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ECOLOGICAL SUSTAINABILITY FOR SMALL TOWN PENNSYLVANIA:  
HOW GREEN LIVING IS FOR ALL PEOPLE

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## ABSTRACT

Environmental sustainability is a global crisis that can be solved through local action. Across the United States, small towns are working independently in their neighborhoods to increase their level of sustainability. However, they are attempting this effort with little to no professional design assistance. This thesis seeks to expose motivated residents of towns (pop. 5,000-40,000) in Pennsylvania to simple, affordable, and practical environmental improvements that could be incorporated into the existing town infrastructure. Three possibilities are put forward: rain gardens, community gardens, and lawn-alternative front yards. The Appendix is a distributable packet that connects motivated residents to the resources they need to enact environmentally sustainable improvements to their towns. The concepts, benefits, and application of each technique are discussed and illustrated, and case study examples are provided as inspiration and guidance. Though the analysis has been tailored to the conditions of the Pennsylvania region, the ideas and case studies in the packet could be used by residents anywhere within temperate North America.

TABLE OF CONTENTS

LIST OF FIGURES .....iii

ACKNOWLEDGEMENTS .....iv

Chapter 1 The Importance of Local Action for Environmental Sustainability ..... 1

    Local Efforts Affect National Change..... 1

    Environmental Sustainability and the Benefits .....2

    Making a Change in the Community .....10

    Conclusion..... 13

Chapter 2 References ..... 15

    Figures..... 15

    Works Cited ..... 15

Appendix Ecological Sustainability for Small Town Pennsylvania, distributable packet..... 18

## **LIST OF FIGURES**

Figure 1-1 The Threes Spheres of Sustainability.....	3
--	---

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## **Chapter 1**

### **The Importance of Local Action for Environmental Sustainability**

#### **Local Efforts Affect National Change**

Throughout US history, local efforts have affected national change. During WWII, encouraged by slogans like, “our food is fighting”, Americans planted more than 20 million victory gardens. These vegetable, fruit, and herb gardens provided up to 40 percent of all produce consumed nationally, and decreased the cost of the vegetables consumed by the soldiers. (Victory Gardens n.d.) Arbor Day is an example of this grassroots enthusiasm for supporting the environment. What began in 1872 with one man planting trees on his Nebraska farm has grown today to millions of people in all 50 states planting 8 million trees annually. (Arbor Day Foundation 2011) Our country is again in need of the community-level action that accomplished these past feats. America, and the world, is facing an environmental crisis. The Intergovernmental Panel on Climate Change (IPCC) has documented weather patterns becoming more extreme, sea levels rising, and global temperature rising. (2007) This affects the US by increasing the range of pests and diseases, increasing the level of tropical cyclone activity, and decreasing the amount of drinking water available from snowmelt. (IPCC 2007) The time for action is now. And the American people are rising to the call. Across America, individuals and communities are making independent contributions to improve the environment, and collectively these contributions add up to national change. When the small town of Greensburg, Kansas was almost totally destroyed by an enormous tornado in May 2007, the residents took the initiative to transform a disaster into a triumph: the rural, conservative town decided to rebuild entirely “green”. All city buildings will meet the U.S. Green Building Council’s LEED platinum rating

for top-level environment-friendly construction. (Letson 2010) The town of Davis, California, declaring itself to be “the most bicycle friendly town in the world”, has more bikes than cars and 17% of trips are by bike. In 2005 the Bicycle-Friendly Community program of the League of American Bicyclists recognized Davis as the first Platinum Level city in the US. (Davis CA 2011) Individual Americans are also making contributions to the level of national environmental sustainability. The percentage of waste that is recycled has risen from 6.4% in 1960 to 33.8% in 2009. (EPA 2011) People are accomplishing these environmental feats to make positive, immediate impacts on their own lives – improving health, economic vitality, and community cohesion – and also making these efforts out of compassion for the environment. People and the environment are linked, affected by the actions and characteristics of the other. A sustainable relationship between people and the environment is a stable relationship that will perpetuate itself to the benefit of all parties. This relationship needs to be improved, and American citizens are ready to implement that change.

### **Environmental Sustainability and the Benefits**

The focus of this research is environmental sustainability. Environmental sustainability is one of three spheres of sustainable development defined by the UN 2005 World Summit. The spheres are social, economic, and environmental sustainability. Social sustainability is achieved through community participation and strong civil society resulting in social cohesion, cultural identity, diversity, and other forms of social capital. Economic sustainability is maintenance of monetary capital. Environmental sustainability seeks to protect sources of raw materials and ensure that the sinks for human wastes are not exceeded, in order to prevent harm to the natural systems. (Goodland and Daly 1996)

Social, economic, and environmental sustainability are difficult to analyze individually, because they are all aspects of a whole. (Fig 1) Therefore, though this research will focus on how to increase environmental sustainability, the techniques explored will have social and economic benefits. For example, a green roof is environmentally sustainable. A building's roof is covered with a waterproof membrane, filled with growing medium, and planted. It has the environmental benefits of increasing urban air quality and creating wildlife habitat. Though installed for its environmental qualities, the green roof increases social and economic sustainability. The green roof has the social benefits of beautifying the view from surrounding buildings and improving the residents' quality of life. The side economic benefits of a green roof are an increased lifespan for the roof and decreased heating/cooling costs by insulating the building. Sustainability is a multi-

### ***The Three Spheres of Sustainability***

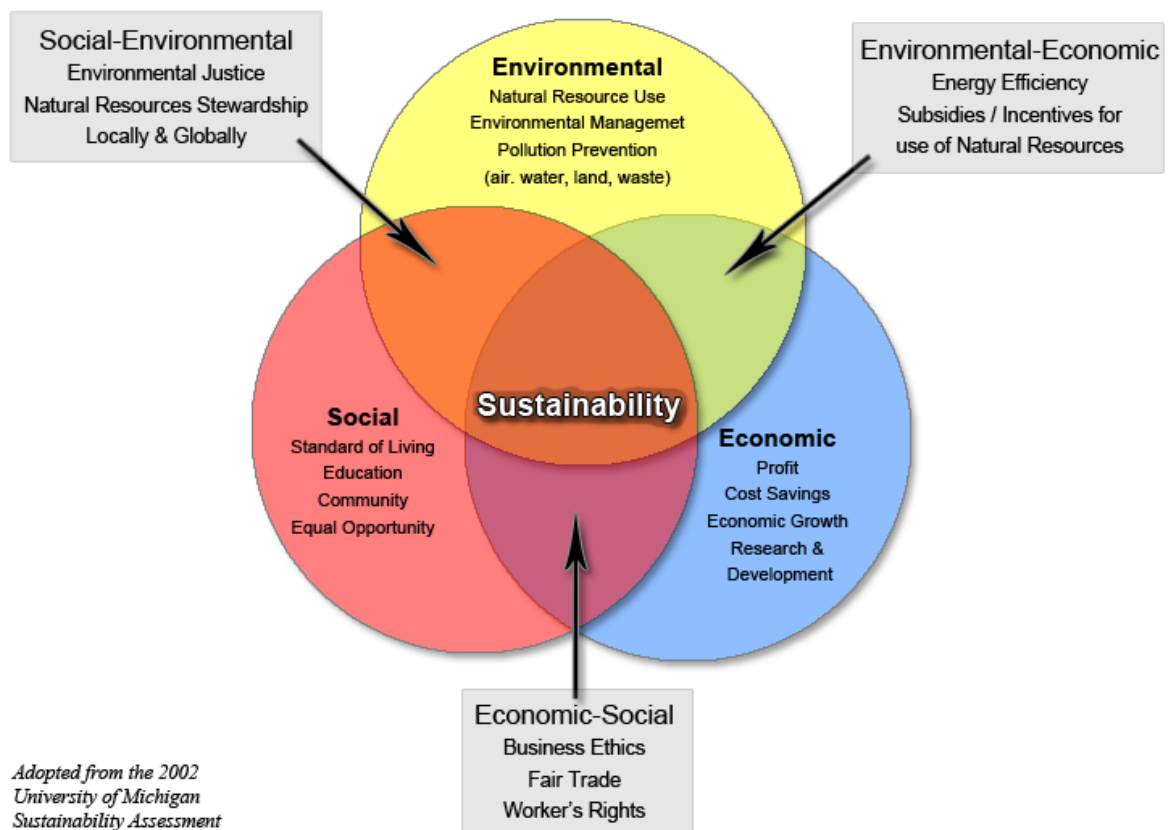


Figure 1: The three spheres of sustainability and their interactions



spheres of sustainability. This research will focus on ways to increase a town's environmental sustainability, but the steps to reach this or the benefits afterwards will also increase the social and economic sustainability of the town.

The principle of environmental sustainability has been explored for over a century. Aldo Leopold, a visionary American environmentalist in the early 20<sup>th</sup> century, developed the concept of a "land ethic", which explores the interdependence of humans and the environment. Ethic, as Leopold describes it, is a shift from competition for survival to cooperation for survival. Land ethic then is a shift in the relationship between people and the environment from exploitation to cooperation. If we, as people, expand our concept of community "to include soils, water, plants, and animals, or collectively: the land,...the role of *Homo sapiens* [changes] from conqueror of the land-community to plain member and citizen of it." (1949, 204) As citizens of the larger land community, it is in our best interests to see this community thrive. Our growth and development must be respectful and sustainable.

The benefits of respectful and sustainable development are immediate and tangible. Fostering a healthy ecosystem increases the natural resources available to people, improves human health, and promotes economic growth.

The natural environment provides many services and resources to people. Soils clean pollutants out of water, rendering the water drinkable; organisms decompose materials, making the elements available for new production; plants respire oxygen, allowing people to breathe. A mature tree absorbs 120-240 lbs. of small particle pollution per year. In Sacramento, this service has a value of \$28.7 million. (University of Washington 1998) Creating a sustainable relationship with the environment permits all of these activities and services to continue to benefit people.

The connection between human health and nature has a long history in the United States. Fredrick Law Olmsted designed Central Park in 1858 in New York City as an antidote to the faceted concept which causes action in a single sphere to ripple benefits into all of the other

faceted concept which causes action in a single sphere to ripple benefits into all of the other perceived disease and stress created by the city. (Szczygiel & Hewitt 2000) In particular, the park's provision of light and air was deemed important to human health.

Air is disinfected by sunlight and foliage. Foliage also acts mechanically to purify the air by screening it. Opportunity and inducement to escape at frequent intervals from the confined and vitiated air of the commercial quarter, and to supply the lungs with air screened and purified by trees [is necessary for the protection of the health]. (Olmsted 1870, 70)

Scientists continue to discover ways in which exposure to nature benefits human health. Viewing nature speeds recovery time, calms stress, lowers depression and increases self-esteem, improves concentration levels in children, and reduces symptoms of Attention Deficit Disorder (ADD). Howard Frumkin completed a landmark study in 2001 comparing the recovery times of post-surgery patients who had windows with views of a brick wall or of trees. He found that those with the view of the trees required less medication and were checked out of the hospital about a day earlier. (Frumkin 2001) As well as speeding the healing process, viewing nature can relieve everyday pressures. Roger Ulrich, a Texas A&M researcher, has shown that people who watch images of natural landscape after a stressful experience calm significantly after only five minutes. (Louv 2005, 46)

The healthful benefits of proximity to nature increase when people expand from viewing it to living amongst it. Cornell University environmental psychologists reported in 2003 that the degree of nature in and around the homes of rural schoolchildren affected the children's psychological state. Those children with more nature around their homes rated lower on behavioral conduct disorders, anxiety, and depression than their peers. The children surrounded by more nature rated themselves higher on measures of self-worth compared to their peers. (Wells & Evans 2003) This suggests that even in a rural setting, more nature is beneficial. Though this study focused on children, it can be extrapolated that adults would react in a similarly positive way to high-nature conditions. The positive influence of views of nature is

especially pronounced in girls (aged six to nine). Researchers at the Human-Environment Research Laboratory at the University of Illinois found that, on average, the greener the girl's view, the better she concentrates, the less impulsively she acts, and the longer she can delay gratification. This helps the girl do better in school, handle peer pressure, and avoid dangerous, unhealthy, or problem behaviors. She will be more likely to behave in ways that will lead to a successful and constructive life. (Taylor et. al. 2002) Developing green, natural environments for our children now will result in more stability and productivity in the next generation to lead the world.

Involvement with nature has also been shown to reduce symptoms of ADD. This is especially pertinent today, when an estimated 3-5%, or approximately two million schoolchildren have ADD. (Barkly 1995) Researchers at the Human-Environment Research Laboratory at the University of Illinois report that, "compared to the aftereffects of play in paved outdoor or indoor areas, activities in natural, green settings were far more likely to leave ADD children better able to focus, concentrate. Activities that left ADD children in worse shape were far more likely to occur indoors or outdoors in spaces devoid of greenery." (Taylor et. al. 2001) The findings from this study have implications for the design of children's environments, such as schoolyards. Providing green play spaces may be a simple way to improve academic performances.

Proximity to nature has a wide array of documented health benefits for people. These benefits are immediately available, sometimes occurring in less than five minutes. (Louv 2005) Environmentally sustainable practices are valuable for the environment, but they are also valuable for peoples' well-being.

Sustainable development provides economic advantages to people as well. Greenery, especially in urban areas, has been shown to lower energy costs, raise property value, increase business sales, boost office occupancy rates, and increase employee productivity. Trees lower energy costs by providing shade, creating evapotranspirative cooling effects, and reducing wind

speed. (McPherson et. al. 1997) A mature tree canopy lowers air temperature by 5-10°F and reduces wind speed by 85%. (University of Washington 1998; McPherson et. al. 1997) The Chicago Urban Forest Climate Project found that increasing tree cover by 10%, or by planting about three trees per residential building lot, reduces annual heating and cooling costs by 5-10%. (McPherson et. al. 1997) Besides energy savings, trees in residential neighborhoods increase property value. Studies by the USDA show that healthy, mature trees add an average of 10% to a property's value. (University of Washington 1998) Landscaping has benefits for businesses, as well. Studies have show that people linger and shop longer on tree-lined streets. (University of Washington 1998) Office buildings surrounded by trees are easier to rent and maintain occupancy. One study looked at 30 variables and found that landscape amenities were more important than even direct access to arterial routes when determining office occupancy rates. (University of Washington 1998) The high rate of occupancy may be due to the businesses finding that their employees are more productive when they have views of nature. In a paper presented to the to the American Psychological Society in 1993, Stephan and Rachel Kaplan, environmental psychologists, revealed the results of a survey of more twelve hundred corporate and state office workers. They found that those workers with a window facing greenery experienced significantly less frustration and more work enthusiasm, which translates into higher worker productivity. (Kaplan et. al. 1998) Developing in an environmentally sustainable manner brings quantifiable economic profits.

A sustainable relationship with the environment acknowledges that people and the environment are community members of the same system, and the success of each is dependent upon the cooperation of both. This abstract concept translates into substantial assets for the community, generating ecological services, improving human health, and stimulating the local economy. But what is sustainable development?

The standard definition of sustainable development was formulated by the World Commission on Environment and Development (Brundtland Commission) in 1987. It defines sustainable development as “development that meets the needs of the present without jeopardizing the ability of future generations to meet their own needs.” This definition is broad enough to apply to many situations, which is why it has attracted much critique. One critique of this definition concerns the acceptance of the current level of development. (Beatley 2004) The only stipulation the Brundtland Commission makes against current styles of development is that “at a minimum, sustainable development must not endanger the natural systems that support life on Earth”. (1987) The disconnect between current patterns of development and this statement, is that the negative repercussions of the development are cumulative; not immediately apparent from any single development project, but accumulates into a world crisis. Based on positive scientific evidence of global climate change, current human development is harming natural systems (IPCC 2007), and action must be taken to remediate construction already in place as well as future construction. Current town developments may serve our needs and respond to environmental conditions now, but how will our towns and suburban landscapes look in fifty years? In one hundred? What will the environment be like? What changes must we make to our towns today to make our towns livable tomorrow?

Currently, scientists are exploring how people can construct a future where people and the environment function in harmony. Wes Jackson and his team of researchers at the Land Institute are researching a new method of agriculture. They hope to develop perennial grain crops that would grow in a mixed field and never need replanting. The diverse grain fields would function like a native prairie, but the grains could still be harvested for human consumption. (The Land Institute 2011) If this effort succeeds, the 88.6 million acres of corn and 53.6 million acres of wheat planted in 2010 in the U.S. (National Ag Statistics Service 2010), which are vast monocultures requiring huge inputs of water, fertilizer, pesticides, and gasoline, will be converted

into habitat-rich, bio-diverse grain prairies that need little tending and provide just as much human food. This research effort is attempting to build upon the natural system of a prairie ecosystem, developing a human landscape which meets the food needs of the present and creates a fully functioning prairie ecosystem for the future generation. This effort surpasses the Brundtland Commission's definition of sustainable development by *changing* current practices to give future generations *greater* opportunities than the ones available to the current generation.

There are many individuals and institutions working to discover the form of a sustainable future, but to achieve that future, we need people to build the form of a sustainable present. Timothy Beatley, professor of Sustainable Communities at the University of Virginia's School of Architecture, believes that "any real solution to our current environmental and sustainability challenges will be by necessity *local* [sic]". (2004, xiii) Local action by local residents uses local expertise and knowledge of the region to build designs that serve the residents, strengthen the uniqueness of that place, and respect the ecological processes of that region. When local residents design their own communities, they learn more about their region, increasing their respect and care for the environmental system that surrounds them. Residents of towns all across America are taking the empowering step forward and committing to environmental sustainability. Individual towns are ahead of Congress and the White House on climate commitments. Towns first began committing to Kyoto Protocol goals, which are to significantly reduce greenhouse gas emissions, in 2005, through the U.S. Conference of Mayors Climate Protection Agreement. Now, more than one thousand towns in the United States and Puerto Rico have signed on. (Lohan 2010) One of those towns is the coastal community of Lincoln City, Oregon. Sitting only eleven feet above sea level, the town could be destroyed by climate change-induced sea level rise. The residents were not content to wait for the government to solve the issue, so they took matters into their own hands. "We could ignore it, let the federal government deal with it," Mayor Lori Hollingsworth says. "We're not willing to do that." So in 2009, Lincoln City committed to

becoming carbon neutral, through renewable energy, energy efficiency, and carbon offsets.

(Lohan 2010) Lincoln City is one of the scores of US communities that have joined the grassroots network Transition Towns. The Transition Towns movement in the United States is only three years old, but already has eighty-four registered communities, and over one hundred more considering joining. Transition Towns is a resource and catalyst grassroots organization that provides inspiration, support, networking, and training to communities who want to make themselves more resilient and sustainable. (Transition United States 2010) The booming membership of Transition Towns is proof that Americans are ready for sustainable change, and they are going to make that change. The actions the towns are making vary in scope and focus, but all are significant steps in the direction of national sustainability. Austin, Texas has the ambitious plan to make city buildings, vehicles, and all other operations carbon-neutral by 2020. Berea, Kentucky holds monthly skill-share workshops where residents learn to grow their own food, weatherize their houses, and install solar panels. Louisville, Colorado now has a car share program. Charlottesville, Virginia is creating a network of walking and biking trails to connect parks, schools, and other public spaces. (Lohan 2010) These discrete, locally-initiated efforts will have an aggregate major national impact.

### **Making a Change in the Community**

The Transition Towns network offers resources and support to motivated towns, but they are one of only a few resources available to interested towns. This effort is resident-led, so it is important to provide interested residents with as much information as they need to lead the change in their own community. The purpose of this packet is to provide inspiration and resources to residents of small towns for manageable and affordable ways that they can retrofit their existing communities to be more environmentally sustainable. The techniques described are

accessible, practical, flexible, and applicable to almost every town. This packet will expose readers to the concepts and benefits of each technique to inspire the reader to take action in her own town. This packet is intended to be an idea guide, not an instruction manual for how to implement these techniques. The retrofits can be easily incorporated into the existing infrastructure of mid-sized or small towns, reducing costs and level of technical and design expertise required. The three retrofit ideas are rain gardens, community gardens, and native plant alternatives to lawns. A rain garden is a small depression planted like a garden that catches water runoff from rainstorms and allows the water to percolate back into the ground, rather than rush off through the storm sewers. These are beautiful additions to a community, and are the most effective and cost-efficient way to manage runoff. A community garden is a parcel of land on which many people have individual garden plots where they grow vegetables, flowers, or whatever else they wish. Community gardens are part of the growing local food movement. People across the country are rediscovering the quality and taste difference of produce grown in-season and served fresh. America now has 6,132 farmer's markets, a 16% increase since 2009, and a 249% increase since 1994, when there were a mere 1,755 at the time the USDA first started tracking markets. (Hevrdejs 2010) A lawn-alternative front yard replaces traditional turf grass with a lower maintenance and lower energy-requiring planting design, like perennial flower beds or a meadow. Native plants can also be incorporated into the rest of the landscape, creating habitat, reducing maintenance needs, and creating a local and unique place identity. These sustainable developments will make an immediate and visible change in the community, giving residents a beautiful, defining element for their town. Installing one of these designs may be enough of a sustainable step for the community. Or this development could be the catalyst for a series of sustainable movements for the town. The entire effort is locally-led, so whatever the product, the process will create community identity, and the net result will be positive.



