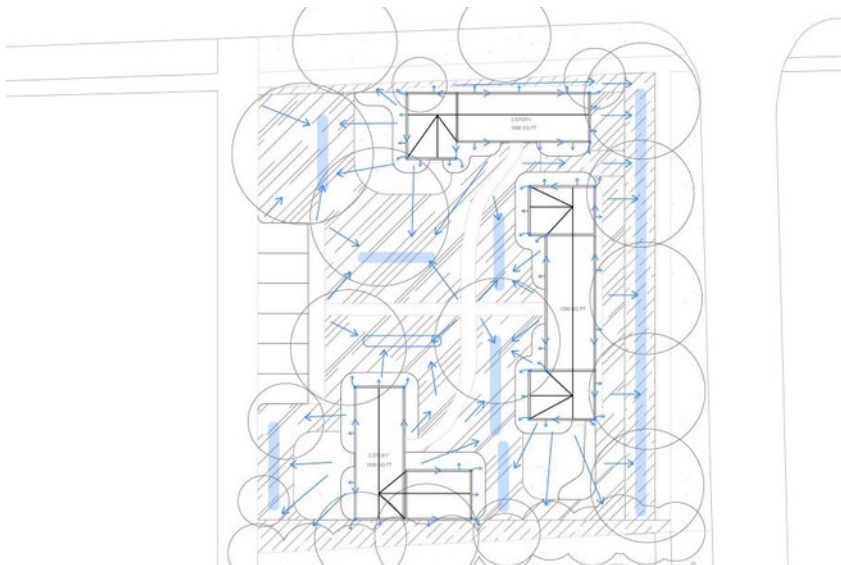


Fig 5.31: Rainwater Flow Diagram.

This site features an existing stormwater ditch on the south side of the property, The stormwater is diverted away from the buildings into bioswales that carry the water south into this stormwater ditch.

Silky or pale dogwood and wild plum can be added along the existing ditch to add seasonal interest, wildlife habitat, and increase native plant diversity. For more information on native trees and shrubs, refer to https://kswildflower.org/tree_index.php.

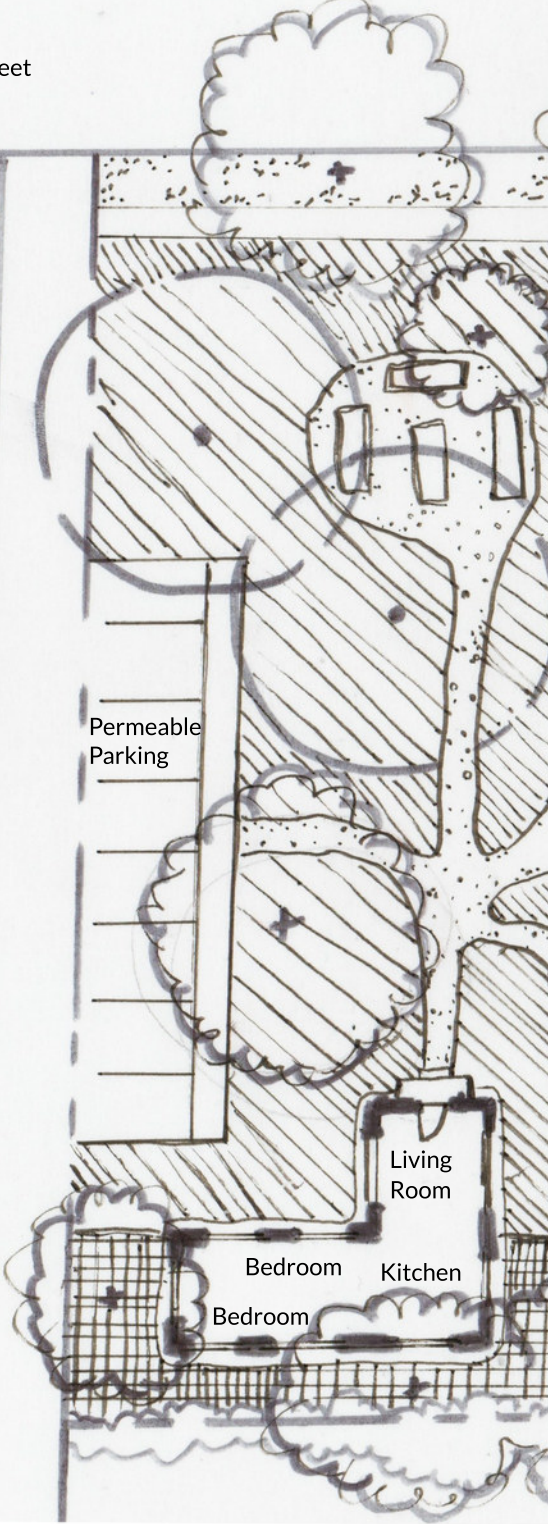
Pearl Street

Alleyway

Permeable
Parking



0 Ft 20 Ft 40 Ft 80 Ft



Southwest Plot

Example Design 2

This design quadruples the normal housing density. While there is little room for private greenspaces, a community garden is available.