Retrofit designs are additions or changes to already built designs. Retrofit designs have the advantage of being very flexible; they are basic design formulas that can take on a variety of built forms, depending on how the community members want it to look, and what the constraints of the site are. This packet assembles information about these sustainability techniques into one package, making previously scattered information available to a constituency group previously underserved by the design profession.

The format of this packet will be chapter divisions according to each of the three retrofit techniques. Each chapter will explain what the technique is, how it is environmentally valuable, general cost ranges, basics steps a community can take to implement it, resources for further exploration, and examples of communities who have used the technique to meet their unique needs. The examples are diverse, to better showcase a spectrum of possibilities to the community members.

During the research for this project, the governmental organization SEDA-Council of Governments (SEDA-COG) has been a valuable resource. SEDA-COG is a public development organization serving eleven Central Pennsylvania counties by providing professional services and expertise in the fields of business and industry, communities and non-profit, and individuals and residential. SEDA-COG provides services to, and connects, rural towns that would otherwise be separated. (SEDA-COG 2010) In December 2010, a meeting with members of the Community Resource Center at SEDA-COG, the department that provides design expertise to the towns, revealed two important points: SEDA-COG is the primary design service provider to the communities of Central Pennsylvania, and they had not yet developed an information packet for towns about simple environmental improvements the municipalities could implement. The team from the Community Resource Center was enthusiastic about a resource that would expose residents to the green possibilities for their community. From their experience with the zeal shown by townships like Sunbury, PA and counties like Lycoming, about implementing

progressive environmentally sustainable projects from, SEDA-COG was optimistic about the reception of a green design packet focused on municipalities. My personal experience with small towns reinforces SEDA-COG's prediction. On November 1, 2010, I attended a public hearing by the State College Borough Council (Centre County, PA). The hearing sought input from residents about the redevelopment guidelines for a historic district of the town. I presented to the council the possibility of retrofitting their streets with rain gardens as each street was due for repair, solving part of their problem of an undersized storm sewer system, and increasing their image as an environmentally friendly town. (This proposal is similar to one implemented by Maplewood, MN. More details found in Chapter 2: Rain Gardens) The council was so excited by this idea that they discussed the possibility of expanding the rain garden retrofit program from the one neighborhood under review to include the entire town. There is evidence that residents of small towns have a need for and will be receptive to a packet of environmentally sustainable design ideas. SEDA-COG has generously agreed to distribute this packet electronically and physically to its constituents. SEDA-COG is the hub of the network of small towns in Pennsylvania, so distributing this packet through that organization is the most efficient way to provide community members with the information.

## **Conclusion**

There is rising interest from members of small town on how to make their communities more environmentally sustainable, but few have access to the resources of professional planners who could design a management plan. This packet will empower townspeople to take achievable steps towards environmental sustainability in their own communities. If the current global sustainability challenges are to be resolved, the action must be *local* – local environmentally sustainable design, in every location, will reverse negative trend and bring a future that is

sustainable into a sustainable present. Sustainable design increases the quality of the natural systems which make life on Earth possible. Sustainable design far surpasses the Brundtland Commission's definition of sustainable development as "meeting the needs of the present without jeopardizing the ability of future generations to meet their own needs" (1987); sustainable design builds a world in which future generations will have greater resources than generations past.

## Chapter 2

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# ECOLOGICAL SUSTAINABILITY FOR SMALL TOWN PENNSYLVANIA

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an inspiration handbook for residents of practical and affordable retrofits that will increase the ecological sustainability of their town



TABLE OF CONTENTS

Chapter 1: Introduction.....	19	Chapter 5: References.....	52
Chapter 2: Rain Garden.....	21	Cover.....	52
Description.....	21	Figures.....	52
Planning a Rain Garden.....	22	Introduction.....	52
Continuing the Rain Garden.....	25	Works Cited.....	52
Further Resources.....	25	Rain Garden.....	53
Case Study.....	26	Figures.....	53
Maplewood, Minnesota.....	26	Tables.....	53
NE Siskiyou Green St., Portland, OR.....	29	Works Cited.....	54
Chapter 3: Community Garden.....	32	Community Garden.....	55
Description.....	32	Figures.....	55
Costs and Funding Opprotunities.....	35	Works Cited.....	56
Variations.....	36	Native Alternatives to Lawn.....	57
Community Supported Agriculture (CSA).....	36	Figures.....	57
School Gardens.....	36	Works Cited.....	58
Further Resources.....	38		
Case Study.....	39		
Gardeners in Community Development, Dallas, TX.....	39		
Intervale Center, Burlington, VT.....	40		
Chapter 4: Native Alternatives to Lawn.....	42		
Description.....	42		
Planning.....	45		
Costs.....	46		
Maintaining a Meadow.....	46		
Examples.....	48		
Further Resources.....	51		



# INTRODUCTION

## Local Efforts Affect National Change

Throughout US history, local efforts have affected national change. During WWII, encouraged by slogans like, “our food is fighting”, Americans planted more than 20 million victory gardens. These vegetable, fruit, and herb gardens provided up to 40 percent of all produce consumed nationally, and decreased the cost of the produce consumed by the soldiers. (Victory Gardens n.d.) Arbor Day is an example of this grassroots enthusiasm for supporting the environment. What began in 1872 with one man planting trees on his Nebraska farm has grown today to millions of people in all 50 states planting 8 million trees annually. (Arbor Day Foundation 2011)

## The Time for Action is Now

Our country is again in need of the community-level action that accomplished these past feats. America, and the world, is facing an environmental crisis. The Intergovernmental Panel on Climate Change (IPCC) has documented weather patterns becoming more extreme, sea levels rising, and global temperature rising. (2007) This affects the US by increasing the range of pests and diseases, increasing the level of tropical cyclone activity, and decreasing the amount of drinking water available from snowmelt. (IPCC 2007) The time for action is now. And the American people are rising to the call.

## Environmental Sustainability in Small Towns

Across America, individuals and communities are making independent contributions to improve the environment, and collectively these contributions add up to national change. When the small town of Greensburg, Kansas was almost totally destroyed by an enormous tornado in May 2007, the residents took the initiative to transform a disaster into a triumph: the rural, conservative town decided to rebuild entirely “green”. All city buildings will meet the U.S. Green Building Council’s LEED platinum rating for top-level environmentally-friendly construction. (Letson 2010) The town of Davis, California, declaring itself to be “the most bicycle friendly town in the world”, has more bikes than cars and 17% of trips are by bike. In 2005 the Bicycle-Friendly Community program of the League of American Bicyclists recognized Davis as the first Platinum Level city in the US. (Davis CA 2011) Individual Americans are also making contributions to the level of national environmental sustainability. The percentage of waste that is recycled has risen from 6.4% in 1960 to 33.8% in 2009. (EPA 2011) People are accomplishing these environmental feats to make positive, immediate impacts on their own lives – improving health, economic vitality, and community feeling – and also making these efforts out of compassion for the environment. People and the environment are linked, affected by the actions and characteristics of the other. A sustainable relationship between people and the environment is a stable relationship that will perpetuate itself to the benefit of all parties. This relationship needs to be improved, and American citizens are ready to implement that change.

## Environmental Sustainability Benefits People

The benefits of respectful and sustainable development are immediate and tangible. Fostering a healthy ecosystem increases the natural resources available to people, improves human health, and promotes economic growth.

The natural environment provides many services and resources to people with significantly higher efficiency than people can provide for themselves. A mature tree absorbs 120-240 lbs. of small particle pollution per year. In Sacramento, this service has a value of \$28.7 million. (University of Washington

1998) Creating a sustainable relationship with the environment permits all of these activities and services to continue to benefit people.

Scientists continue to discover ways in which exposure to nature benefits human health. Viewing nature speeds recovery time, calms stress, lowers depression and increases self-esteem, improves concentration levels in children, and reduces symptoms of Attention Deficit Disorder (ADD). Scientists continue to discover ways in which exposure to nature benefits human health. Viewing nature speeds recovery time, calms stress, lowers depression and increases self-esteem, improves concentration levels in children, and reduces symptoms of Attention Deficit Disorder (ADD). Proximity to nature has a wide array of documented health benefits for people. These benefits are immediately available, sometimes occurring in less than five minutes. (Louv 2005) Environmentally sustainable practices are valuable for the environment, but they are also valuable for peoples’ well-being.

Sustainable development provides economic advantages to people as well. Greenery, especially in urban areas, has been shown to lower energy costs, raise property value, increase business sales, boost office occupancy rates, and increase employee productivity. Trees lower energy costs by providing shade, creating evapotranspirative cooling effects, and reducing wind speed. (McPherson et. al. 1997) A mature tree canopy lowers air temperature by 5-10°F and reduces wind speed by 85%. (University of Washington 1998; McPherson et. al. 1997)

Besides energy savings, trees in residential neighborhoods increase property value. Studies by the USDA show that healthy, mature trees add an average of 10% to a property’s value. (University of Washington 1998) Developing in an environmentally sustainable manner brings quantifiable economic profits.

## Purpose of the Packet

The purpose of this packet is to provide inspiration and resources to residents of small towns for manageable and affordable ways that they can retrofit their existing communities to be more environmentally sustainable. The techniques described are accessible, practical, flexible, and applicable to almost every town. This packet will expose readers to the concepts and benefits of each technique to inspire the reader to take action in her own town. This packet is intended to be an idea guide, not an instruction manual for how to implement these techniques. The retrofits can be easily incorporated into the existing infrastructure of mid-sized or small towns, reducing costs and level of technical and design expertise required. The three retrofit ideas are rain gardens, community gardens, and native plant alternatives to lawns.

## Sustainable Idea: Rain Garden

A rain garden is a small depression planted like a garden that catches water runoff from rainstorms and allows the water to percolate back into the ground, rather than rush off through the storm sewers. These are beautiful additions to a community, and are the most effective and cost-efficient way to manage runoff. A community garden is a parcel of land on which many people have individual garden plots where they grow vegetables, flowers, or whatever else they wish.

# INTRODUCTION

## Sustainable Idea: Community Garden

Community gardens are part of the growing local food movement. People across the country are rediscovering the quality and taste difference of produce grown in-season and served fresh. America now has 6,132 farmer’s markets, a 16% increase since 2009, and a 249% increase since 1994, when there were a mere 1,755 at the time the USDA first started tracking markets. (Hevrdejs 2010)

## Sustainable Idea: Lawn-alternative Front Yard

A lawn-alternative front yard replaces traditional turf grass with a lower maintenance and lower energy-requiring planting design, like perennial flower beds or a meadow. Native plants can also be incorporated into the rest of the landscaping, creating habitat, reducing maintenance needs, and creating a local and unique place identity.

These sustainable developments will make an immediate and visible change in the community, giving residents a beautiful, defining element for their town. Installing one of these designs may be enough of a sustainable step for the community. Or this development could be the catalyst for a series of sustainable movements for the town. The entire effort is locally-led, so whatever the product, the process will create community identity, and the net result will be positive.

## Retrofit Design

Retrofit designs are additions or changes to already built designs. Retrofit designs have the advantage of being very flexible; they are basic design formulas that can take a variety of built forms, depending on how the community members want it to look, and what the constraints of the site are. This packet assembles information about these sustainability techniques into one package, making previously scattered information available to a constituency group previously underserved by the design profession.

## Sources

This handbook is a collection of previously published research, documents, and images. These resources are indicated throughout the handbook, and can serve as references for exploring concepts in greater depth. The packet’s value lies in its unification of formerly scattered resources into one cohesive reference at a scale and complexity appropriate for small towns in Pennsylvania. The resources have been collected, edited, and compiled into a format that is accessible to residents of small towns, and especially appropriate to residents in Pennsylvania.

## Conclusion

There is rising interest from members of small town on how to make their communities more environmentally sustainable, but few have access to the resources of professional planners who could design a management plan. This packet will empower townspeople to take achievable steps towards environmental sustainability in their own communities. If the current global sustainability challenges are to be resolved, the action must be local – local environmentally sustainable design, in every location, will reverse negative trend and bring a future that is sustainable into a sustainable present. Sustainable design increases the quality of the natural systems which make life on Earth possible. Sustainable design far surpasses the Brundtland Commission’s definition of sustainable development as “meeting the needs of the present without jeopardizing the ability of future generations to meet their own needs” (World Commission 1987); sustainable design builds a world in which future generations will have greater resources than generations past.



# RAIN GARDEN

## DESCRIPTION

A rain garden is a shallow depression in the ground, planted like a garden, that soaks up rain water runoff from house roofs, streets, or other paved surfaces. The rain garden fills up with several inches of water after a storm, and allows that water to slowly soak into the ground rather than running off into a storm drain. A rain garden can soak up 30% more water than a traditional lawn.<sup>1</sup> The water is held just long enough for it to percolate into the soil. This usually takes only a few days, sometimes just a few hours. Most of the time, the rain garden is dry.

## How it works

Rain gardens act like a natural forest floor, which lets the water soak into the ground and has very little runoff. The rain garden slows the water down and gives it a chance to seep naturally into the ground. This recharges our groundwater supply and prevents polluted water from harming people and the ecosystem. The rainwater enters the garden through an inlet, and any overflow water exits through an outlet. The sides of the rain garden are planted with native plant species that can tolerate both flooding and drought. The water is cleaned by natural processes where native plants and microorganisms break down and remove pollutants such as phosphorus, nitrogen, heavy metals, and hydrocarbons.<sup>2</sup> By keeping the water on site and preventing it rushing down the stormdrains, less contaminated water enters local water bodies (streams, lakes, the ocean). There is also less erosion of the soil and damage to overfilled streams. The health of the citizens and the environment are improved.

## Benefits

Rain gardens have many environmental and landscaping benefits. The rainwater infiltrates the soil and recharged the groundwater table. By capturing water from rainstorms (stormwater),

and allowing it to infiltrate the soil, less load is put into the stormsewer system. Nationally, there is a need of at least \$42.3 billion to build new and upgrade existing stormwater management systems. Stormwater management is the highest need for rural areas, totalling 85% (\$26.9 billion) of total water infrastructure needs. Pennsylvania has the highest small community need of any state in the nation, at (\$2.9 billion)<sup>3</sup> Green infrastructure like rain gardens are a practical solution to this need, especially in Pennsylvania's small towns. Another benefit of rain gardens is less runoff into streams and rivers, which cause erosion and damage to those systems. As the water percolates through the soil, pollutants are filtered out by plant roots, microorganisms, and soil minerals, making the water cleaner and safer. The pollutants are trapped in the first 2-5 cm of filter surface. Placing a thick layer of mulch in the garden will trap the pollutants, and then the mulch can be scraped up and replaced every two years.<sup>4</sup> Rain gardens filter out heavy metals like copper, lead, and zinc, and nutrients like nitrogen, phosphorous, and potassium. A study conducted in Maryland by Davis et. al. showed very high removal rates of copper (95%), phosphorus (98%), and nitrate (20%).<sup>5</sup> Because rain gardens are usually planted with native plants, they provide habitat for local fauna.

Rain gardens have simple elements, and flexible shape, so they are very easy to install as a retrofit. Their ease of installation makes them an ideal way to improve the sustainability of an area. Rain gardens are beautifully landscaped, enhancing the character and grace of the neighborhood in which they are installed.

## Retrofit Installation

Rain gardens are an ideal way to improve an existing site's environmental sustainability, because there are only a few elements, and they can be adapted to fit the shape of any design.

**BENEFITS OF RAIN GARDENS**

1. Ease, versatility, and cost-effectiveness of installation
2. Reduce load on stormwater infrastructure
3. Reduce runoff and erosion of streams
4. Recharge groundwater
5. Clean pollutants out of the water
6. Create habitat
7. Beautify the neighborhood

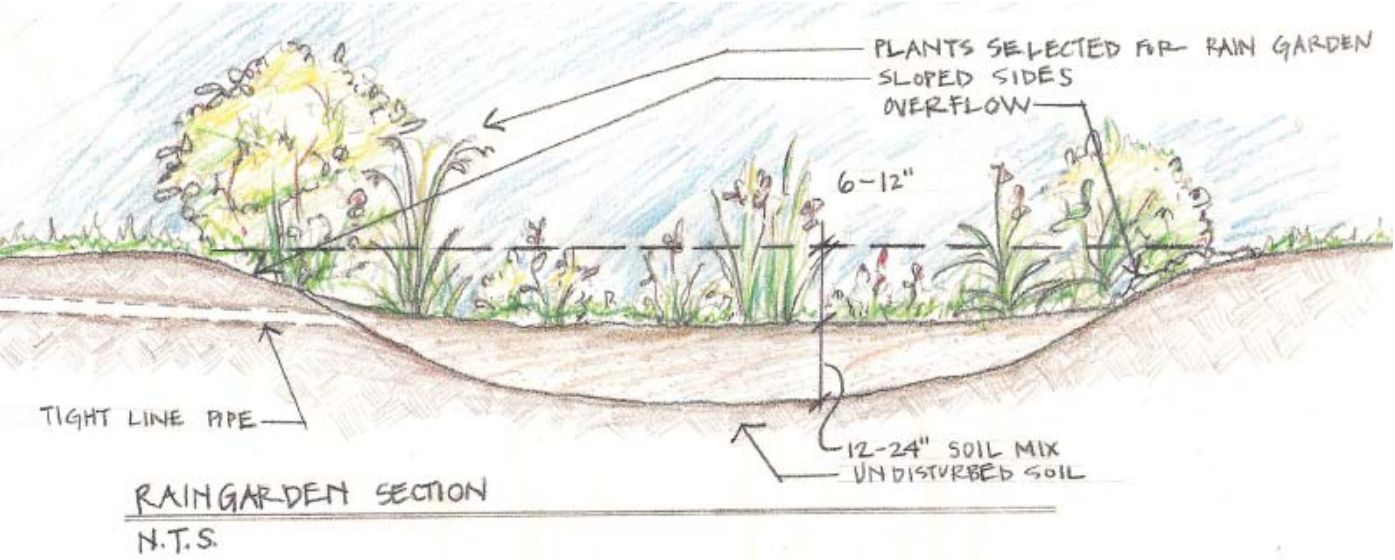


Fig. 1: Design elements of a typical rain garden

## FREQUENTLY ASKED QUESTIONS

### Does a rain garden form a pond?

No. The rain water is designed to soak up the rainwater, so that the garden is dry between rainstorms. (Note: Some rain gardens are designed to hold water, but those are not addressed in this publication)

### Are they a breeding ground for mosquitoes?

No. Mosquitoes take over 7 days to mature from larva to adult, and rain gardens are dry within 72 hours. Usually, rain gardens only hold water for a few hours after a storm.

### Do they require a lot of maintenance?

No. Rain gardens can be maintained with little work after the plants are established. Because the plants are native, they are tolerant of existing soil and precipitation patterns, so require no fertilizer or irrigation. Some weeding and watering may be needed during the first two years of plant establishment. Removing a replacing the mulch layer every two years removes the trapped pollutants.

### Is a rain garden expensive?

No, it does not have to be. If community members volunteer their labor, the main cost would be the plants. Even this cost can be minimized if people donate cuttings from their gardens.

Adapted from: Bannerman, Roger & Ellen Considine. (2003). *Rain Gardens*. Wisconsin Dept. of Natural Resources, USGS. University of Wisconsin Extension Office.



# RAIN GARDEN

## PLANNING A RAIN GARDEN

This section covers types of rain gardens, where to place it, how to size it, what soils and slopes are best, and what plants should be used.

### Variations

The concept of a rain garden is widely adaptable to different situations. The classic rain garden is a planted depression on a residential lot. This rain garden captures and filters runoff from the roof, lawn, and adjacent street. A commercial application is to install rain gardens in the islands of a parking lots, where they filter the polluted runoff. Other variation is along a street, as a planter, such a traditional street trees are planted in. This rain garden filters water from the street. A different street-side rain garden is a curb bumpout, which has the added advantage of being a traffic calming device since it narrows the road. Residential rain gardens are the simplest to design and install, while the parking lot, street planters, and curb extensions require more careful planning for the overflow and soil mixes and layers.



Fig. 2: Residential rain gardens beautify the property, require little maintenance, and reduce runoff.



Fig. 4: Rain garden street planter look like traditional street tree planters, but also filter runoff from the street.



Fig. 3: Parking lot islands as rain gardens. These planting strips beautify the parking lot and filter the polluted runoff from the lots



Fig. 5: Rain garden curb bumpouts use the same space as street parking, but filters street runoff and is a traffic calming device.

### Site Selection

Rain gardens work best when they drain small area, five acres or less. When they collect water from an area larger than this, they tend to clog. Designing many small rain gardens throughout a region is more efficient. When locating possible places for a rain garden, analyze the slope of the area and existing drainage patterns. Collect water from high points and move it to the low point, and site the rain garden there. It seems intuitive to place the rain garden where water naturally pools, but this would be counterproductive! The water pools because the soil drains poorly, and rain gardens should drain away the water. Places with a high water table should also be avoided, as the water will not drain quickly. Instead, rain gardens are best installed on a flat site or a slope of less than 12%. This makes it easier to dig the flat bottom of the rain garden. Rain gardens should be at least 10 feet from the edge of a building, to prevent seepage into the foundation. Rain gardens should not be placed over septic systems or other utilities. The draining water could damage the infrastructure. Also, it is better to place rain gardens in full or partial sun, rather than under a large tree. <sup>6</sup>

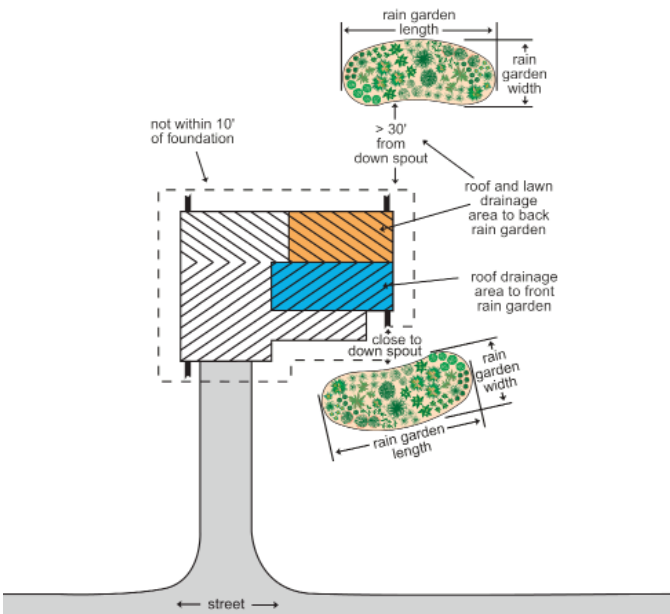


Fig. 6: Residential rain gardens can be placed in the front or back yard. Crescent, kidney, and teardrop shapes work well.

### Rain Garden Shape

The shape of residential rain gardens are very flexible, because they do not have hard, engineered edges. Oval, round, long and narrow, and kidney bean shapes are all possibilities. The long side of the rain garden should face uphill, to have the most opportunity to collect storm runoff. Rain gardens with hard, engineered edges along roads and parking lots tend to have straight lines and be rectangles.



Fig. 7: Community members volunteer to build a rain garden.

### Rain Garden Size and Depth

Rain gardens should be sized to collect the first inch of rain from the catchment area. Most rainstorms are an inch or less, and this first flush carries most of the pollutant. For a residential rain garden, a rule of thumb is that the area of the garden should be a minimum of 20% of the catchment area. <sup>7</sup> An appropriate size for a rain garden collecting water from a 1,000 sq. ft. rooftop is 83 sq. ft. If the catchment area has permeable surfaces, like lawn, then the required rain garden size would be less. The type of soil will help determine the size. Sandy soils drain quickly, so rain gardens on these soils will not need to be as large. Clay soils drain more slowly, so the area of rain gardens on these soils will need to be larger. The average rain garden is designed to hold 6-12 inches of ponded water, 9 inches being the most common. <sup>8</sup> Refer to the reference section at the end of the chapter for more details on sizing.



RAIN GARDEN

Construction

There are different construction requirements depending on the type of rain garden, but they all have several elements in common. They all have plants, then a thick layer of mulch, then some type of soil/gravel mix that soaks up the water well. Rain gardens also have an inlet and an outlet, which can be as simple as overflow into and out of the garden, or as sophisticated as a piping and grate system. A diagram of the different methods of rain garden construction is shown in Figure 8. To convey the water into the rain garden, a slope of at least 2% is needed (Drop of 1/4" every 1'). If the slope is very steep, or will have high water flow, lining the channel with rocks will prevent erosion. The common depth of the various elements of a rain garden is shown in Figure 9, so give an idea of the size relationships. The dimensions are flexible. The first 18" of the soil under the rain garden will need to be amended so that it can drain quickly. Prince George's County, Maryland recommends a mix of 50-60% sand, 20-30% soil, and 20-30% compost. (Fig 10) Figure 10 diagrams a rain

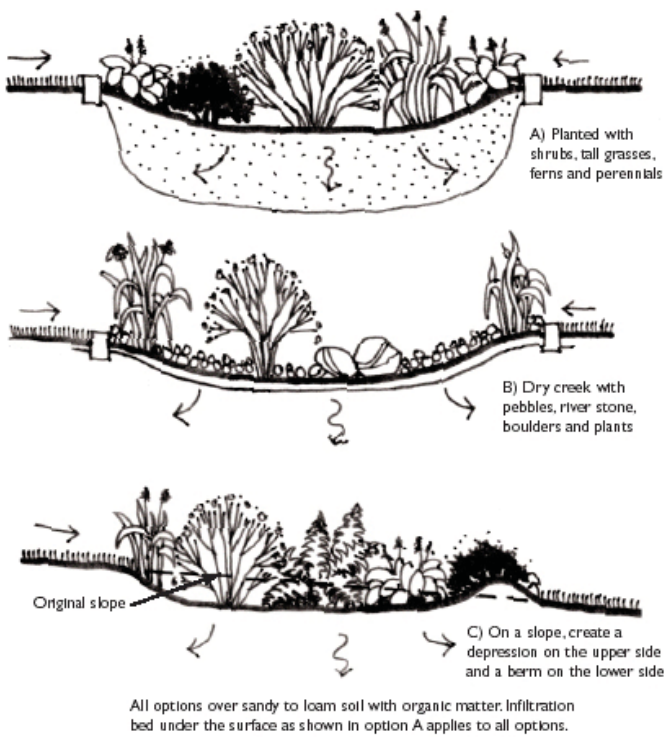


Fig. 8: Basic construction methods for rain gardens

garden with high infiltration and groundwater recharge rates. There are other systems that include piping for more urban situations. Figure 11 shows a rain garden with high infiltration and groundwater recharge rates. There are other systems that include piping for more urban situations. Figure 11 shows a rain garden designed for high filtration and partial recharge of runoff. The pipe at the bottom ensures a desired rate of drainage. The rain garden in Figure 12 is designed for maximum water quality treatment. It can handle high nutrient loads because of a fluctuating aerobic/anaerobic zone in the layer below the underdrain. The discharge pipe is located above a recharge gravel bed, giving more of a chance for infiltration before the water is carried away. This placement of the perforated pipe above the gravel bed means that more water can collect in the spaces between the gravel, and then infiltrate into the ground, before the excess is carried away into the traditional storm sewer system via the pipe. The rain garden in Figure 13 is designed to only provide filtration, and no infiltration. This design is appropriate for the pre-treatment of highly contaminated water. The liner prevents the water from infiltrating into the soil. For all of these designs, a thick layer of mulch of at least 3" is important for filtering pollutants.<sup>9</sup>

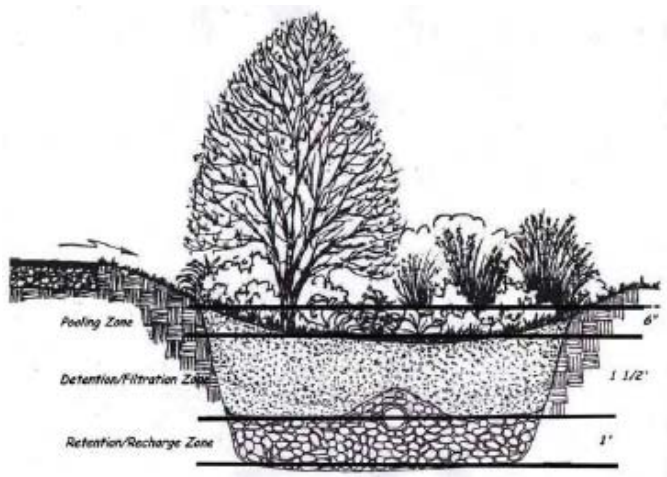


Fig. 9: Depth of rain garden elements

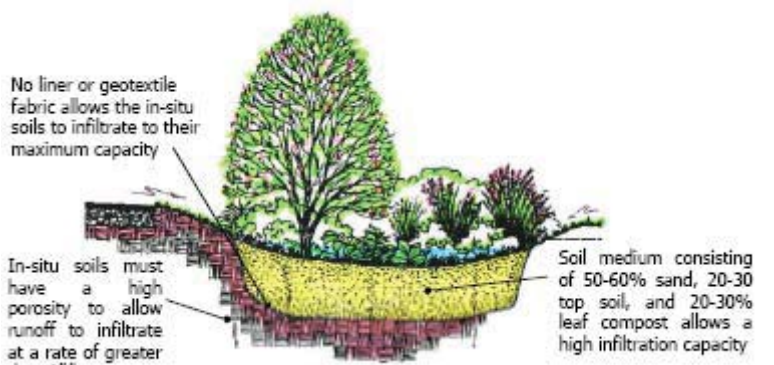


Fig. 10: Diagram of the design of a rain garden for high infiltration.

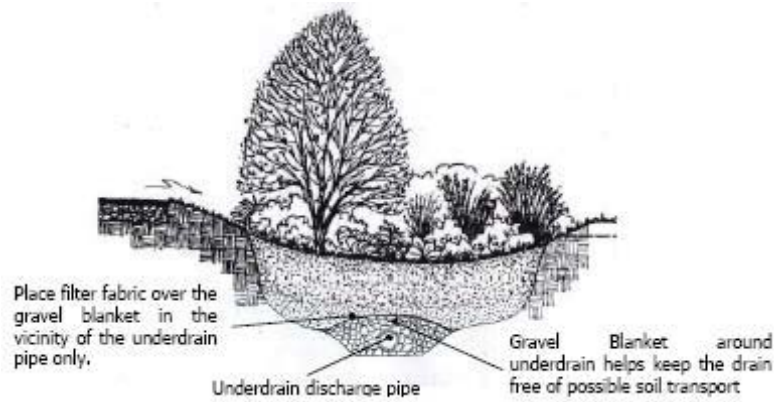


Fig. 11: Diagram of rain garden designed for filtration and partial recharge

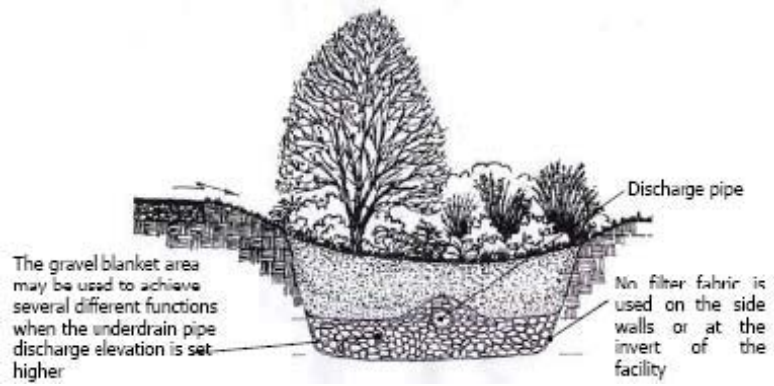


Fig. 12: Diagram of rain garden designed for infiltration, filtration, and recharge

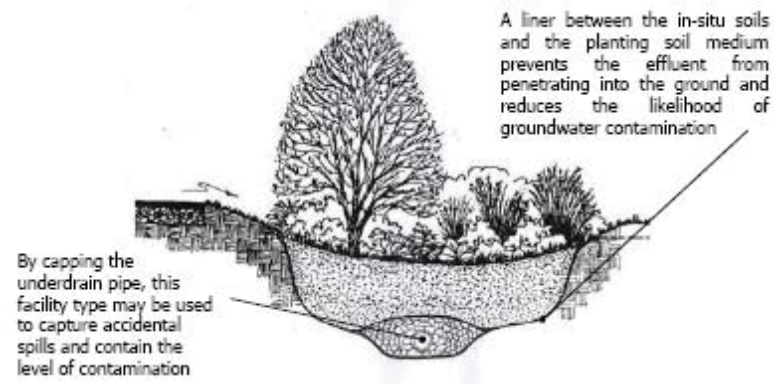


Fig. 13: Diagram of rain garden designed for filtration only of highly polluted water



RAIN GARDEN

Planting the Rain Garden

Rain gardens are meant to be beautiful as well as functional, so the plants should be chosen with seasonal color, varying height, and textural difference in mind. Flowers, grasses, shrubs, and trees can all be planted. Native plants are most often used when planting a rain garden, because they are adapted to local conditions and need little maintenance. Using native plants has the added benefit of creating wildlife habitat, as well. The chosen plants should be tolerant of both wet and dry conditions, since the rain garden is dry for long periods in between the short flooding. There are three zones of wetness in a rain garden, and the plants in each zone must be chosen appropriately. The zones are the wet zone, mesic (middle) zone, and the transitional zone. Figure 14 below shows the arrangement of these zones. Zone 1, the wet zone, is the deepest part of the rain garden and will be the wettest for longest. The plants in this zone must tolerate standing water for long periods of time. Zone 2, the mesic zone, will hold water, but drain faster than Zone 1. Zone 3, the transitional zone, will receive water infrequently and will drain the fastest.<sup>10</sup> Table 1 lists Pennsylvania plants appropriate to each zone. Refer to the reference section for a more complete listing of possible plants.

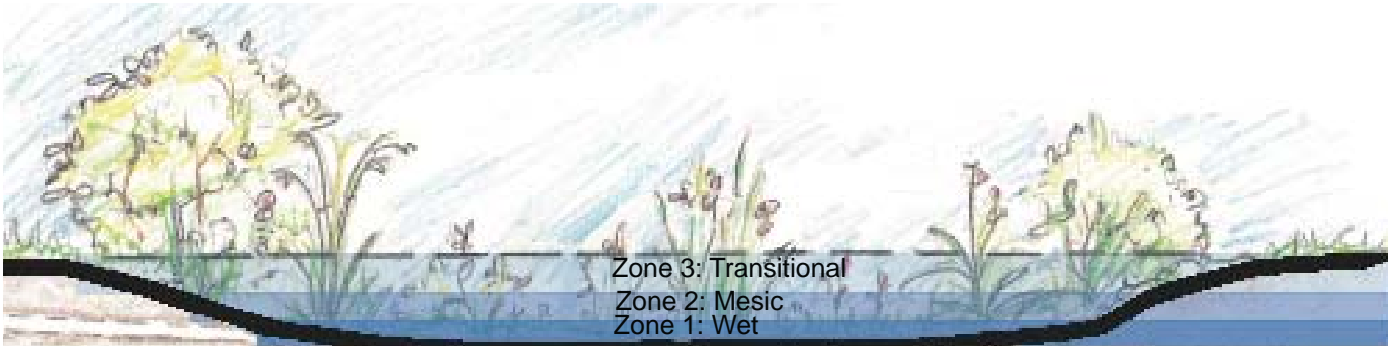


Fig. 14: The ponding water level creates different moisture zones, which influences where plants are located in the garden.



Fig. 15: There is a wide variety of plants that can be included in a rain garden

Table 1: A partial list of the possible plants for each moisture zone of a Pennsylvania rain garden.

Zone 1 – Wet Zone			
Common Name	Scientific Name	Height(/Width)	Notes
Perennials and Ferns			
Blue flag iris	<i>Iris versicolor</i>	24-36"	Purple flowers May-Aug
Cardinal flower*	<i>Lobelia cardinalis</i>	24-48"	Red flowers May-October
Cinnamon fern	<i>Osmunda cinnamomea</i>	2-5'	
Green bullrush	<i>Scirpus atrovirens</i>	36-48"	
Marsh marigold*	<i>Caltha palustris</i>	12-24"	Yellow flowers April - May
Tussock sedge	<i>Carex stricta</i>	24-36"	24-36"
Shrubs			
Black chokeberry**	<i>Aronia melanocarpa</i>	3-6' / 3'-6'	Flowers May, dark berries winter
Hutchinsbush*	<i>Cephalanthus occidentalis</i>	7' / 15'	
Swamp azalea	<i>Rhododendron viscosum</i>	2-8' / 3-8'	2-8' / 3-8'
Winterberry*	<i>Ilex verticillata</i>	6-9' / 6-9'	6-9' / 6-9'
Trees			
Black birch**	<i>Betula lenta</i>	40-60' / 25-35'	Fall color
Red maple**	<i>Acer rubrum</i>	40-60' / 35-50'	Fall color
River birch**	<i>Betula nigra</i>	40-60' / 25-35'	Interesting bark, fall color
Sycamore**	<i>Platanus occidentalis</i>	75-100' / 75-100'	Fast growing, interesting bark
*Note: Species noted with an asterisk (*) are also suitable for Zone 2 of the rain garden			
**Note: Species notes with a double asterisk (**) are suitable for all zones of a rain garden			
Zone 2 – Mesic Zone			
Common Name	Scientific Name	Height(/Width)	Notes
Perennials			
Blue false indigo	<i>Baptisia australis</i>	3-4'	Violet-blue flowers May - June
Blue star	<i>Amorpha tabernaemontana</i>	1-3'	Pale blue flower in April, lacey foliage
Beltania	<i>Beltaria asteroides</i>	1-5'	White flower August - October
Broom sedge	<i>Andropogon virginicus</i>	2'	A bunching grass, flower stalks 3-5'
Culvers root	<i>Veronicastrum virginicum</i>	3-6'	White spike flowers June - September
Mistflower	<i>Eupatorium altissimum</i>	10-36"	Blue flowers July - October
Threadleaf coreopsis	<i>Coreopsis verticillata</i>	18" / 3'	Yellow flowers early to late summer
Shrubs			
Inkberry	<i>Ilex glabra</i>	6-8' / 5-8'	Evergreen, black berries fall-winter
Red twig dogwood	<i>Cornus sericea</i>	5-15' / 10-20'	Red bark, fall color
Virginia sweetspire	<i>Itea virginica</i>	3-4' / 3-4'	White flowers spring, fall color
Zone 3 – Transition Zone			
Common Name	Scientific Name	Height(/Width)	Notes
Perennials			
Anise hyssop	<i>Agastache foeniculum</i>	2-4'	Purple flowers June - September
Bee balm	<i>Monarda fistulosa</i>	2'-4'	Red flowers May - September
Black-eyed Susan	<i>Rudbeckia triloba</i>	1-4'	Yellow flowers June - October
Blazing star	<i>Liatris spicata</i>	2-4'	Pink flowers June - September
Butterfly weed	<i>Aurelius tuberosa</i>	1-3'	Orange flowers June - September
Purple coneflower	<i>Echinacea purpurea</i>	2-5'	Purple flowers late June - August



# RAIN GARDEN

## CONTINUING THE RAIN GARDEN

### Maintaining the Rain Garden

Rain gardens are relatively simple to maintain. The most maintenance is required during the first two years of plant establishment. Until they are established, the plants may need watering during dry periods and weeds will need to be pulled. Once the plants are established, they will not need extra water or fertilizer because they are native varieties and adapted to local conditions. The plants can be trimmed for aesthetic reasons. A thick layer of mulch (3-4 in.) in the rain garden will keep weeds down, increase soil moisture, and trap any pollutants. The mulch should be removed and replaced every two years to remove the pollutants.<sup>11</sup> Leave the vegetation standing over winter as a snow catch, habitat, and for visual interest. Trim them down at the beginning of Spring to give the new shoots room. The inlets and outlets to the rain garden should also be periodically checked to keep them clear.<sup>12</sup>



### The Costs and Cost-Benefits of Rain Gardens

A residential rain garden costs approximately \$3-\$5 per square foot if volunteer labor is used. If a landscape architect installs the garden, it will cost approximately \$10 to \$12 per square foot.<sup>13</sup> The initial cost for a rain garden may seem high, but the EPA studied the cost of rain gardens compared to conventional development approaches and found that rain gardens reduce project costs and improve environmental performance. The EPA evaluated 17 case studies across the country. Total capital costs savings ranged from 15-80% when a low impact design like a rain garden was constructed compared to conventional stormwater management. These savings come from reduced costs for site grading and preparation, stormwater infrastructure, site paving, and landscaping. In all cases, the low impact development provided benefits that cannot be monetized, but still benefit the community and the environment. These benefits include improved aesthetics, expanded recreational opportunities, increased property values, reduced runoff volumes into streams, and decreased incidents of combined sewer overflows. This study did not examine the cost savings provided by rain gardens due to improved environmental performance, reductions in maintenance cost, and reductions in replacement cost. Therefore, the cost savings of implementing rain gardens or other low impact developments could be even greater than the 15-80% the EPA estimates.<sup>14</sup>



Fig. 16: New Seasons Market, OR rain garden functions well when wet and looks nice when dry

## FURTHER RESOURCES

- **Bannerman, Roger and Ellen Considine. 2003. Rain Gardens. Wisconsin Dept. of Natural Resources, USGS. University of Wisconsin Extension Office.** <http://www.dnr.state.wi.us/org/water/wm/dsfm/shore/documents/rgmanual.pdf>  
This clearly written manual provides details for homeowners on how to layout, build, and maintain their own rain garden. The diagrams and sample garden designs are clear and inspirational. A source that provides the basic, beginning information.
- **Danko, Lauri. 2005. "Great Plants for Rain Gardens". Penn State Cooperative Extension of York County. March.** <http://www.maescapes.org/pdf/Great%20Plants%20for%20Rain%20Gardens%202006.pdf>  
A rich list of Pennsylvania native plants that are appropriate for rain gardens in the state. They are organized according to moisture zones, for easier garden planning.
- **Dunnet, Nigel and Andy Clayden. 2007. Rain Gardens. Timber Press, Inc.: Portland**  
A book appropriate for people with some experience with rain gardens looking for more types and creativity of rain water treatment. Includes many ways besides rain gardens for the environmental reuse of water on site. Photos of built projects offer visual inspiration.
- **Echols, Stuart P. 2007.** <http://artfulrainwaterdesign.net/>  
A website featuring case studies of creative stormwater management techniques around the United States. Pictures and background information of each project is included. Different applications of rain gardens are highlighted, as well as other low impact stormwater designs.
- **Maplewood, Minnesota. 2011. "Rainwater Gardens".** <http://www.ci.maplewood.mn.us/index.aspx?NID=456>  
The website of the town Maplewood, MN in which they describe their community-wide rain garden effort. The website includes links to descriptions and photos of built projects and resources for homeowners to build their own rain gardens. Of particular interest are the sample garden designs, which Pennsylvania residents could adapt to their region.
- **Prince George's County, Maryland (PGCM), Department of Environmental Resources. 2006. The Bioretention Manual; Watershed Protection Branch, MD Department of Environmental Resources: Largo, MD** [http://www.princegeorgescountymd.gov/Government/AgencyIndex/DER/ESG/Bioretenion/pdf/Bioretenion%20Manual\\_2009%20Version.pdf](http://www.princegeorgescountymd.gov/Government/AgencyIndex/DER/ESG/Bioretenion/pdf/Bioretenion%20Manual_2009%20Version.pdf)  
A practical manual developed for use by Prince George's County, MD, where many rain garden innovations have developed. This manual provides sizing and construction details for rain gardens, as well as practical details on the construction of types of rain gardens.