The two large trees in the northwest corner are also protected instead of opting to add additional housing.

Instead of subdividing the plot into private four private properties, the area is managed by a landscaping company hired by a homeowners association.

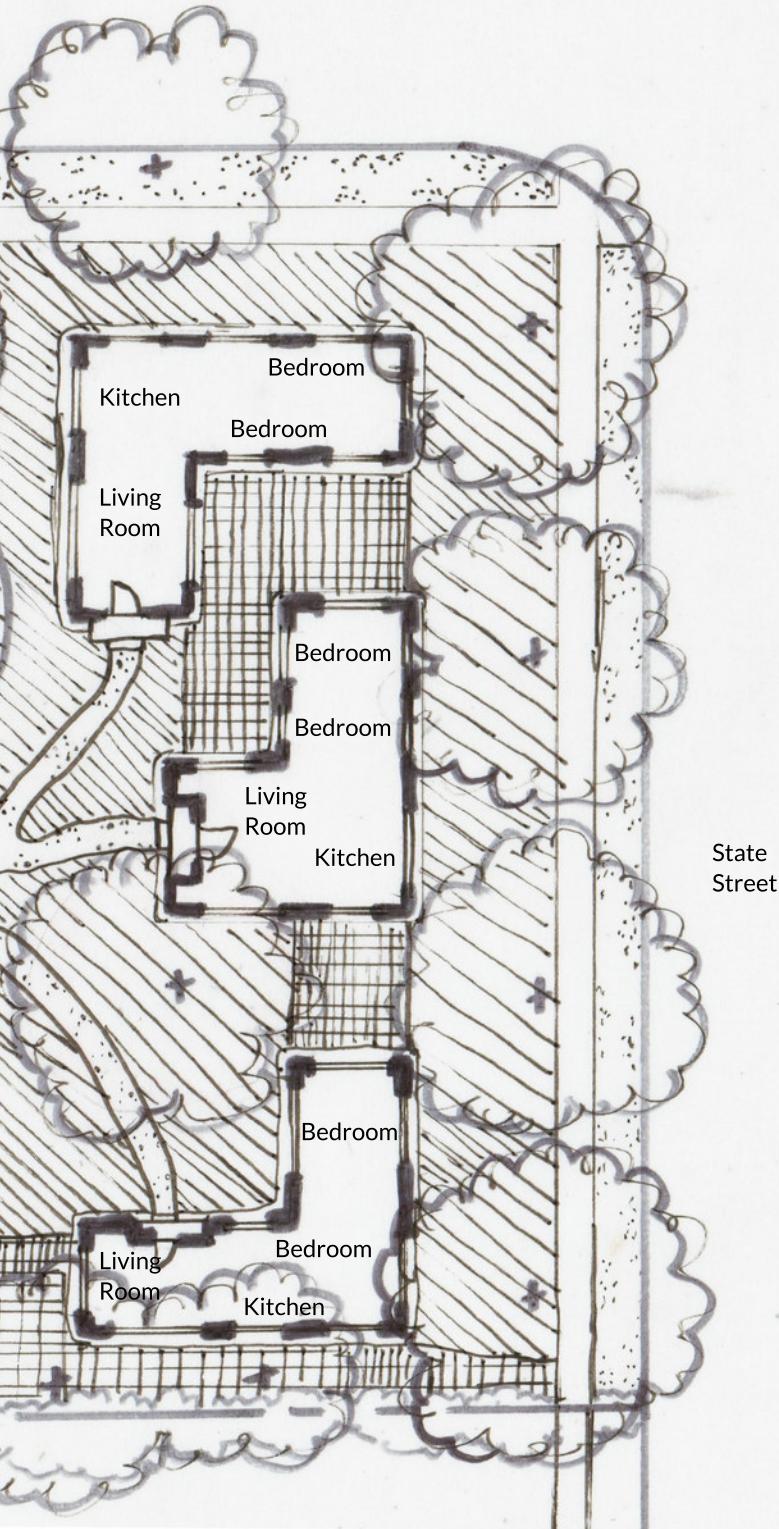


Fig 5.32: Plan View of
Southwest Plot
Example 2



Fig 5.33a:
Little Bluestem

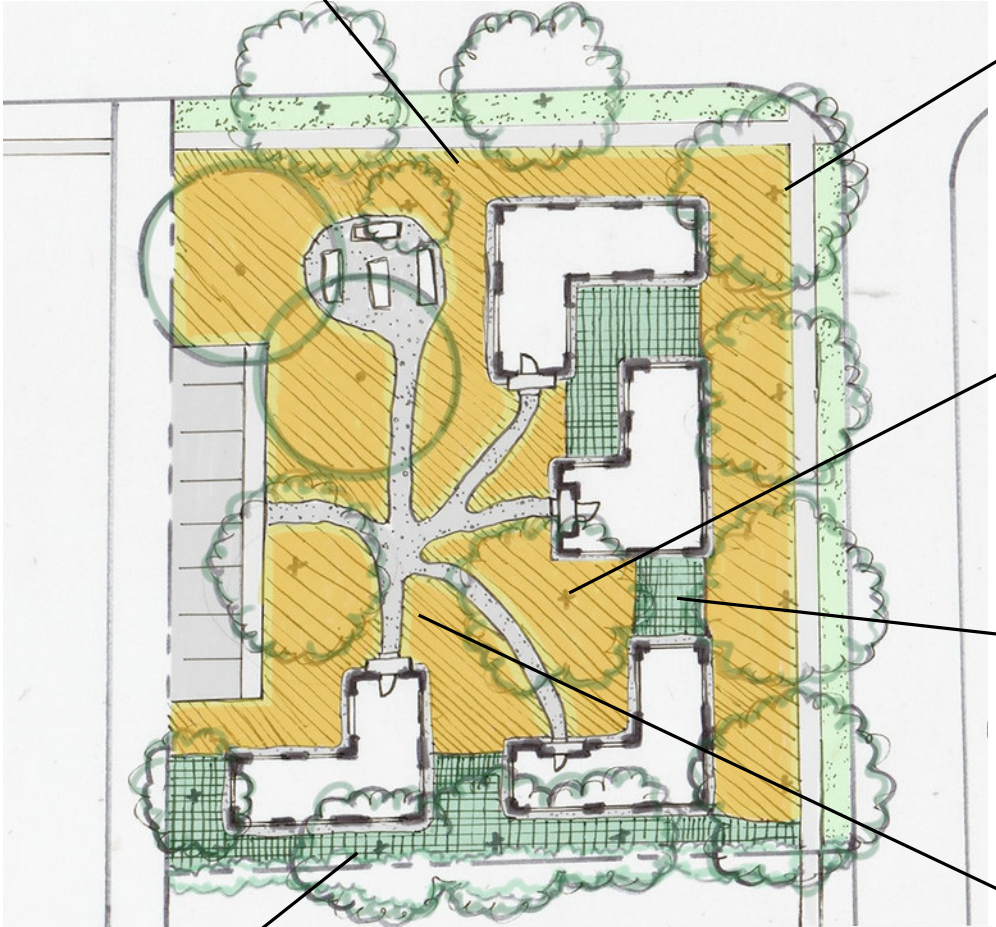


Fig 5.33f:
American
Sycamore

0Ft 20Ft 40Ft 80Ft



Southwest Plot

Example Design 2 Planting Choices

This design also proposes native prairie grass species such as little bluestem, prairie dropseed, and switchgrass to cover the majority of the site.

American sycamore is planted on the southern edge of the plot. These large trees provide excellent shade during the summer and have access to the water they need due to being planted near the drainage ditch. Putting less drought-tolerant plants in locations where there is stormwater accumulation is an excellent strategy to increase plant variety on site and reuse rainwater.

Common hackberry is a hardy tree that is used as a street tree on the northern and eastern edges. They provide shade and wind protection as well as food for native birds.



Fig 5.33b:
Common
Hackberry



Fig 5.33c:
Honey
Locust



Fig 5.33d:
Switchgrass



Fig 5.33e:
Prairie
Dropseed

Fig 5.33: Southwest Plot
Example 2 Plantings.



Fig 5.34: Perspective of community garden.



Fig 5.35: Section view of design.