# RAIN GARDEN CASE STUDY: MAPLEWOOD, MN

Maplewood, MN is a town of 35,000 residents on the outskirts of St. Paul. Maplewood is a progressive existing suburban neighborhood that integrates rainwater gardens into existing and new designs. Today the town has over 620 residential rain gardens and 60 rain gardens on public property.<sup>15</sup>

### Background

The neighborhood rain garden initiative developed in the early 1990s when city officials found that planned street improvements would have required the construction of costly new storm sewers in an urban neighborhood. New stormsewers would have been a huge monetary expense for the town and an environmental expense for Lake Phalen, a popular urban lake into which the stormsewers discharge. As an alternative, city officials decided that low impact developments, like rain gardens, would mitigate present and future stormwater problems associated with the town’s growth. In 1996, the City of Maplewood partnered with the University of Minnesota Department of Landscape Architecture and the Ramsey Washington Metro Watershed District to implement the first rain garden project. Since then, the rain garden project has been a huge success, garnering local support, national attention, and measurable environmental benefits.<sup>16</sup>

### How It Works

The gardens are installed in a phased manner. The municipality installs the rain gardens as residential streets need repair. The residents of the street are given the choice of a traditional curb and gutter system or no curbs and a rain garden. A 5-step program has been set up for Maplewood’s rain garden program

1. Residents sign up for a free rain garden when their street is being updated
2. City constructs garden
3. Residents select a garden design from 10 standard plant layouts
4. Residents plant the plants the city supplies
5. Residents maintain the garden

The town tries to make rain gardens installation as simple as possible for the residents. Education seminars and workshops are a large part of the rain garden program. The workshops include drainage and soils, rain garden location, and rain garden construction. The town also hosts volunteer Planting-Days. These hands-on workshops give participating community members access to a variety of garden designs, advice on which plants to use, and a chance to speak to master gardeners. These programs also create a venue for neighbor interaction and community building. The pre-planned rain garden layouts offered by the city range from formal to low-maintenance, to meet the desires of any resident. Some of the designs are the “Perennial Rainbow Garden”, the “Shade Garden”, and the “Butterfly and Friends Garden”. The plants are chosen and located within the garden for their status of a native plant and their tolerance for varying water levels.<sup>17</sup> The town encourages business owners to implement rain gardens and other runoff-reducing designs by offering a reduced environmental utility fee if they do.<sup>18</sup> Through education of the residents, a phased installation schedule, and pre-planned garden designs the City of Maplewood has successfully enacted a municipality-wide rain garden program that serves them well now and will continue to into the future.

### THE FACTS

**Location:** Maplewood, MN  
**Designer:** Joan I. Nassauer, Prof. of Landscape Architecture at the University of Minnesota  
**Date:** 2006-present  
**Cost:** 75-85% less than a traditional curb and gutter system  
**Total Rain Gardens:** 620 residential rain gardens and 60 rain gardens on public land and counting

### How Successful is It?

Rain garden installation costs the city 75-85% of what a traditional curb and gutter design does. And the presence of rain gardens are reducing city drainage problems. When a large storm struck the town in 2006, no water was observed running from the rain garden project areas.<sup>19</sup> The gardens are also hugely popular with the residents. Maplewood resident Michael Hafner, who, with his wife planted two rain gardens in 2000, says that the rain gardens were “one of the best things that has happened to us since we moved here”.<sup>20</sup> Virginia Gayner, horticulturist and open space coordinator for Maplewood, credits the popularity of the program with the residents primarily to the beauty of the planted gardens. “Most of our residents [plant rain gardens] for aesthetics, but the environmental benefits are also important to people.”<sup>21</sup> The rain garden program of Maplewood, MN is successful economically, ecologically, practically, and popularly and is an inspiration to any community looking to enact a neighborhood-wide rain garden strategy.

### WHY USE MAPLEWOOD, MN AS AN EXAMPLE?

- **A Town-wide Rain Garden Program:** A effort led by the local government and easily applicable to the entire neighborhood
- **A Retrofit Design:** The rain gardens integrate easily into the existing neighborhood layout because they do not need much space, unlike bigger pipes or retention basins
- **Popular Program:** An intense public education program and freedom of choice for residents of garden and design means that the program is well received locally and nationally.
- **Addresses Aging Stormwater Infrastructure:** A method to reduce load on stormsewers and reduce the cost of updating aged infrastructure



Fig. 17: Maplewood, MN hosts workshops on rain garden concepts, design, and construction



WHAT CAN BE LEARNED FROM MAPLEWOOD, MN?

- **Phased Installation Method:** The phased approach of the rain gardens reduce the initial installation cost for the municipality. Installing rain gardens as part of street repairs gives the town time to learn from experience, as well as reducing the actual cost of street repairs.
- **Labor and Cost Division:** The town provides the construction and plants for the rain garden, but leaves the planting and maintenance of the rain gardens to the residents. Labor and maintenance are often difficult for municipalities to include in their budget. This labor/cost division between the local government and the residents means the rain gardens are constructed properly and maintained beautifully. The possible problem with maintenance completed by residents is that after a property is sold, the new owners may not be willing to maintain the garden.
- **Freedom of Choice by Residents:** Residents choose if they want a garden, and which design suits their needs the best. This gives the residents a sense of buy-in and ensures that the gardens will be maintained.
- **Set Garden Designs:** The choice between 10 set garden designs makes rain garden installation easier for homeowners. The rain garden is more likely to function and the plants to thrive when appropriate plant species are selected. The local government can purchase the plants in bulk at better rates when there are specific species to be planted. The disadvantage to set garden designs is no flexibility by the homeowner to customize their garden. The area can also take on a homogenous appearance when the same 10 garden designs are repeated throughout the neighborhood.
- **Education Program:** The City of Maplewood makes a strong effort to educate the residents through websites, flyers, and workshops. A focus group review in 2002 of residents of Maplewood revealed that many residents prior to rain garden installation on their street were unfamiliar with the concepts and functions of a rain garden. The residents were more willing to participate in the rain garden program once they understood how a rain garden works.<sup>22</sup> Other towns interested in rain gardens should consider a complimentary education program to increase support for rain gardens from the neighbors.



Fig. 18: A curb-less residential rain garden in Maplewood, MN. The water flows in sheet flow into the rain garden.



Fig. 19: A curb cut residential rain garden in Maplewood, MN. The curb cut directs water into the rain garden. Maplewood began offering this as an option in 2006.



Fig. 20: A rain garden open house in Maplewood, MN. Building rain gardens builds community spirit.





Fig. 21: Residential rain gardens can look formal or wild, be in the shade or sun. Rain gardens beautify the neighborhood and improve the environment..

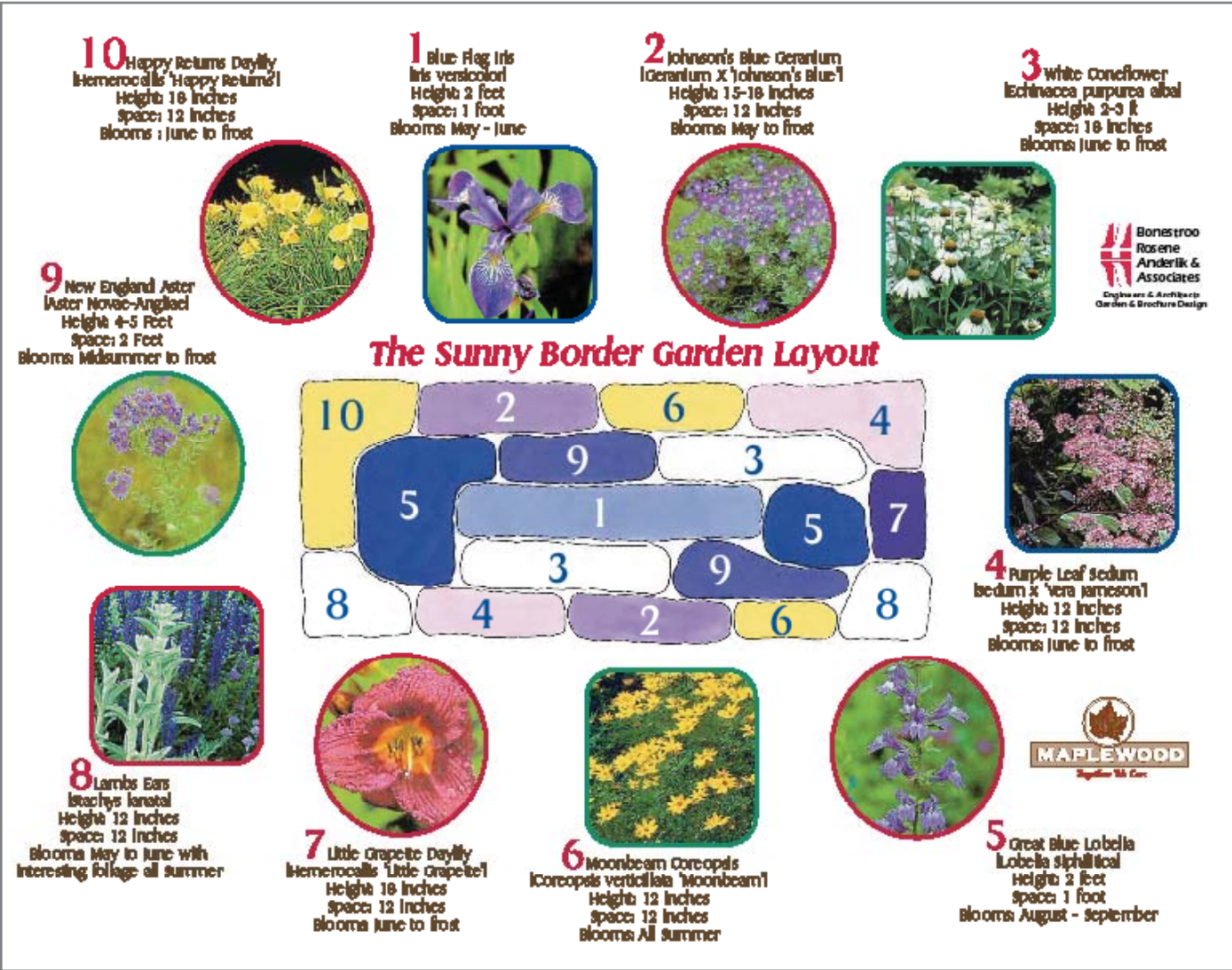


Fig. 22: The Sunny Border Garden, one of the pre-designed layout offered by Maplewood, MN

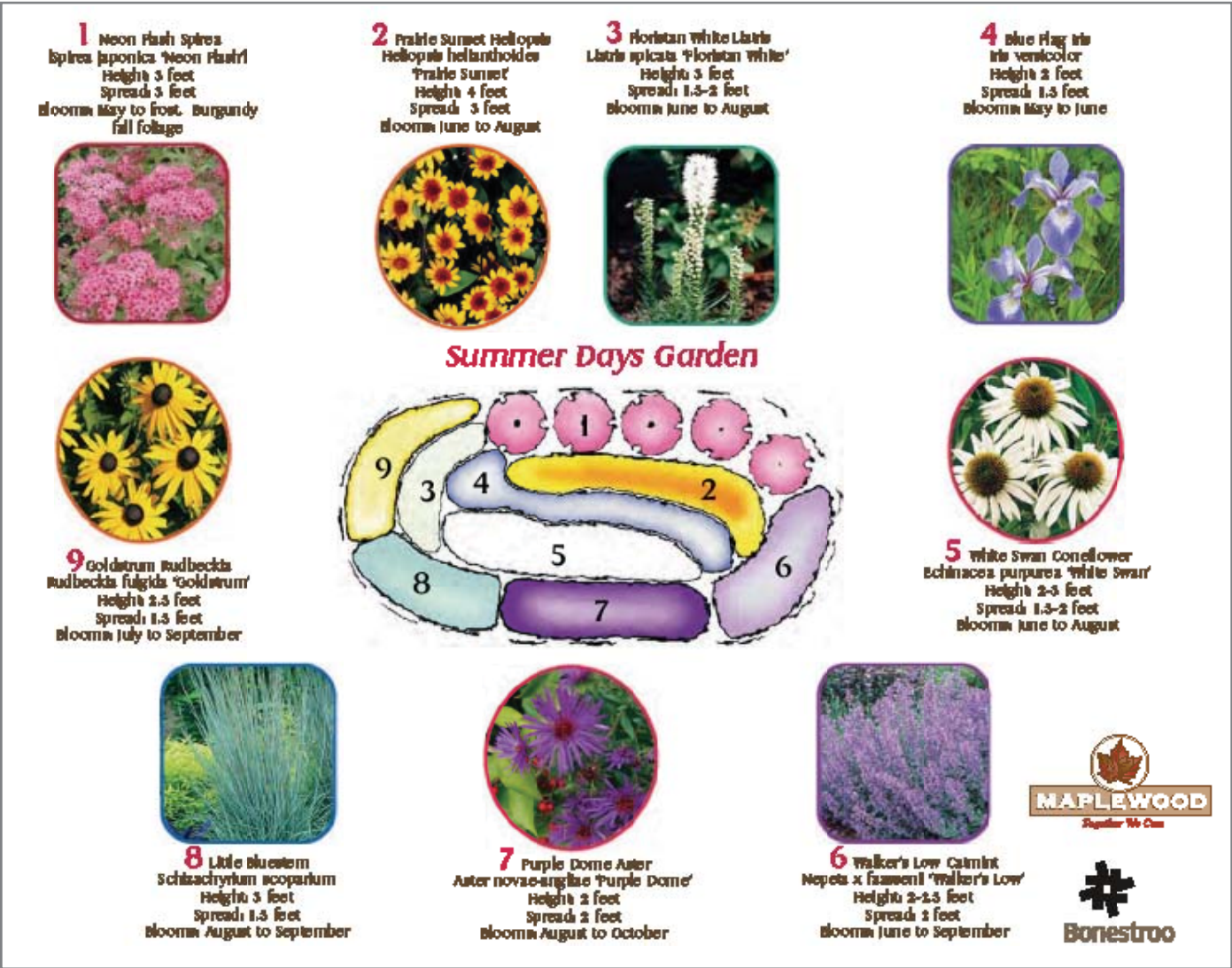


Fig. 23: The Summer Days Garden, one of the pre-designed layout offered by Maplewood, MN



# RAIN GARDEN CASE STUDY: NE SISKIYOU GREEN ST., PORTLAND, OR

## Background

Siskiyou St. is an 80 year-old residential street in Portland, OR. In 2003, the City of Portland chose this street to test the rainwater garden technique of curb bump outs. Two on-street parking spots were replaced on either side of the street with a planted curb extension. This retrofit was the first of its kind and has been very popular locally and nationally. Residents of other Portland neighborhoods are now requesting similar developments. The design won a 2007 ASLA General Design Award, in part for its prototype potential.<sup>23</sup>

## How It Works

The design converts a portion of NE Siskiyou St.’s parallel parking zone into curb extensions that capture and filter rainwater runoff from the 10,000 sq. ft. of impervious street and driveway surfaces. The stormwater runoff flows downhill along the curbs on each side of the street until it reaches the 7’x50’ curb extension. The water enters through a curb cut, then is retained at a 7” depth by a series of checkdams. The checkdams are made of packed earth, which the water spills over and into the next cell when the uphill cell reaches capacity. If the storm has a high enough intensity, the last cell overflows into another curb cut through which the runoff exits the curb extension and flows into the traditional stormsewer system. This rarely happens, however. The rain garden can infiltrate water at a rate of 3” per hour, and has the ability to manage the nearly 225,000 annual gallons of runoff from the street. The curb extension rain gardens reduce the intensity of a typical 25-year storm by 85%. The plants in the curb extension were selected for being native, low-maintenance, of year-round interest, and matching the style of the surrounding residential gardens. The entire project cost less than \$20,000 and took two weeks to build. Community involvement was important to the success of this project. The residents were involved in the design process from the beginning, asking questions, choosing which parking spaces to eliminate, and what plants should be planted. As a result, all of the residents are supportive of the project and have partnered with the City to help maintain the rain gardens. The rain gardens continue to reach out to the community through informative signs posted in the bumpouts.<sup>24</sup>

## How Successful is It?

The Siskiyou green street project demonstrates that installing retrofit residential rain gardens can be easy, cheap, fast, flexible, and popular. Almost all of the street runoff water is treated, reducing runoff into the stormsewer by at least 85%. The plant species used in the curb extensions are flexible to the needs of the climate and the residents, adding a beautiful amenity to the street. Because the rain gardens are curb extensions, they have the added benefit of being a traffic calming device. Narrowing the driving lane encourages drivers to slow down. This project is notable for its multi-functional successes at runoff treatment, visual amenity, and traffic calming. The design’s adaptability and transferability are especially notable, and can be used in nearly every other neighborhood in the county.

## THE FACTS

**Location:** Portland, OR  
**Client:** Sustainable Stormwater Management Program, Oregon  
**Designer:** Kevin Robert Perry, ASLA  
**Date:** 2003  
**Cost:** Approximately \$17,000 for the two curb extensions and \$3,000 for the ancillary sidewalk/curb work  
**Square Footage of Rain Gardens:** 590 sq. ft. total  
**Surface Area Treated by Rain Gardens:** 10,000 sq. ft.  
**Volume of Water Treated Annually:** 225,000 gallons

## WHY USE SISKIYOU ST. AS AN EXAMPLE?

- **Versatile Retrofit Design:** Curb extensions as rain gardens are a transferable concept to almost every neighborhood in the world
- **Cheaply and Quickly Installed:** The design was build for under \$20,000 in 2 weeks, making this a fiscally and practically achievable development for small towns
- **Multi-Functional:** Serves as runoff filtration/infiltration, visual neighborhood amenity, and traffic calmer
- **Addresses Aging Stormwater Infrastructure:** A method to reduce load on stormsewers and reduce the cost of updating aged infrastructure

## WHAT CAN BE LEARNED FROM SISKIYOU GREEN STREET?

- **Rain Gardens Can Easily Integrate Into an Existing Town Design:** Curb bumpouts are easy to install in any parallel parking situation and can treat large volumes of runoff
- **Community Participation is Key:** Involving community members in every stage of design will increase community buy-in, build community pride, and create a project that everyone likes.
- **Educational Signage:** Placing a sign describing what the project is and how it works, as well as a simple diagram will increase the understanding and appreciation of the design by visitors, and may inspire them to initiate a similar program in their own hometown
- **Traffic Calming:** Planted curb bumpouts restrict the driving lane, causing motorists to drive more slowly. An important issue on most residential streets.



RAIN GARDEN CASE STUDY: NE SISKIYOU GREEN ST., PORTLAND, OR

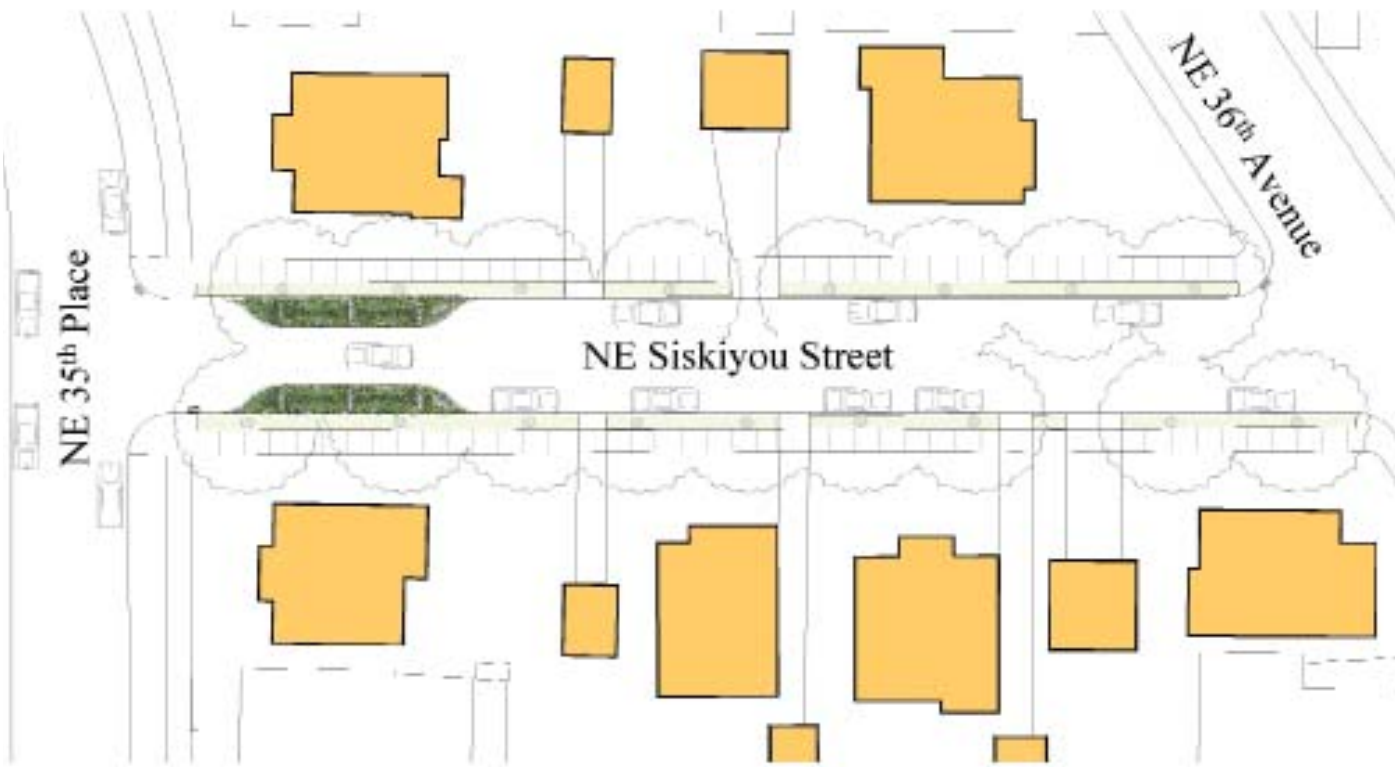


Fig. 24: Plan view of the Siskiyou St. rain garden curb bumpouts

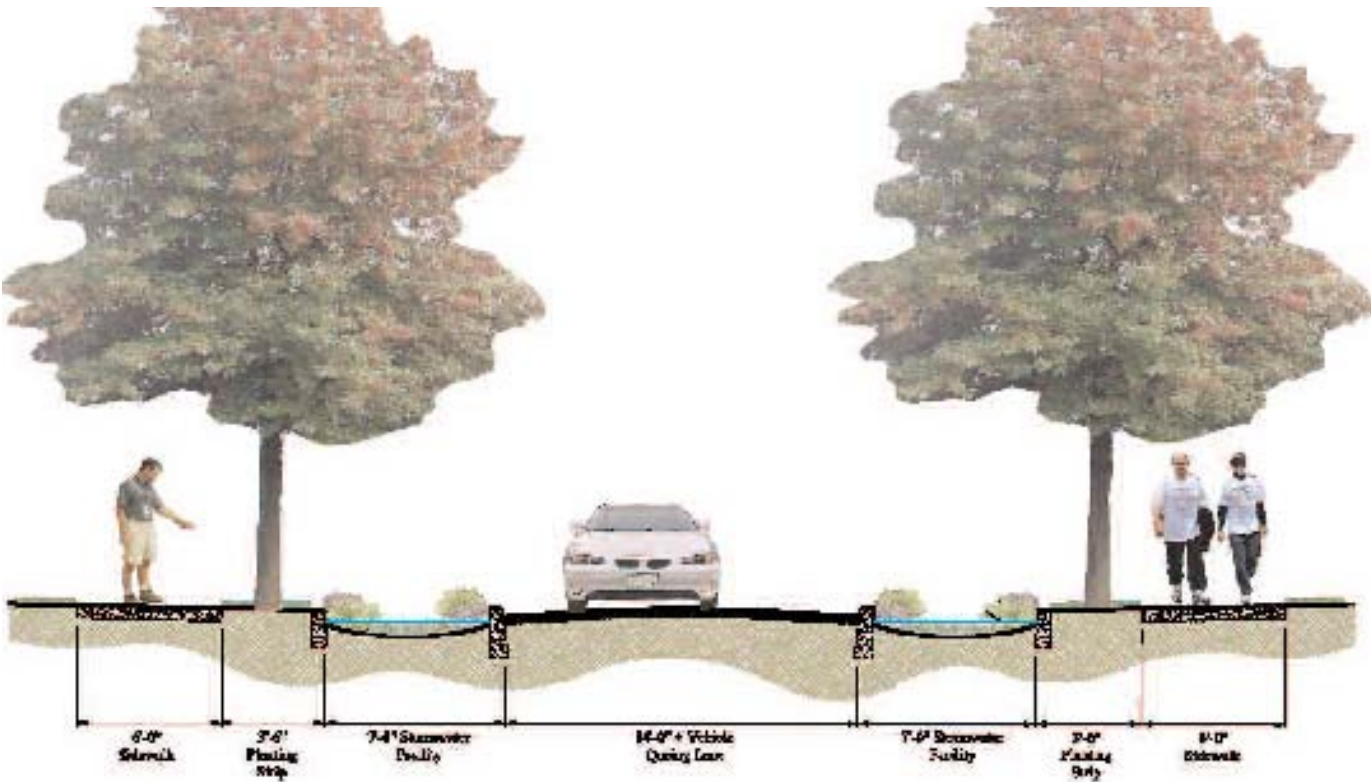


Fig. 25: Section cut showing the dimensions of the street through the curb bumpouts



Fig. 26: Enlarged plan view of the rain garden curb bumpouts and their components



Fig. 27: View up Siskiyou St. with the rain garden curb bumpouts in the foreground





Fig. 28: The rain gardens are popular with the residents, who helped in the decision making process



Fig. 30: Educational signs explain with text and diagrams what the bumpouts are and how they work



Fig. 29: The curb cut on the uphill side of the bumpout lets the runoff into the garden, where it infiltrates

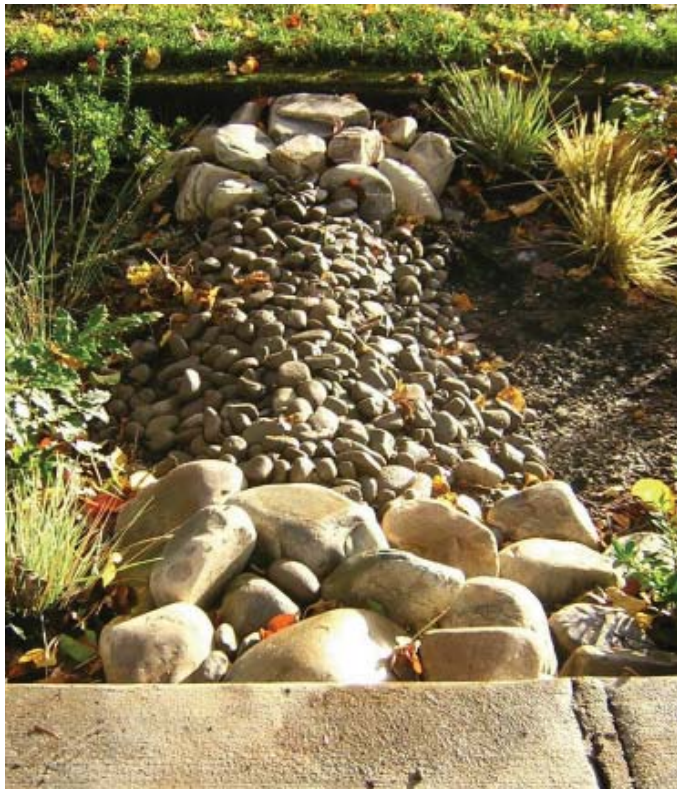


Fig. 31: The checkdams are built of packed earth covered in river pebbles. They hold the runoff in a series of cells until the water infiltrates



Fig. 32: The rain gardens infiltrate water at a rate of 3"/hour and can manage the nearly 225,000 gallons of runoff from the road it receives annually



# COMMUNITY GARDEN

## DESCRIPTION

A community garden is, quite simply, any piece of land cultivated by a group of people. It can be urban, suburban, or rural. It can be in a park, in a median strip, at a hospital, at a school. It can be one large garden, or many small plots. A community garden is a shared green space planned and maintained by some community members for the benefit of the entire community. Community gardens are part of the Slow Food movement, a world-wide grassroots movement which values “good, clean, and fair food for all.”<sup>1</sup> Community gardens are growing in popularity in America. According to the American Community Gardening Association, there are about 18,000 community gardens in the US and Canada.<sup>2</sup>

## How it works

Community gardens are managed by the active participation of the gardeners themselves, rather than by professional staff. Gardeners may form a grassroots action to initiate the garden, or the garden may be initiated top-down, through a municipal agency. There is no “off the shelf” design for community gardens, so they vary widely in location, shape, organization, and produce grown. Land for the community garden may be publicly or privately held. There is a strong tradition in America of gardening vacant lots, but it is important to establish permission, otherwise the garden may be developed by the land owner at a later date. The shape of the entire garden will strongly depend upon the shape of the available site. There is no one type of shape that is more desirable for the garden. The size and layout of the plots within the garden also vary widely. Sometimes there is one large bed tended by all of the gardeners, while other times the garden is divided into separate plots maintained by each gardener.<sup>3</sup> The organization of a community garden depends on if it was formed with grassroots or top-down action.

gardens usually arrive at decisions through consensus making or by electing a panel of officials. Top-down gardens are usually run by appointed officials. In all cases, the day-to-day operations and maintenance of the garden is given to the community members. Community gardens can grow vegetables, but flowers, native plants, herbs, or even art, are popular additions.<sup>4</sup>

## Retrofit Installation

Community gardens are an ideal retrofit installation because they can be arranged to fit onto any sized plot of land. It is the effort of the community that determines the success of the garden, so the physical form is not highly essential. The beneficial returns of the community garden are immediately visible, making this retrofit installation instantly gratifying.

## BENEFITS OF COMMUNITY GARDENS

- 1. Produces nutritious food
- 2. Improves the quality of life for people in the garden
- 3. Stimulates social interaction
- 4. Encourages self-reliance
- 5. Beautifies neighborhood
- 6. Reduces crime
- 7. Reduces family food budgets
- 8. Conserves resources
- 9. Reduces carbon footprint
- 10. Lowers urban temperatures

## HOW TO GET YOUR COMMUNITY INVOLVED IN A GARDEN

- **Let people know the benefits:** let people know that developing a garden empowers people of all ages and abilities to participate and contribute something positive to the community and that they can make a difference
- **Word of mouth:** talk to neighborhood friends and anyone passing by the garden project and how they can become involved
- **Use established institutions:** talk to groups already invested in the community such as church groups, community centers, boys’ and girls’ clubs, local council representatives, schools, garden clubs, and businesses to let them know the new developments in the community and how they can participate in the garden project
- **Connect with community:** spread the word to your community. Post flyers at local churches, community centers, libraries, schools, stores, and other public locations. Use the internet as a communication tool. Create a email listserv to easily communicate between interested residents. If you are tech-savvy, create a website.
- **Post contact information:** create garden signs and pass out flyers listing the location of the garden, the contact person, meeting times, and recent garden developments.
- **Neighborhood libraries:** your local library might have a display box where you could tell the story of your garden and its creation

Adapted from: Payne, Karen & Don Boekelheide. (2001). *Cultivating Community, Principles and Practices for Community Gardening as a Community-Building Tool*. American Community Gardening Association. as listed by Gardening Matters. (2007). *Gaining Community Support*. [www.gardeningmatters.org](http://www.gardeningmatters.org)



Fig. 1: Community gardeners gather to celebrate



Fig. 2: Gardens bring generations together



# COMMUNITY GARDEN

## Benefits

According to the 2000 US Census, 79% of American citizens live in an urban area <sup>5</sup>. Increasing population density distances citizens from nature and the benefits of an agrarian lifestyle. Community gardens reestablish those connections to nature and to food production. The benefits of community gardens include a reduced carbon footprint, increase municipal revenue, food production, health and exercise, crime prevention, ecosystem improvement, and a stronger community feeling.

1. **Reduced Carbon Footprint:** food in the United States travels an average of 1,300 miles from farm to table, changes hands six times <sup>6</sup>, and consumes 10 calories of fossil-fuel energy to produce a single calorie of food. <sup>7</sup> Producing food locally greatly reduces green house gas emissions.
2. **Increase Municipal Revenue:** community gardens have been shown to increase surrounding property value and reduce maintenance costs. In Milwaukee, properties within 250 feet of gardens experienced an increase of \$24.77 with every foot, and the average garden was estimated to add approximately \$9,000 a year to the city tax revenue. <sup>8</sup> Gardens add tax revenue and business development incentive, benefiting the local municipalities.
3. **Food Production:** community gardens allow families and individuals without land the opportunity to produce food. The cost of fresh produce is rising, by 40% from 1985 to 2000 <sup>9</sup>, just as obesity rates are becoming a national epidemic. <sup>10</sup> Providing easy access to fresh food is of national importance. And community gardens are an ideal method. Gardens are 3-5 more productive than traditional large-scale farming <sup>11</sup>. The value of food produced is very high. From 1978-1989, \$8.9 million worth of produce was grown in Milwaukee community gardens. <sup>12</sup>
4. **Health and Exercise:** gardens are wonderful places to eat healthier and to add exercise. Studies have shown that community gardeners and their families eat healthier, more nutrient rich diets than do non-gardening families. <sup>13</sup> Studies have also shown that increasing consumption of fresh local produce is one of the best ways to address childhood lead poisonings, as well as to reduce their exposure to chemical fertilizers and pesticides. <sup>14</sup> Gardening is also wonderful exercise that is fun, too. Gardening can be the equivalent of light aerobic exercise. <sup>15</sup>
5. **Crime Prevention:** a community garden gives incentive for neighbors to be outside, creating “eyes on the street” which decreases crime. <sup>16</sup> Police forces are recognizing the value of community gardens. In Philadelphia, burglaries and thefts in one precinct dropped by 90% after police helped residents clean up vacant lots and plant gardens. <sup>17</sup>
6. **Ecosystem Improvement:** community gardens add a highly functioning green space to the vicinity where it is planted. This green space cools the temperature of the neighborhood, filters toxins from the air, and cleans pollutants out of rain runoff <sup>18</sup>
7. **Strong Community Feeling:** community gardens foster social interactions. They are common ground where anyone of all ages can come to work cooperatively. A Swedish study shows that children and parents who live in places that allow for outdoor access have twice as many friends as those who have restricted outdoor access. <sup>19</sup>



Fig. 3: Community gardens have a long history, dating back to victory gardens during WWII



Fig. 4: Michelle Obama planted a garden in the White House lawn to encourage gardening nationwide



Fig. 5: Community gardens add to a town's identity



Fig. 6: Community gardens are very productive



10 STEPS TO STARTING A COMMUNITY GARDEN

1. **Organize a meeting of interested people:**

Determine whether a garden is really needed and wanted, what kind it should be (vegetable, flower, both, organic), whom it will involve, and who benefits. Invite neighbors, tenants, community organizations, gardening and horticulture societies, building superintendents, and anyone else who is likely to be interested

2. **Form a planning committee:**

This group can be comprised of people who feel committed to the creation of the garden and have the time to devote to it, at least in the initial stage. Choose well-organized persons as garden coordinators. Form committees to tackle specific tasks: funding and partnerships, youth activities, construction, communication.

3. **Identify all of your resources :**

Do a community assessment. What skills and resources exist in the community that can aid in the garden’s creation? Contact local municipal planners about possible sites, as well as horticultural societies and other local sources of information and assistance. Look within your community for people with experience in landscaping and gardening.

4. **Approach a sponsor:**

Some gardens “self-support” through membership dues, but for many, a sponsor is essential for donations of tools, seeds, or money. Churches, schools, private businesses, or parks and recreation departments are all possible supporters. One garden raised money by selling “square inches” at \$5 each to hundreds of sponsors.

5. **Choose a site:**

Consider the amount of daily sunshine (vegetables need at least six hours a day), availability of water, and soil testing for possible pollutants. Find out who owns the land. Can the gardeners get a lease agreement for at least three years? Will public liability insurance be necessary?

6. **Prepare and develop the site:**

In most cases, the land will need considerable preparation for planting. Organize volunteer work crews to clean it, gather materials, and decide on the design and plot arrangement.

7. **Organize the garden:**

Members must decide how many plots are available and how they will be assigned. Allow space for storing tools, making compost, and pathways between plots.

8. **Plan for children:**

Consider making a special garden plot just for kids -- including children is essential. Children are not as interested in the size of the harvest as they are interested in the process of gardening. A separate area for them allows them the chance to explore at their own pace.

9. **Determine rules and put them into writing:**

The gardeners themselves devise the best ground rules. We are more willing to comply with the rules that we have had a hand in developing. Ground rules help gardeners to know what is expected from them. Some issues to address are: dues, how money will be used, how plots are assigned, how will maintenance be rotated, and how often the gardeners have meetings.

10. **Help the members keep in touch with each other:**

Good communication ensures a strong community garden with active participation by all. Some ways to do this are: create an email listserv, install a garden bulletin board, have regular celebrations. Community gardens are all about creating and strengthening communities.

*Adapted from: American Community Gardening Association. (2011) 10 Steps to Starting a Community Garden. <http://communitygarden.org>*



Fig. 7: Design workshops involve all stakeholders in the future garden and increase feeling of ownership



Fig. 8: Volunteer labor reduces start-up cost and builds community spirit.



Fig. 9: Using recycled materials when building the garden keeps costs down and adds character

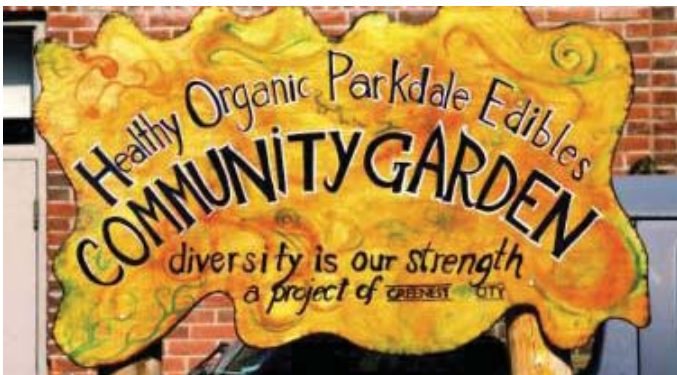


Fig. 10: Many gardens create entrance signs that are a logo for the garden and a source of pride



# COMMUNITY GARDEN

## COSTS AND FUNDING OPPORTUNITIES

Community gardens are relatively inexpensive to create because they rely on volunteers and require inexpensive materials. This section discusses the general costs of a community garden, suggestions on how to reduce those costs, and ideas for funding opportunities.