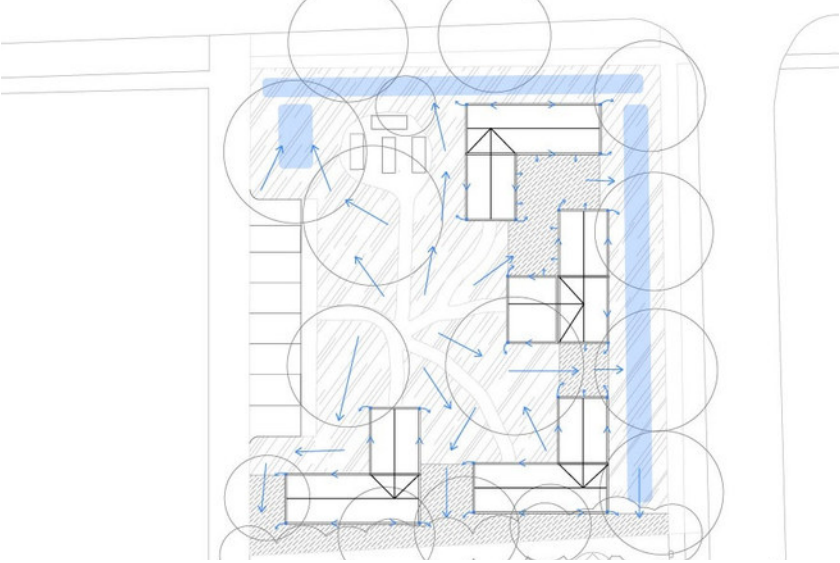


Fig 5.36: Rainwater Flow Diagram.

The same strategy is used again to carry rainwater to the stormwater ditch to the south. Rain gardens in between the buildings help provide spaces for shady, moisture-loving plants to thrive.

Because Kansas and other states in the Great Plains experience frequent droughts or prolonged dry periods, it is important to consider plantings that can handle both ample precipitation and dry soils. During extended dry periods fire protection buffers around homes can be created by mowing or clipping native grasses and forbs.



Chapter 6: Conclusion



Cost Savings

These guidelines and designs can substantially reduce landscaping costs. For example, when taking the first example plot from Cottonwood Falls, an affordability-focused landscape creates hundreds of dollars of cost savings per year compared to a typical turfgrass lawn. While the plant material for the affordability-focused landscape is more expensive, there is no need to install an irrigation system. This can save thousands of dollars during the installation. In addition, the yearly maintenance costs of the affordability-focused landscape is almost \$1000 cheaper than the typical turfgrass lawn. It is clear that not only is the affordability-focused landscape cheaper in the installation, but yearly maintenance costs are substantially less as well.

The affordability-focused landscape does not take into account cost of the weeding that must be done while the seeds are establishing, and does not account the supplemental watering that may need to happen during establishment. It also does not consider other factors of the turfgrass lawn maintenance such as aeration, pesticide application, or equipment costs. It can be assumed that the substantial cost difference between the affordability-focused landscape and the typical turfgrass lawn would remain.

In addition to the prairie grass groundcover, the affordability-focused landscape uses shrubs and trees to provide more greenspace benefits. Use of one-gallon shrubs and smaller caliper trees (1.5-2-inch) can reduce costs, and making sure they have enough (but not too much) water is critical during establishment. Overall, the affordability-focused landscape offers greater aesthetic value, more ecosystem benefits, and improved comfort and well-being of the residents at a fraction of the cost of the typical turfgrass landscape.

Affordability-Focused Landscape		Installation Cost	Typical Turfgrass Lawn	Installation Cost
2274 square feet meadow	Prairie Meadow Grass Seed	2274 square feet x \$.0022 = \$5.00	4416 square feet turfgrass	Kentucky Bluegrass Seed
266 square feet rain garden	Rain Garden Mix	266 square feet x \$0.0212 = \$5.64	Irrigation System	4416 square foot area
1409 square feet turfgrass	Zoysia Grass Seed	1409 square feet x \$0.077 = \$108.49		4416 x \$0.02 = \$88.32
467 square feet planting beds	Estate Mulch	467 square ft x \$0.1667 = \$77.85		\$2,000 - \$8,000 for irrigation system installation
3 Caddo Sugar Maples	Caddo Sugar Maple - 5 Gal	3 x (\$85.00 + \$25 tree diaper) = \$255.00		Total: \$88.32 + \$2000 = \$8000
1 Bur Oak	Bur Oak - 1 Gal	1 x \$45.00 + \$25 tree diaper = \$45.00		
1 Honey Locust	Honey Locust - 24 Inches	1 x \$29.00 + \$25 tree diaper = \$29.00		Yearly Maintenance Cost
1 Apple Tree	Apple Tree - 2-4 Feet	1 x \$48.00 + \$25 tree diaper = \$48.00		
20 Black Chokeberry Shrubs	Black Chokeberry - Seedlings	20 x \$1.70 = \$34.00		\$30 per mow x 30 weeks = \$900
25 Coralberry Shrubs	Coralberry - 1 Gal	25 x \$15.00 = \$375.00		Fertilizing: \$50 a year
		Total: \$982.98		1.5" of water per week x 30 weeks = 45" of water per year.
	Yearly Maintenance Cost			45" of water = 27.9 gallons of water per square foot
				27.9 gallons x 4416 square foot = 123,206.4 gallons of water
	initial watering costs during establishment			Water cost: \$5.60 minimum + \$2.00 per 1000 gallons
				\$5.6 + 123 k gallons x \$2.00 = \$252 per year
	\$30 per mow once a year = \$30			Total: \$1202 per year
	Cost of mowing 1400 square feet turfgrass: 9\$ x 15 weeks = \$135			
	Total: \$165			
	Hand water twice a month if needed			
	Total: Approx. \$300 per year			