### Costs

A typical community garden contains raised garden plots, hose bibs, a tool shed, and compost bins. The cost will vary based on the size and components of the garden. To give an idea of the cost, in the summer of 2008 a 4,300 sq. ft. community garden in San Francisco cost around \$20/sq. ft. to build, construction costs only. This included 14 gardenplots (2 of which were wheelchair accessible), hose bibs, a tool shed, compost bins, a small greenhouse, and surface of either decomposed granite or bark mulch. This does not include fence costs. Nor does it include design and other soft costs.<sup>20</sup>

### Funding Opportunities

There are many corporate and government grants and partnerships available to help reduce the start-up costs of a community garden. Some funds are dedicated especially to school gardens, which can offset some of the difficulties of establishing one. The American Community Gardening Association lists available grants on their website, <<http://communitygarden.org>>.

### Reducing Costs

If the costs of creating a community garden are higher than expected, there are several ways to reduce the cost:

- **Rent, loan, and trade:** Make contacts throughout the community to draw upon the skills of individuals and the resources of companies to acquire tools, knowledge, plants, and building materials for minimal or no cost.
- **Do It Yourself (DIY):** Utilizing the skills of community members is a way to cut costs.
- **Trash to Treasure:** Repurpose existing materials for new uses. For example, empty milk bottles can be used as mini-greenhouses.<sup>21</sup>
- **Plant for less:** Reduce the costs of planting by: starting plants from seeding, collect and save seeds from your garden, get cuttings from someone you know, attend a plant swap, ask nurseries to donate plants, or contact horticulture schools to ask if they might sell plants at a reduced rate
- **Contact the Cooperative Extension:** Penn State has a cooperative extension office in each Pennsylvania county to serve the agricultural needs of residents. They, and other states' cooperative extensions, are valuable resources for technical advice, soil testing, and growing tips.
- **Apply for a grant:** There are many government and corporate grants available for community gardening. See the section "Funding Opportunities" on this page and the resources list at the end of the chapter.

*Adapted from* Martin, Heide. (2007). Figuring Costs. Rebel Tomato. *American Community Gardening Association*. <http://www.communitygarden.org/rebeltomato/roots/figuring-costs.php>



Fig. 11: Compost increases the garden's quality



Fig. 12: Compost bins, where the garden refuse progresses down the series as it ages to compost

## 10 TOOLS FOR COMMUNITY GARDENS

1. Trowel
2. Hand Fork
3. Hoe
4. Hand Pruners
5. Watering Can
6. Pitchfork
7. Shovels and Spades
8. Wheelbarrow
9. Gloves
10. Watering Hose

*Adapted from:* American Community Gardening Association. (n.d.). *Ten Tools Every Community Gardener and Garden Needs*. <http://communitygarden.org/docs/10tools.pdf>

## COMPOST 101

- **What is compost?**  
Compost is a dark, crumbly, and earthy-smelling form of decomposing organic matter. Decomposition and recycling of organic wastes are an essential part of soil building.
- **Why should I make compost?**  
Composting is the most convenient and practical way to handle garden wastes. It is easier and cheaper than bagging these wastes for garbage collection. Compost also improves your soil by increasing water holding capacity, increasing nutrients available to plants, and improving soil texture. All of these result in higher produce yields.
- **What can I compost?**  
Garden waste like grass clippings, leaves, flowers, old plants, twigs, and old plants can be composted. Food scraps can be composted, but will attract animals, so should not be added to open compost bins. Meat, dairy, and oil should never be added to compost. Paper may also be composted.
- **How do I compost?**  
Composting can happen in a series of open bins where the compost gets turned with a pitchfork, or in a closed barrel that can be turned with a handle. In order to properly decompose, the compost needs a ratio of 2:1 wet organics (plants, grass clippings) to dry organics (dry leaves, straw, paper). A compost pile also needs moisture and air, which is why turning the pile and sprinkling it during dry periods is important. It takes 2 months to 2 years.

*Adapted from:* American Community Gardening Association. (1991). How to: composting. *Community Greening Review*. p. 13-16. <http://communitygardening.org>



# COMMUNITY GARDEN

## VARIATIONS

The basic community garden is a plot on a public piece of land tended by gardeners from throughout the community. But there are several variations in the form and structure of community gardens, which will be discussed in this section.

### Community Supported Agriculture (CSA)

Community supported agriculture consists of a group of individuals who pledge to support a farm operation so that the farmland becomes, either legally or metaphorically, the community's farm.<sup>22</sup> CSAs are growing in popularity, with Local Harvest listing 4,000 United States CSAs in their database.<sup>23</sup> To find a CSA near you, visit <<http://www.localharvest.org/csa/>>

- **How it works:** Individuals purchase “shares” of the farm at the beginning of the season, which allows them to receive weekly/biweekly portions of the crop. Because the members buy-into the farm, they share the risk and the bounty of the season with the farmer. Paying at the beginning of the season ensures the farmer can purchase equipment and will not fold in a bad season. It also gives the farmers more time to farm rather than marketing their produce.
- **Benefits:** The crops are usually produced organically. Compared to buying organic produce in grocery stores, CSAs are more cost efficient. They also provide access to local, fresh, sustainably raised produce to people who may not have the time to garden.
- **Concerns:** CSAs can be expensive to pay for all at once, ranging from \$400-\$650 for a summer share



Fig. 13: CSAs provide a basket of farm produce to the shareholders every week



Fig. 14: The harvest in a CSA basket is fresh, seasonal, and flavorful

### School Garden

Planting gardens on school grounds is a way to connect students to their environment, teach healthy foundational eating habits, and bring classroom lessons to life. Any type of garden will make the schoolyard a more engaging and welcoming place, as well as being an outdoor classroom, but a vegetable garden provides these benefits in addition to teaching children about how to garden, the food process, and healthy eating habits. School gardens are rising in popularity. In California, Alice Waters, chef and creator of the Edible Schoolyard, worked with the then Superintendent of Public Instruction for the State of California, Delani Eastson, in 1995 to create guidelines for the “garden in every school” initiative.<sup>24</sup>

- **How it works:** A garden is planted on school property, with permission from the principal and support from teachers and community members. The children tend the garden during the school year, either through an afterschool gardening club, or through classwork. Over the summer, the garden can be tended by students, and/or by community volunteers.
- **What it consists of:** The garden usually features planting beds, a workstation, a water source, and a storage shed. Sometimes it also includes animal pens and an outdoor oven. The gardens maximize production by including perennial and annual crops. Some perennial crops are berry bushes and fruit trees that need little tending. Annual crops, like tomatoes, carrots, peppers, and leafy greens, are planted in traditional beds. The food crops can be coordinated with the school curriculum; for example, if students are learning about world cultures, they could plant a garden of Polish, Italian, and Mexican vegetables. The schoolyard may also include animals, like chickens, rabbits, or honey bees.

“On any given day, 35% of elementary school kids eat no fruit, 20% don’t touch a vegetable, and many of those who do come no closer than French fries. A shocking 90% consume fat above the U.S. Department of Agriculture’s recommended level, and 27% of children between the ages of 6 and 11 are obese. Many school have abandoned school lunch programs all together, turning them over to fast-food chains.”

Danks, Sharon. (2010). *Asphalt to Ecosystems: design ideas for schoolyard transformation*. Oakland: New Village Press. p. 80



Fig. 15: The welcome sign at Cobb Elementary displays the value of a school garden



# COMMUNITY GARDEN

- **Benefits:** Schoolyards are uniquely positioned to educate the future generation on ecological stewardship. Schoolyards are conveniently located as outdoor classrooms and community gathering spaces. *School gardens benefit students* by bringing classroom lessons to life, bringing children in contact with natural processes, and teaching healthy food habits and gardening skills. The garden provides a forum for hands-on learning and leadership that is usually unavailable in a traditional classroom setting. The students can incorporate their garden produce into the school lunch program, increasing the nutritional value of school lunches, and teaching the children life long culinary skills. *School gardens benefit teachers* by creating hands on learning labs that engage and inspire students. Lessons taught in the garden can include soil, weather, plant growth, insect life cycles, microbiology, arithmetic, geometry, finances, art, health/nutrition, reading/writing, and foreign languages. *School gardens benefit the community* by creating a gathering space, encouraging bonding during the planning and construction process, and enriching the community identity.<sup>25</sup>
- **Concerns:** School gardens take more planning and coordination than gardens located on other properties. The principal, teachers, school board, and community residents must support the creation of a school garden. The maintenance of the garden over the summer, when the students are on vacation, also needs to be arranged. Perhaps a student or community volunteer gardening club could be established to maintain the garden.



Fig. 16, Fig 17: These two pictures, taken from roughly the same location in 1991 and 2007, capture the degree of transformation to a school yard when it is greened and gardened.



Fig. 18: Students actively participate in gardening



Fig. 19: Many lessons can be taught in the garden

## RULES OF THUMB FOR STARTING A SCHOOL GARDEN

1. Start with buy-in from the principal
2. Form a school garden committee to oversee the project's development
3. Discuss new ideas with school faculty before engaging parents
4. Make in initial inquiries to the school district to see what's possible
5. Allow enough time to give careful thought to the master plan -- 1-2 semesters
6. Allow project participants to get involved as soon as possible
7. Dream big, but start small. Plan to construct the project over time by setting short- and long-term goals
8. Thoroughly document the design, construction, and stewardship process.
9. Create a support network that will support and continue the garden over time.
10. Never "finish". Continued growth maintains a sense of ownership of the garden.
11. Plan for maintenance at the very beginning.
12. Raise money to start the project and maintain the garden.

Adapted from: Danks, Sharon. (2010). *Asphalt to Ecosystems: design ideas for schoolyard transformation*. Oakland: New Village Press.



FURTHER RESOURCES

- **American Community Gardening Association (ACGA), website. <http://communitygarden.org/>**  
ACGA's website is a valuable resource for any group looking to start or improve a community garden. The website included many valuable articles and links to other valuable resources. The website also has a listing of grants that communities can apply for to start their garden.
- **Danks, Sharon. (2010). Asphalt to Ecosystems: design ideas for schoolyard transformation. Oakland: New Village Press.**  
This book is an valuable resource when designing a school garden. Its focus is schoolyard greening, a valuable transformation which Danks covers well, but the book also includes an extensive chapter on school vegetable gardens. Examples from around the world are shown.
- **Gardening Matters, website. <http://www.gardeningmatters.org/>**  
Gardening Matters is a non-profit organization serving community gardens in the Twin Cities, but the content and quality of their website makes it valuable resource for community garden members nationwide. The have tips for every stage of community garden implementation, including funding possibilities. The site also links with other sites providing community gardening resources.
- **Jeavons, John. (1974) *How to grow more vegetables: and fruits, nuts, berries, grains, and other crops than you ever thought possible on less land than you can imagine.* Willits: Ecology Action of the Midpeninsula**  
This book is the essential book on biointensive gardening. Biointensive gardening is a method particularly applicable to community gardens because it requires little space, manual (opposed to mechanical) labor, and produces very high crop yields. Community members starting a garden should refer to this book when starting to plant
- **Kirby, Ellen & Elizabeth Peters (eds.). (2008) *Community Gardening.* New York: Brooklyn Botanic Garden, Inc.**  
This book gives an overview of community gardens: their history, benefits, and selected case studies. A useful starting book for community members curious about community gardens, but other resources should be used for the nuts and bolts of construction.
- **Penn State Cooperative Extension. website. <http://extension.psu.edu/>**  
Each state's cooperative extension is run by a land grant university that provides agricultural resources to state residents. These resources include gardening information, like frost dates, as well as technical agricultural advice. Contact the Extension office in your county for assistance. Other state's Cooperative Extensions can also be valuable resources, as they publish there findings to the general public.



# COMMUNITY GARDEN CASE STUDY: GARDENERS IN COMMUNITY DEVELOPMENT, DALLAS, TX

### Background

Gardeners in Community Development (GICD) is a network of seven gardens in the Dallas area that produces vegetables to feed hundreds of low-income families. The garden was founded in 1994 and is staffed by one full-time and one half-time staff member, and 150-200 volunteers. The purpose of this garden is to produce high amounts of fresh vegetables, fruits, herbs, and flowers, as well as to improve residents' quality of life by maintaining green space.<sup>26</sup>

### How It Works

The seven gardens are located throughout the Dallas area, providing quality green space in many neighborhoods. One garden is based at an elementary school and two others are located on church property where volunteers grow food for area food pantries. Besides providing fresh produce, GICD hosts workshops and training sessions covering everything from canning to composting to seed saving. GICD also sells produce at area farmers markets, increase their food outreach, and generating capital to benefit refugee gardeners. Social action and charity are high priorities of GICD: each year GICD gardeners work with other Dallas programs to deliver more than 7,000 pounds of produce to emergency food providers.<sup>27</sup>

### How Successful is It?

GICD has faced challenges to find funding, but has managed to triumph and grow over 13 years of supporting fresh, local food and community development. They have achieved their mission of "growing people" and helping community members: in 2006 and 2007, GICD won Heifer International's Passing on the Gift Award for the number of pounds donated to food pantries from its gardens and the amount of training offered to the public.<sup>28</sup> GICD has been very successful.



Fig. 21: Community gardeners tend the GICD gardens.

### THE FACTS

**Location:** Dallas, Texas

**Founded:** 1994

**People:** 1 full-time and 1 part-time staff member; 150-200 volunteers

**Site:** Seven area gardens

**Programs:** Grow food with community gardeners, help families sell produce in a market garden, provide training sessions, distribute produce to food pantries

### WHY USE GICD AS AN EXAMPLE?

- **High Quantity of Food Produced:** GICD grows a lot of food for the community, especially for low-income families.
- **Community Outreach:** GICD conducts many workshops and training sessions each year, and spreads the word of their efforts through frequent e-newsletters.
- **Long-lasting:** GICD has been gardening and supporting the community for 15 years, despite constant funding difficulties



Fig. 22: Markets connect with the larger community

### WHAT CAN BE LEARNED FROM GICD?

- **Community Gardens Make a Difference in People's Lives:** GICD feeds hundreds of families in their area. The network of parks increases residents' access to green space. Community gardens provide food, but they also build community
- **Partnerships Multiply the Benefits:** GICD has partnered with schools and churches to create and tend gardens on their properties. The garden network benefits by increasing food production and the partners benefit through community involvement and gardening
- **Workshops and Training Sessions:** Conducting many training events throughout the year builds gardener skills and interest, and invites other community members to participate in the garden.
- **Donations to Food Pantries:** Donating extra produce from the garden to food pantries gives access to nutritional food to people who could not otherwise afford it.
- **Volunteer Spirit:** GICD continues because of support from the community: the staff are partially or totally unpaid.



# COMMUNITY GARDEN CASE STUDY: INTERVALE CENTER, BURLINGTON, VT

For 23 years the Intervale Center has been dedicated to preserving Vermont’s agriculture, community, and natural resources. Their diversified work has helped to build a community food system that honors producers, values good food, and enhances the quality of life. When the program began, Intervale was a polluted located, the site of an illegal junk yard. After decades of hard work, Intervale has been transformed into a nationally recognized center for sustainable agriculture.<sup>29</sup>

### Background

Intervale Farms program supports small-scale beginner farmers through an incubator system, leasing land and necessary agricultural equipment. It also assists with business planning and market access to help independent farms establish the financial foundation for a viable agricultural business. This program is well established, begun in 1986, and now including 350 acres of farm and conservation land hosting 12 farms. Intervale Center is a diversified institution: it provides gardening education, financial support for new farmers, compost facilities for the region, a youth training program, a garden market center, and grows trees and shrubs for environmental restoration.<sup>30</sup>

### How It Works

The incubator program is intended to assist interested people gain the skills and financial capital to establish their own small farms throughout the region, growing the local food network. Intervale has several starter farms in the same vicinity, allowing a cooperative, mentoring community to develop. New farmers work these farms for three years, during which they receive coaching in setting up a business plan, and the Intervale Center subsidizes the cost of equipment, land, and facilities. After three years, the Center gradually applies the realistic cost of land and resources while assisting the farmers to either buy their own land or stay at the Center and become a mentor.<sup>31</sup>

“Don’t Treat Your Soil Like Dirt” - Intervale’s compost motto. Intervale’s compost facilities surpass most urban waste treatment centers. Intervale composts 20,000 tons of waste from Burlington’s commercial and residential debris, including from large companies like Ben and Jerry’s and IBM. The rich compost is returned to the community through the Intervale Center’s market.<sup>32</sup>

The Intervale Center supports a youth program, in which teens from the Burlington neighborhood are paid to work part-time. The program teaches valuable skills, leadership, and confidence. The teens develop a business plan, grow produce, and then sell the produce at a farmer’s market. The participants also collect and distribute approximately 30,000 pounds of fresh, organic produce a year to 20 social service agencies. This program connects low-income families with fresh produce, and youth with their community.<sup>33</sup>

### How Successful is It?

The Intervale Center is testament to the power of community agriculture and gardens to empower the residents, enhance the community, and improve the environment. The Intervale Center has remained at the forefront of sustainable agriculture: establishing Vermont’s first CSA, Vermont’s first large-scale composting center, and Vermont’s first bareroot nursery. Intervale Center has a strong foundation and will continue to grow and benefit the community for decades to come. The impact the Intervale Center has on Burlington was recognized by Kiplinger’s Magazine when they recognized Burlington,VT one of the 2010 Best Cities, and the Intervale Center as the “crown jewel of localvores”.<sup>34</sup>

### THE FACTS

- Location:** Burlington, Vermont
- Founded:** 1986
- People:** 20 staff members, not including farmers, youth interns, and volunteers
- Site:** 350 acres of farm and conservation land hosting 12 farms
- Programs:** Provide agricultlure-development services and incubator system for beginning farmers; compost Burlington’s wastes; administer a youth program; grow native plants for ecosystem restoration projects; develop a food enterprise center

### WHY USE THE INTERVALE CENTER AS AN EXAMPLE?

- A Small Town:** Burlington is of comparable size (pop. 42,000) to many Pennsylvania towns, so the programs practiced there are transferable.
- Highly Successful:** This program transformed a run-down, polluted part of town into a thriving contributor to the community, and has initiated fourteen more small farms in the area.<sup>35</sup>
- A Business Model:** The Intervale Center uses its farms as a teaching tool to help community members start their own farms. This increases the total supply of local food and preserves the region’s historically agricultural landscape. The Center is not self-sufficient, generating only 20% of its funds from farm sales, and relying on grants and donations for the other 80%. But the Center’s program increases the total social and economic capital of the town.<sup>36</sup>
- Community Agriculture Improves Town’s Economy and Residents’ Quality of Life:** The Intervale Center developed a polluted plot of land into a beautiful and productive town amenity, and the Center provides 60 full-time, part-time, and seasonal jobs.<sup>37</sup>



Fig. 23: The Intervale Center’s campus is an incubator farm for new farmers



COMMUNITY GARDEN CASE STUDY: INTERVALE CENTER, BURLINGTON, VT

WHAT CAN BE LEARNED FROM THE INTERVALE CENTER?

- **Incubator Business Model:** The Intervale Center is a resource helping starting farmers to succeed. The impact on the region is greater than one single farm could ever make.
- **Partnerships with the Community and Local Government:** Partnering with other established institutions, like IBM to collect their organic waste, or Intervale's Healthy City youth program to run an agriculture session, expands the influence of the agriculture center into more of the community life.
- **Diversification of Programs to Better Serve the Community:** The Intervale Center has expanded it's efforts beyond gardening to include technical mentoring, financial assistance, regional composting, a food market, and natural resources conservation, generating a manifold of benefits to the community.
- **One Person Can Make a Difference in an Entire Region:** The Intervale Center project was begun by a single man, Will Raap, and has grown to encompass the Burlington region. With passion and dedicated work, any community member can transform his or her community through gardening.
- **Gardening and Small-Scale Agriculture are Valid Re-Development Focuses for a Town:** The original garden focus of the Intervale Center has created spin-off industries: youth mentoring, a bare root plant nursery, a regional composting facility, CSAs, and tourism. The community is revitalized by encouraging environmental sustainability.



Fig. 24: The Intervale Center hosts frequent celebrations and outreach events



Fig. 25: Healthy City is a youth program teaching neighborhood teens gardening and business skills



Fig. 26: The Intervale Center is a valuable green space close to the center of Burlington



Fig. 27: The Center's staff, farmers, and youth interns form close bonds



Fig. 28: The Intervale Center actively promotes community appreciation for local foods



Fig. 29: Family Day in the garden invites community members to participate in the Center



Fig. 30: The regional compost facility composts 20,000 tons of waste from companies and residents



# NATIVE ALTERNATIVES TO LAWN

## DESCRIPTION

In the United States, lawns cover 32 million acres, an area larger than the state of Pennsylvania.<sup>1</sup> Lawns fragment habitat and require massive amounts of energy to maintain. Replacing all or some of the lawn with native plants reestablishes habitat in the urban and suburban systems, and reduces the carbon footprint of the property.

## How it works

The lawn is the ubiquitous landscape across the country, from Vermont, to Arizona, to Florida. Natural to none of these locations, the lawn's exotic monoculture requires continuous energy inputs. These energy inputs harm the environment, wildlife habitat, and human health, while creating a landscape that hides the unique features of place. Replacing some or all of the lawn with native plants will reverse each of these negative effects.

Many lawns are used infrequently. Evaluate what the lawn is used for -- children's play, pets, entertaining -- and keep only that minimum amount. The rest of the property can be converted into a wildlife-friendly environment.

The lawn can be converted into several landscaping options. There are several native grasses that grow low, to give the appearance of a lawn without the negative impacts. The lawn can also be converted to a meadow, with a mix of taller native grasses and flowers. It is also possible to plant the property as a garden of native plants. All of these options are beautiful, sustainable, and easy to implement.

## FREQUENTLY ASKED QUESTIONS

- **What is a meadow?**  
A meadow is a field of natural grass and native wildflowers typically occurring in the eastern part of North America. Meadows are found naturally in forest clearings, flood plains, and old fields. Meadows are a temporary ecological community and will convert to forest unless maintained. Prairies are slightly different from meadows, occurring in Midwestern North America. They have different types of grasses, and based on moisture level, will grow to different heights. <sup>2</sup>
- **Does all of the lawn need to be removed to have environmental benefits?**  
No. Lawns have recreational value, for children, pets, and entertaining. But the minimum amount of lawn should be kept for the greatest environmental benefit.
- **Will a meadow attract vermin?**  
No. Natural landscapes do not attract mice, rats, or other vermin, as they do not provide the right type of food. Rats are attracted to human garbage, so a native lawn alternative will not encourage them.
- **Will a meadow increase allergy symptoms?**  
No. The wildflowers and native grasses in a natural landscape do not create a pollen problem. The plants that cause the most allergies are: (1) pioneer plants like goldenrod and ragweed, which are not included in native landscaping, and (2) non-indigenous turf and pasture grasses like Kentucky bluegrass and Bermuda grass, which are common lawn grasses. Replaces the lawn with native plants may decrease allergy symptoms.
- **Are the dried grasses of a native meadow a fire hazard?**  
No. The old grasses are removed every year, so fuel cannot build up. Any fire would be too quick burning and small to cause much damage.

*Adapted from:* Ingram, John. (1999). When cities grow wild – natural landscaping from an urban planning perspective. The Wild Ones. <http://www.for-wild.org/whenciti/ingram-31.htm>

## BENEFITS OF NATIVE ALTERNATIVES TO THE LAWN

1. Fewer carbon emissions from mowing
2. Improves water quality of streams, lakes, and the Chesapeake Bay
3. Creates wildlife habitat
4. Soil quality improves
5. Saves water
6. Reduces toxic chemical exposure to people
7. Reduces allergy symptoms
8. Saves time and money on maintenance
9. Connects people with their local surroundings
10. Adds to the area's sense of place and uniqueness



Fig. 1: Replacing lawns with native meadows is beautiful and environmentally sustainable



# NATIVE ALTERNATIVES TO LAWN

## Retrofit Installation

Replacing lawn with a meadow or other native plants is an ideal retrofit, because it is simply a matter of changing the landscaping. A meadow can fit any place at any size, which makes this a flexible retrofit option. This option also has the benefit of requiring no coordination to implement: individual homeowners can make this sustainable change to their property without trying to organize a neighborhood-wide effort.

## Benefits

Replacing the lawn with a meadow or other native plantings has far reaching positive impacts to the environment, human health, and regional uniqueness.

- **Lower carbon emissions:** Lawn mowers emit high quantities of CO<sub>2</sub>, a greenhouse gas that influences global warming, acid rain, smog, and ozone degradation. California's Air Resources Board has determined that in the one hour it takes to mow the lawn, the power lawn mower emits pollutants equivalent to driving 350 miles in a 1991 model car.<sup>3</sup> Mowing a meadow once a year, instead of a lawn forty times would reduce carbon emissions by 98%.
- **Reduced water usage:** Lawns developed in the cool, shady, and damp climate of England, so in the United States high quantities of water are required to recreate that ideal growing condition. Even on the moist East Coast, 30% of water usage is devoted to lawns.<sup>4</sup> In an era when water is predicted to be the new oil, it is vital to restrict water usage to essential purposes.<sup>5</sup> Replacing lawns is a simple and effective change. Native plants are adapted to local water conditions and are hardy enough to withstand drought. A landscape of native plants will also save the property owner the time and expense of irrigating.

- **Improved water quality:** Lawns require many types fertilizers, pesticides, and herbicides to stay lush. These chemicals run off in rainfalls and enter streams, lakes, and, eventually, the Chesapeake Bay. The dissolved chemicals, especially nitrogen and phosphorus, wreck havoc in the aquatic ecosystems. The extra nutrients cause algae blooms, which consume the dissolved oxygen in the water, killing all other life forms.<sup>6</sup> Pesticides are still potent when they enter water bodies, and can kill fish and birds.<sup>7</sup> As the chemical compounds in fertilizers break down, they release greenhouse gasses that destroy the ozone layer and add to global warming.<sup>8</sup> American homeowners apply vast quantities of chemicals to their lawns: 3-20 lbs. of fertilizer and 5-10 lbs. of pesticides each year.<sup>9</sup> According to the National Academy of Science, homeowners use up to ten times more chemicals per acre than farmers.<sup>10</sup> This effects the Chesapeake Bay, the largest estuary in North America, and the drainage point for much of Pennsylvania. Urban and suburban areas contribute 16% of the nitrogen pollution, 32% of the phosphorus pollution, and 28% of the sediment pollution to the Bay.<sup>11</sup> Native plants do not require fertilizer or other chemicals, because they are adapted to the local conditions and will thrive without assistance. Switching from a chemical-intensive lawn to a self-sustaining native landscape will greatly improve local and regional water quality.

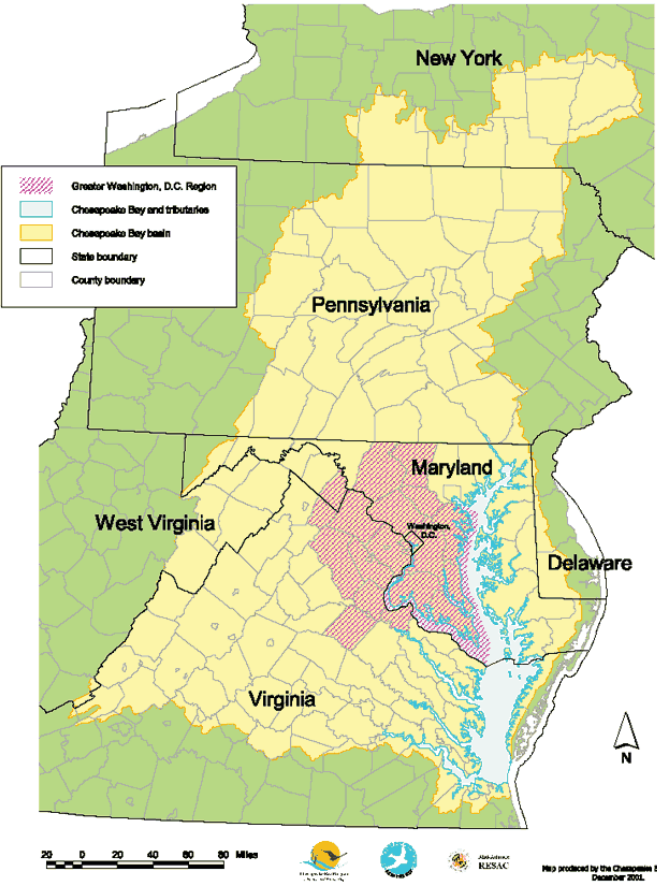


Fig. 2: The Chesapeake Bay watershed includes 6 states, including much of Pennsylvania



Fig. 3: Irresponsible irrigation leads to water waste and runoff of lawn chemicals into streams and lakes



Fig. 4: Algae bloom in a suburban detention basin from runoff from lawn fertilizer kills aquatic life



## NATIVE ALTERNATIVES TO LAWN

- **Wildlife habitat creation:** As human developments expand, wildlife habitat is lost. Using native plants in the urban and suburban landscape will reconnect these fractured habitats. Birds and butterflies especially benefit from small scale native plantings. In a study of Pennsylvania neighborhoods, researchers found that native landscaping supported significantly more and a greater species variety of caterpillars and birds. Of special note, bird species of regional conservation concern were eight times more abundant and diverse on properties with native landscaping.<sup>12</sup> Creating habitat for wildlife helps the creatures, and people derive the pleasure of seeing wildlife up close.
- **Improved human health:** The pesticides, fertilizers, and other chemicals applied to lawns are harmful to people's health. Of 30 commonly used lawn pesticides, 13 are probably carcinogens, 14 are linked with birth defects, 18 are linked with reproduction defects, 20 are linked with liver or kidney damage, 18 are linked with neurotoxicity, and 28 are irritants.<sup>13</sup> Native plants do not require any chemical application, so all of these health risks would be removed.
- **Lowered maintenance and cost requirements:** Lawns require weekly mowing, frequent watering, and regular chemical application to maintain their appearance. Native landscaping, however, only requires yearly trimming, and no added inputs, saving the property owner time and money.



Fig. 5: Native meadows attract wildlife



Fig. 6: Native plants provide food for butterflies



Fig. 7: Pesticides are harmful to human health

- **Beauty:** A natural landscape is a intriguing landscape, filled with diversity of color, texture, and growth. Many people prefer a natural residential landscape to a traditional one. At the 1995 Cincinnati Flower Show, Warren Klink, a landscape architect, built an “urban restoration garden”. The display had two sides: one side of a house facade was the “messy” natural garden that was in fact carefully designed, and on the other side of the facade was the “restored” garden with traditional perennial beds. Most visitors preferred the “messy” garden.<sup>14</sup> An important feature when designing natural plantings is to keep a clearly defined edge. This helps people to read the meadow or other planting as deliberate and cared for, rather than messy and abandoned.
- **Sense of place:** Defined by the National Trust for Historic Preservation, a sense of place is “those things that add up to a feeling that a community is a special place, distinct from anywhere else.”<sup>15</sup> When lawns are found everywhere, from the desert suburbs of Phoenix, AZ to the beaches of the Jersey Shore, then no place is unique. The sense of place that gives towns identity is lost. Replacing the ubiquitous lawn with regionally specific native plants develops place identity.

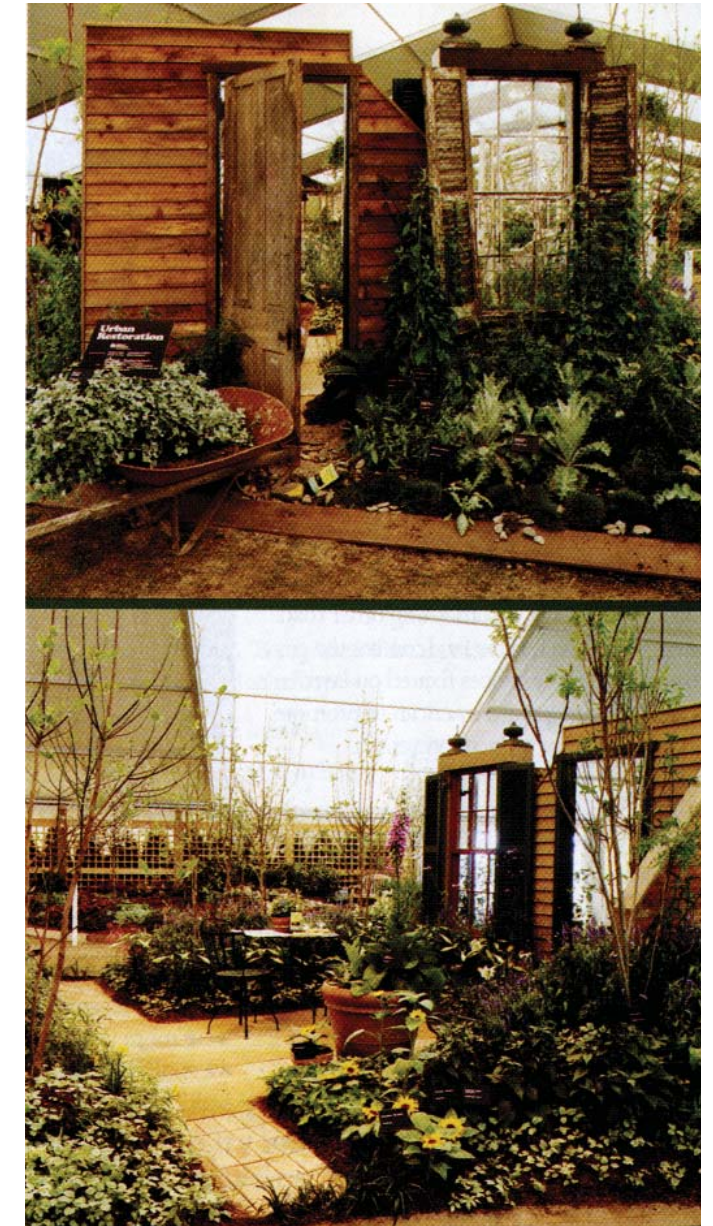


Fig. 8: Visitors found the “wild” garden (top) more attractive than the “restored” garden (bottom)



Fig. 9: Native landscaping connects people to local ecology and natural systems



# NATIVE ALTERNATIVES TO LAWN

## PLANNING

### Location

Any lawn, no matter its location, can be replaced with a meadow or other native planting. Sunny or shady, dry or moist, there is a group of native plants which have naturally adapted themselves to that condition, and can be planted. Lawns can also be replaced on any type of property: residential, commercial, parks, roadsides. Native landscaping is beneficial everywhere.

### Choosing the Plants

It is important to choose plants that are adapted to the specific conditions of the property, so that they will thrive without assistance. Look for low-lying area that dare damp, sunny and dry hillsides, shady areas under trees. For an appropriate list of native plants for each environment, consult with the local Ag Extension office or refer to the resources list at the end of the chapter.

Many lawns are in open sunny locations, so replacing it with a meadow is usually the appropriate measure. A meadow is a mix of grasses and wildflowers, usually with a higher percentage of grasses than wildflowers. There are two types of grasses, “warm-season” and “cool-season”. Warm season grasses grow in warm weather and are typically found in mid-western prairies. Cool season grasses grow in the cooler spring and early summer months, and are typically found in eastern meadows. But the two types can be found it both prairies and meadows and may be used interchangeably. The grass in a meadow serves the important function of keeping out weeds, supporting the wildflowers, and providing cover and food for birds.<sup>16</sup>

There are two types of flowers that can be planted: annual and perennial. Annual flowers bloom immediately, but do not return the following year. Perennial flowers take two to three years to become established, but then perpetuate in the

become established, but then perpetuate in the garden. When first planting the meadow, seeding a mix of annual and perennial flowers will give the meadow an immediate bloom while waiting for the long-lasting flowers to become established.<sup>17</sup>

### Installing the Meadow

First, the existing turf, roots, weeds, and seeds must be removed. This can be done by cutting out the sod, placing black plastic over the turf to use solar heat to kill the existing plants, or, in large-scale situations, tilling the soil and planting meadow plant seeds and a cover crop such as barley that will grow quickly and shade out any weeds.<sup>18</sup> Refer to the resource list at the end of the chapter for more detailed instructions.

Once the soil has been cleared, it should be seeded with an appropriate mix of grasses and flowers, the soil tamped, and a light layer of mulch spread. The seeds should be watered lightly over six weeks to encourage germination.<sup>19</sup>

It is also possible to plant “plugs”, very young plants that have already sprouted. The meadow is established more quickly, but this method requires more money and work. In Pennsylvania, April is the ideal month for planting.<sup>20</sup>

Another method of meadow establishment is to simply stop mowing the lawn and see what grows. Many wildflowers will arrive on their own, including Joe Pye weed, goldenrod, and milkweed. This meadow will provide habitat, but the property owner will have no control over the species of plants and flowers that grow.<sup>21</sup>



Fig. 10: Native meadows can be installed anywhere there is unused lawn, including fast food restaruants



Fig. 11: Delaware has recently launched an initiative to plant native meadows in highway median strips, lowering maintenance costs and creating wildlife habitat



Fig. 12: Explaining the purpose of a front-yard meadow with a sign will explain to neighbors that the meadow is intentional

## BUYING NATIVE PLANTS

**A native plant is one that was present in that region before European settlement.**

**Importance of a local ecotype:** The plant's ecotype refers to the region to which it was grown. Planting natives that are the local ecotype means that it is best adapted to the local climate conditions and local pollinators. The plants will be more successful because they will not be shocked by a climate condition change. Red maples are native to most of the United States. But a red maple grown in Washington and planted in Pennsylvannia will not do as well as a tree grown and planted in Pennsylvania.<sup>22</sup>

**Source of native plants:** Nurseries that sell native plants either grow them or collect them from the wild. Always buy nursery-propigated plants, because taking wild plants degrades the natural ecosystem from which they were taken.<sup>23</sup>

**Where to buy native plants:** There are several nurseries in Pennsylvania that sell propagated native plants. Refer to the reference section at the end of the chapter for a list.



Fig. 13: Grass plugs starts a meadow quickly



# NATIVE ALTERNATIVES TO LAWN

## COSTS

The costs of maintaining a lawn are high. Americans spend \$750 million each year on grass seed and \$25 billion on do-it-yourself lawn and garden care.<sup>24</sup> Alternatively, the costs of a natural landscape include the initial cost of plant stock, and then almost no maintenance costs. By converting lawn to native landscaping, the CIGNA headquarters in Connecticut has cut the maintenance crew in half and reduced their annual landscaping budget by \$400,000.<sup>25</sup> Conversation Design Forum, a Chicago based firm, estimates that a mature native landscape results in saving of \$4,000 per acre each year compared to conventional turf.<sup>26</sup> Homeowners and local governments alike will feel the financial benefits of replacing turf with meadows or other natural landscaping.

## MAINTAINING A MEADOW

### Maintenance Schedule

The first three years of a meadow garden will require the most time and money. Once established, the meadow will be nearly maintenance free. During the first year, while the plants are still small, the meadow will need occasional mowing to keep the weeds down. The second season, weeds in the meadow garden should be hand pulled. From the second season on, the meadow will need to be mowed only once, in late winter or early spring.<sup>27</sup> Mowing is important to remove the old stalks and return the organic material into the soil cycle. Meadows and prairies were adapted to regrow after burning, so a controlled burn is another possible way to help the meadow function like a native ecosystem. Controlled burns take a lot of preparation, contacting the fire department, acquiring permits, warning the neighbors. But it has the best benefits and is a visible way to raising awareness in the neighborhood about meadow gardens.



Fig. 14: Replacing most of the lawn with a native meadow reduces maintenance and creates wildlife habitat. Leaving some lawn as a border signals to viewers that the meadow is intentional and tended



Fig. 15: Meadows need to be burned or mowed once a year. Burning should be done by experienced people

## Invasive Species

The National Invasive Species Council defines invasive species as species that “are alien [non-native] to the ecosystem under consideration whose introduction does or is likely to cause economic or environmental harm or harm to human health.”<sup>28</sup> Many now invasive plants were originally imported as garden varieties, and have since escaped. The most environmentally important change property owners can make, even more important than replacing turf, is to remove invasive species from their property -- those intentionally planted and those that have seeded themselves. Removal techniques include mechanical removal, by hand-weeding or mowing; chemical techniques, by applying herbicides; and environmental techniques, by manipulating the environment to something invasives cannot tolerate, like high grass shading out seedlings.

## COMMON INVASIVE PLANTS

Invasive plants are non-native species that grow aggressively, spread, and displaces other plants.<sup>29</sup>

- Purple loosestrife (*Lythrum salicaria*, *L. virgatum*)
- Japanese honeysuckle (*Lonicera japonica*)
- Multiflora rose (*Rosa multiflora*)
- Japanese knotweed (*Polygonum cuspidatum*)
- Oriental bittersweet (*Celastrus orbiculatus*)
- Barberry (*Berberis thunbergii*)
- Burning bush (*Euonymus alatus*)
- Privet (*Ligustrum obtusifolium*, *L. vulgare*)
- Wineberry (*Rubus phoenicolasius*)
- Garlic mustard (*Alliaria petiolata*)



LANDSCAPE ORDINANCES

Although environmentally-friendly lawn alternatives are growing in popularity, there are still some “weed” ordinances which can lead to controversy over natural landscaping. These laws, usually set by local governments or homeowner associations, govern the height or type of plants that may be grown. In an area where many residents still cling to the conventional lawn, these steps may help avoid conflicts.

- 1. Research local ordinances to find what local laws are in existence
- 2. If there are any local laws that conflict with the proposed natural landscaping, apply for a variance
- 3. Start with smaller plantings in the backyard, and expand from there.
- 4. Share plans with neighbors, explaining the benefits of converting a lawn to natural landscaping
- 5. Include borders around native plantings. It makes the native plantings look more appealing and cared for

Most objections to lawn conversions arise because the new design does not conform with the norm of a manicured lawn. However, some neighbors may discover that they like the alternative design and may replace their own lawns.