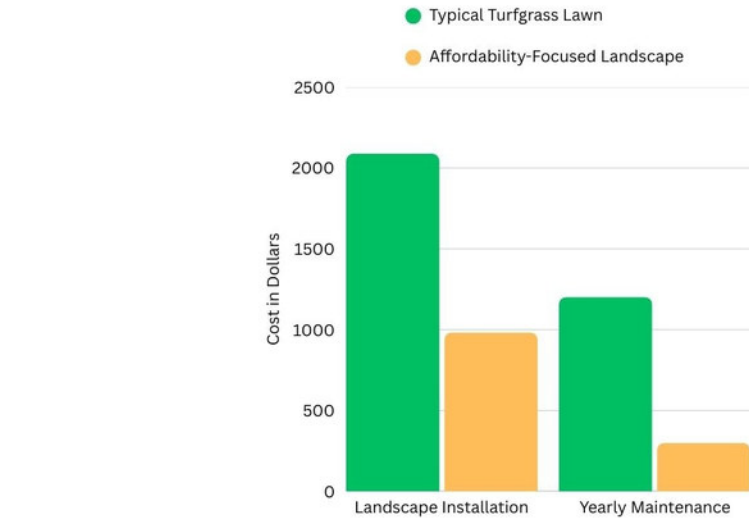


Table 6.1: Cost comparisons of a typical turfgrass landscape versus an affordability-focused landscape (Otto, Tyler. 2025).

As our focus on affordable housing increases, so too should our attention on affordable landscapes. The placement and arrangement of housing clusters, property lines, and zoning regulations all impact how the landscape is built and maintained. In order to reduce costs, variances from set zoning codes may be necessary.

As housing density increases, the importance of greenspace benefits becomes even more important. Nurturing a landscape that emphasizes biodiversity, stormwater retention, and improved aesthetics will not only contribute to the comfort and well-being of the residents, but be more environmentally sustainable and affordable.

This report focuses on and uses the town of Cottonwood Falls, Kansas as an example for how small residential plots can be developed to foster affordability for the residents. Increasing housing density and reducing construction costs by using prefabricated modular housing are both great ways to increase affordability, but a large portion of a homeowner's expenses also comes from maintaining the surrounding landscape. By replacing the typical turfgrass lawn using native plants that are more hardy one can substantially reduce watering and maintenance costs.

In implementing these more affordable landscapes, there are many more issues and opportunities to consider and research. Community perception may view these landscapes as unwelcome after being accustomed to turfgrass lawns. As previously mentioned, signage or other community outreach methods may help influence public perception. The One Drop at a Time project by Marcus de la Fleur incorporated walking tours to help educate the community (De la Fleur, Marcus. 2009). Conversations about the importance of creating and maintaining climate-resilient and more biodiverse landscapes are important.

Due to the wide variety of plant material, maintenance of these more complex ecosystems can be complicated. Educating homeowners on proper maintenance of these landscapes is essential. Fire-prone grasses such as big and little bluestem, indian grass, switchgrass, and sideoats gramma should not be within 10 feet of the home. Prairie dropseed, which is less flammable and dense, can be used instead. Buffers of mown grass or gravel can be used to prevent prairie grass from growing directly adjacent to the house, especially during prolonged dry spells. Common undesirable weeds and invasive species need to be looked for and quickly removed while the landscape is establishing and year-to-year afterwards.

There are many other strategies to reduce fossil energy use and property owner landscaping costs, such as having communal landscape spaces, using grant programs, and supporting renewable energy. It is important to take into account the aesthetic landscape character of the neighborhood, city regulations, and types of plants permitted. This report offers a broad overview of how landscape design can be used as a tool to reduce housing costs for residents, but as further research is done regarding the affordability of housing, continued research into the affordability of all lower to middle income landscapes should also be explored.



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