Adapted from Sullivan, Kristi. & Margaret Brittingham. (2010). *Meadows and Prairies: wildlife-friendly alternatives to lawn*. Penn State Agricultural Research and Cooperative Extension. <http://pubs.cas.psu.edu/freepubs/pdfs/uh117.pdf>

PLANTS TO ATTRACT BUTTERFLIES

Food Plants

- Milkweed (*Asclepias syriaca*)
- Aster (*Aster* spp.)
- Wild indigo (*Baptisia lactea*)
- New Jersey tea (*Ceanothus americanus*)
- Turtlehead (*Chelone glabra*)
- Wild lupine (*Lupinus perennis*)
- Wild petunia (*Ruellia humilis*)
- Ironweed (*Vernonia fasciculata*)

Nectar Sources

- Butterfly weed (*Asclepias tuberosa*)
- Aster (*Aster* spp.)
- Coreopsis (*Coreopsis* spp.)
- Purple coneflower (*Echinacea pupurea*)
- Fireweed (*Epilobium angustifolium*)
- Joe-pye weed (*Eupatorium dubium*)
- Wild sunflower (*Helianthus* spp.)
- Blazing star (*Liatris* spp.)
- Cardinal flower (*Lobelia cardinalis*)
- Bee balm (*Monarda didyma*)
- Wild bergamot (*Monarda fistulosa*)
- Phlox (*Phlox paniculata*)
- Black-eyed Susan (*Rudbeckia laciniata*)

Adapted from Johnson, Lorraine. (1998). *Grow Wild!*. Fulcrum Publishing: Golden

GRASSES FOR NATIVE MEADOWS

Grasses are the foundation of a meadow, and should be 45%-65% of the meadow mix.

Side oats gramma (*Bouteloua curtipendula*)  
Grows 18-24 inches high, showy flowers and seeds, fall color.

Virginia wild rye(*Elymus virginicus*)  
Grows 3-5 feet with foxtails

Switch grass (*Panicum virgatum*)  
Grows 4-5 feet with fall color.

Little bluestem (*Schizachyrium scoparium*)  
Grows in clumps 6-12 inches high, with flowers 2-3 feet high. Brilliant fall color

Prairie dropseed (*Sporobolus hterolepis*)  
Grows 2-3 feet high, bright green foliage

Adapted from Greenlee, John. (2009). *The American Meadow Garden: creating a natural alternative to the traditonal lawn*. Timber Press: Portland

GRASSES FOR NO-MOW LAWNS

Some native grasses naturally grow low, creating the look of a lawn, but with all of the benefits of a native meadow

Blue gramma (*Bouteloua gracilis*)  
Blue-green foliage grows 4-6 inches high. Full sun. Does well when mixed with buffalo grass (*Buchloe dactyloides*)

Buffalo grass (*Buchloe dactyloides*)  
Sod-forming, and drought tolerant.

Pennsylvania sedge (*Carex pensylvanica*)  
Clumping. Does well in shade and sun.

Adapted from Greenlee, John. (2009). *The American Meadow Garden: creating a natural alternative to the traditonal lawn*. Timber Press: Portland



Aster



Black-eyed Susan



Switch Grass



Little Bluestem



Blue Indigo



Beebalm



Cardinal Flower



Butterflyweed



Phlox

Fig. 16: Common grasses and flowers in a meadow





Fig. 17: Native meadow garden at Oregon residence



Fig. 18: Native meadow in front of a North Carolina residence

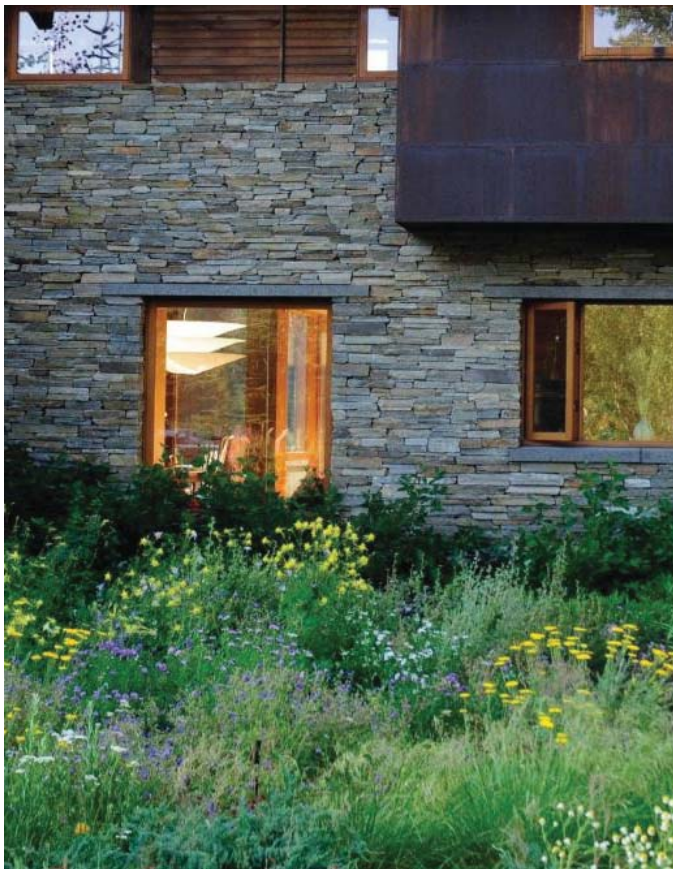


Fig. 19: Native meadow sweeps to the house

**Native Meadow Garden, Oregon. (Fig. 17)**  
The meadow can be designed and used as a garden, having the advantages of a meadow: high wildlife value and low maintenance, and all of the beauty of a garden. Incorporating native plants throughout the property, not only in the front, will yield a beautiful landscape.

**Native Meadow, North Carolina (Fig. 18)**  
Planting a native meadow at the edges of the property reduces the amount of lawn to be maintained and frames the property with regionally identifying plants.



Fig. 20: Native meadow, Minnesota

**Native Meadow (Fig. 19)**  
Using native plants in the landscaping develops place identity specific to the region, and creates a unique look for the property.

**Native Meadow, Minnesota (Fig. 20)**  
This Minnesota suburban property has replaced much of their lawn with a wildflower meadow. The strip of turf border the meadow defines the meadow as an intentional design, signalling to neighbors that the property owner is responsible when growing the meadow, rather than irresponsible about mowing.



NATIVE ALTERNATIVES TO LAWN: EXAMPLES

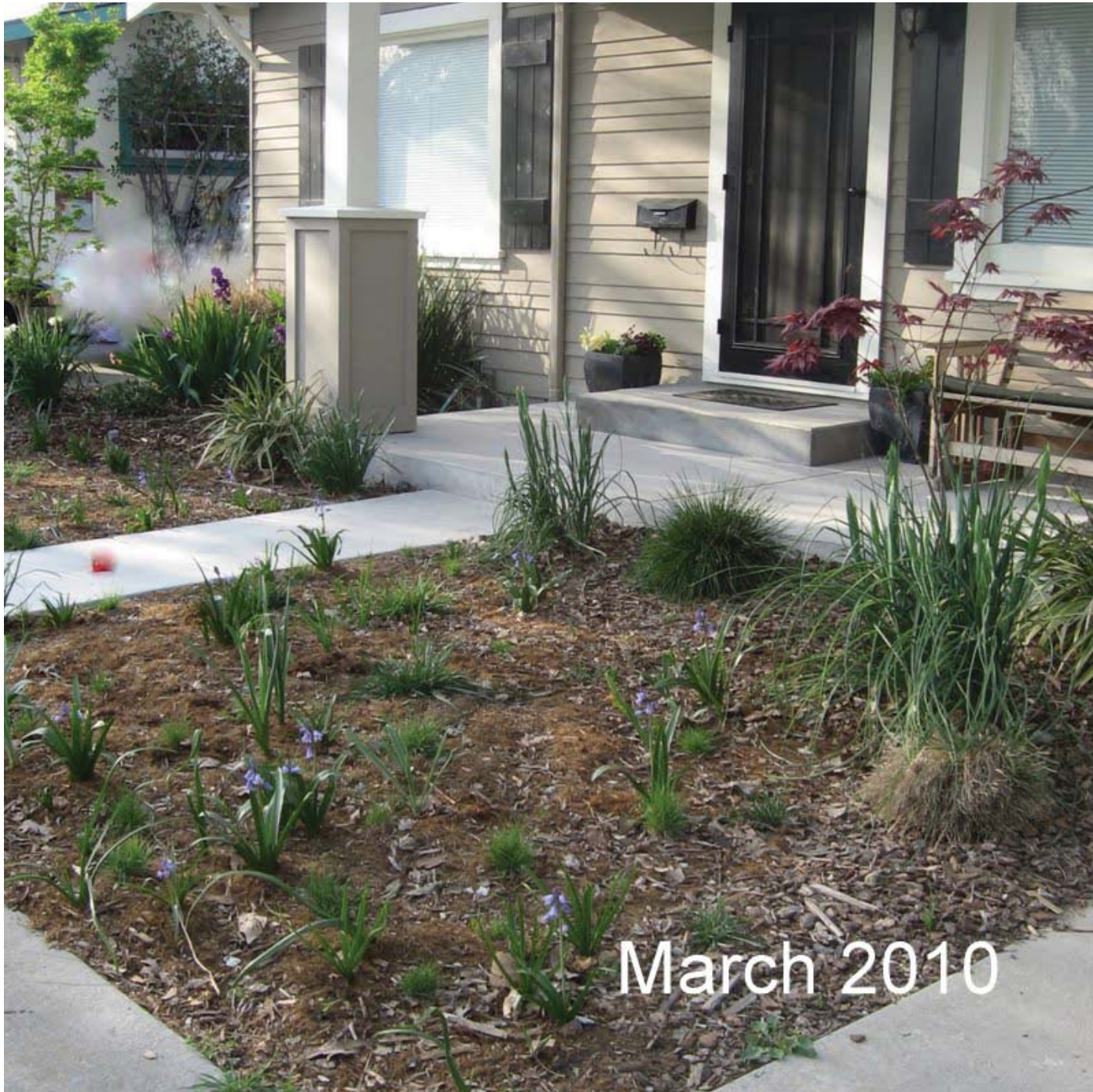


Fig. 21: Front yard meadow just after planting

**The Growth of a Native Meadow. (Fig. 21, Fig. 22)**

These two photographs were taken of the same property in San Jose, California, one year apart: when the meadow was planted and one year later. The growth of the plants was extensive, looking like a lush meadow one year after installation. The meadow grasses and flowers are fast growing, so homeowners do not need to be concerned about a “messy” looking property when replacing turf with native meadow. The property owners have gotten many positive comments from their neighbors about the meadow that replaced their turf lawn.



Fig. 22: Front yard meadow one year after planting has filled out and is growing robustly





Fig. 23: Low growing native grass, like red fescue, looks like a lawn, but requires little maintenance

## No-Mow Lawn. (Fig. 23)

The landscape architecture firm Shades of Green Landscape Architecture designed this residence in Sausalito, California with a no-mow lawn. Planting a mix of naturally low growing fescues, the designers created a landscape that looks like a lawn, but only needs once-yearly mowing.

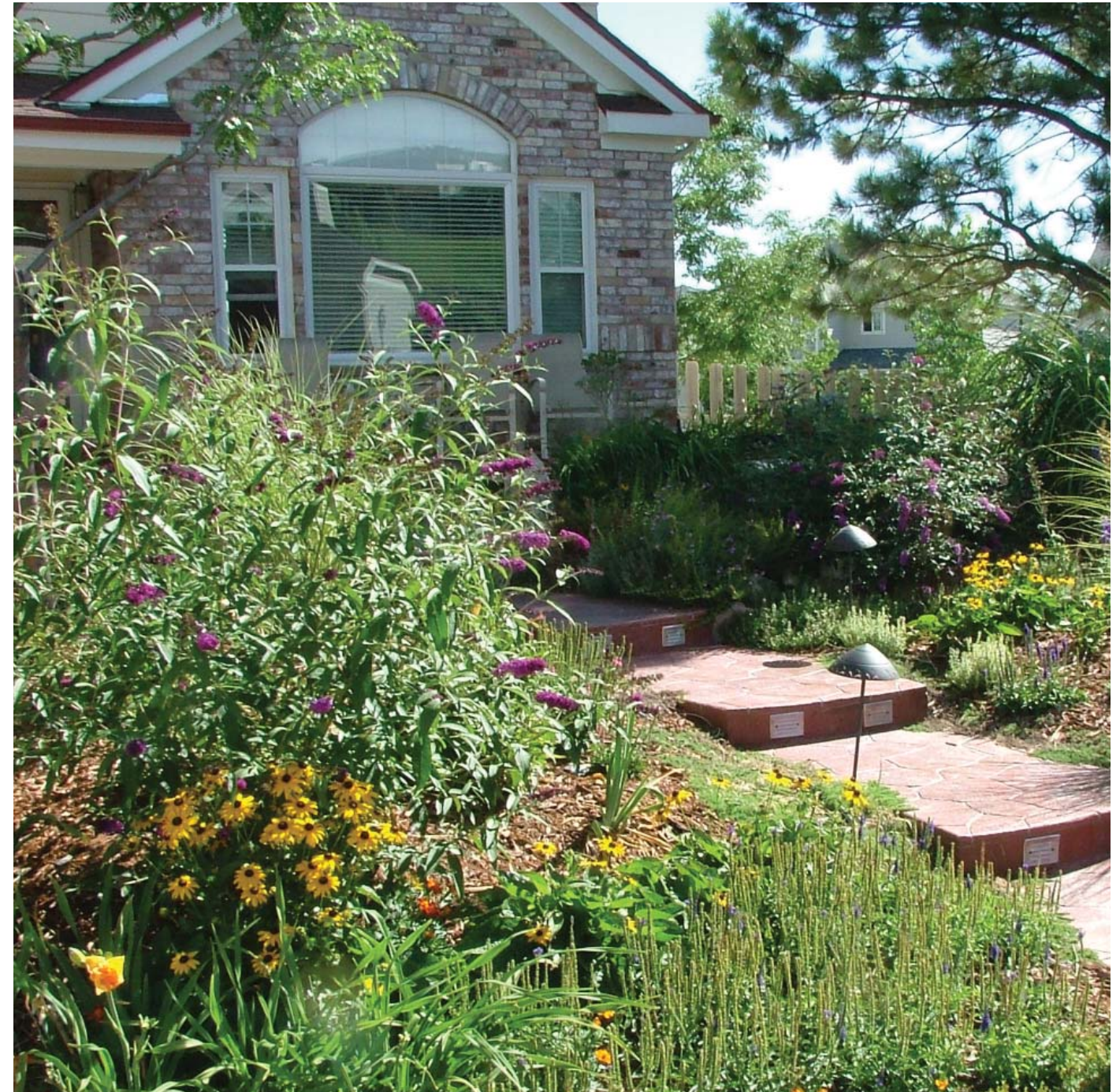


Fig. 24: The lawn can be replaced with a garden of native plants, rather than a wild meadow

## Native Plant Garden (Fig. 24)

Rather than seeding an even mix of native plants as a meadow, the native plants can be arranged to create a garden in the front yard. This alternative gives a tended look to the property, and still provides all of the benefits to the environment that replacing turf with meadow does. This residence is located in Kansas.



### FURTHER RESOURCES

- **Greenlee, John. (2009). *The American Meadow Garden: creating a natural alternative to the traditonal lawn*. Timber Press: Portland**  
This book is a photograph-rich resource on the entire process of converting lawn to meadows. The author gives design advice for grass use, provides plant lists, describes how to plant a meadow, and provides case studies of residential meadow plantings.
- ***Greenscaping: Greenacres*. (2008) U.S. Environmental Protection Agency. <http://www.epa.gov/greenacres/wildones/handbk/index.html>**  
This online handbook was created by Wild Ones, a not-for-profit natural landscaping society. The handbook provides a history of lawns and sustainable landscapes, as well as practical advice on the creation of a native landscape, from what plants to use to where to buy them.
- **Guide to Gardening for Life in Southeastern Pennsylvania. The Audubon Society. [http://web4.audubon.org/bird/at\\_home/GuidetoGardeningForLife\\_PA.html](http://web4.audubon.org/bird/at_home/GuidetoGardeningForLife_PA.html) free download.**  
This free book offers native plant lists for Pennsylvania landscaping and details steps to make a more wildlife friendly yard, including how to create meadows and how to manage deer.
- **Pennsylvania Department of Conservation and Natural Resources. (2000) *Invasive Plants in Pennsylvania*. <http://www.dcnr.state.pa.us/forestry/InvasivePlantBrochure.pdf>**  
This publication by the Pennsylvania DCNR lists the most common invasive plant species in the state, where they are found, and how to remove them.
- **Johnson, Lorraine. (1998). *Grow Wild!*. Fulcrum Publishing: Golden**  
This book is a reference to those who are planting native plant gardens, including meadows, on their property. The book describes native plants appropriate to each region, including plants native to woodlands and prairies, which are both applicable to Pennsylvania. The book provides plant descriptions and examples of properties where the native landscaping was used.
- **Lady Bird Johnson Wildflower Center. website. <http://www.wildflower.org/>**  
This organization is dedicated to education about and conservation of native habitats. The website offers many resources to native plant gardeners, including a list by state of native plants, images of native plants, and resources about native plants.
- **Maryland Native Plant Society. website. <http://www.mdflora.org/>**  
The Maryland Native Plant Society's mission is to promote awareness, appreciation, and conservation of native plants and their habitats. Many Maryland native plants are also native to Pennsylvania, so this is a useful source for Pennsylvania residents. This website gives detailed descriptions of native plants, useful when picking out the plants for a native
- **Penn State Cooperative Extension. website. <http://extension.psu.edu/>**  
Each state's cooperative extension is run by a land grant university that provides agricultural resources to state residents. The cooperative extension can inform what the local environments are, and what plants are best adapted to them, so that the homeowner can incorporate these plants into their lawn alternative design.
- **The Pennsylvania Native Plant Society. website. <http://www.pawildflower.org/>**  
This non-profit educational society seeks to increase the understanding and appreciation of Pennsylvania's native plants through field trips, newsletters, and an annual plant sale. Their website connects visitors to important resources, like PA native plant nurseries, and other websites where more native plant information can be found.
- **Wild Ones. website. <http://www.for-wild.org/>**  
Wild Ones is a not-for-profit environmental education and advocacy program. The website provides many well written articles on a variety of topics related to landscaping with native plants.
- **Zimmerman, Catherine. (2010). *Urban and Suburban Meadows: bringing meadowscaping to big and small spaces*. Matrix Press Media: Silver Spring.**  
This book is directed to suburban homeowners who wish to convert their lawn into a meadow. It covers how to design, build, and maintain a meadow, and resources for further research and buying plants. Many photographs of built meadow gardens and meadow plants offer inspiration.

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## **ACADEMIC VITA**

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Bachelors in Landscape Architecture, Pennsylvania State University, Spring 2011  
Honors in Landscape Architecture

Thesis Title: Ecological Sustainability for Small Town Pennsylvania: how green living is for all people

Thesis Supervisor: Bonj Szczyguel, Associate Professor

#### **Work Experience**

- Intern, Baltimore County Soil Conservation District. Cockeysville, MD  
June – July 2010  
Survey sites; Learn the bureaucratic, economic, and design procedures for conservation
- Intern, Callahan and Ass. Landscapers. Herford, MD  
May – August 2009  
Sketched, laid out, installed, and maintained residential landscapes
- Intern, Manor View Farm. Monkton, MD  
May – August 2008  
Participated in propagation, field growth, sales, maintenance, and inventory of plant stock
- Intern, KCI Technologies, Inc. Hunt Valley, MD  
Organized professional licensing reference for engineers, landscape architects, and architects

#### **Grants Received**

Academic Excellence Scholarship [2006-2011] (Schreyer Honors College)  
Penn State Bookstore Scholarship [2006-2011]  
Schreyer Ambassador Travel Grant [2010] (Schreyer Honors College)  
Ann Pellow Wagner Memorial Scholarship [2009, 2010]  
Maryland Nursery and Landscape Association Scholarship [2009]  
American Nursery & Landscape Ass. Horticultural Research Institute Scholarship [2009]  
Carmen C. Fenza Memorial Scholarship [2008]

#### **Awards**

Member, Phi Beta Kappa [2011]

Student Marshal, Dept. of Landscape Architecture [2011]  
Member, Golden Key Honor Society [2009-2011]  
Dean's List [Every semester 2006-2011]  
Departmental Award of Excellence in the Study of Landscape Architecture [2007, 2008, 2010]  
Planting Design Departmental Excellence Award [2009]  
Humphrey Repton Creative Writing Award [2007]

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