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COMMUNITY SUPPORTED AGRICULTURE AT INDIAN CREEK NATURE CENTER'S
SUGAR GROVE FARM: SUSTAINABLE FARMING FOR IOWA

By

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January 2017

A capstone report submitted in partial fulfillment of the requirements for the degree

of

MASTER OF NATURAL RESOURCES and NEPA Certificate Program

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Abstract:

Agriculture is the largest revenue source for the state of Iowa and the state's two priority crops are corn and soybeans. Farming practices that emphasize monoculture production of these crops can reduce biological diversity and habitat for all-important pollinators, and exacerbate runoff and erosion that sends nutrient-rich soil, herbicides, and pesticides into streams and rivers. The industrial agriculture model is lucrative now, but unsustainable for Iowa over the long run. Sugar Grove Farm, a subset of Indian Creek Nature Center (ICNC), plans to grow a variety of food crops on a large-scale, economically sustainable farm, and support low-income households in Linn County by implementing a subsidized, community supported agriculture (CSA) program. By using the processes of agroecology and restorative agriculture, the nature center will work in conjunction with Iowa's natural resources to grow quality produce that is affordable for a sector of the community who lacks financial opportunities to purchase quality fresh food. I have worked with numerous community partners, conducted research in agroecology, and conversed with experts in the field. This paper outlines the CSA logistics and plans, providing data and reasoning to the importance of sustainable agriculture and the necessity to educate Iowa's future farmers to adopt similar techniques. Indian Creek Nature Center's CSA program will launch in 2018.

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Glossary of terms and acronyms

Agroecology- The study of interactions among plants, animals, humans, and the environment within agricultural systems.

Alley cropping- Planting crop plants between rows of closely planted tree and shrub plants.

Broadacre- Land suitable for farms practicing large-scale crop operations.

CSA- Community Supported Agriculture, a program through which participants buy shares of a farmer's crop prior to the growing season. Participants pick up shares of fresh produce throughout a season, usually anywhere from 16-24 weeks.

FIF- Feed Iowa First. Not-for-profit organization based in Cedar Rapids, Iowa helping combat food insecurity.

GIS- Geographic Information Systems. A computer system for capturing, storing, checking, and displaying data related to positions on the Earth's surface. Capable of showing many kinds of data on one map.

ICNC- Indian Creek Nature Center. Not-for-profit nature center based in Cedar Rapids, Iowa. Owner of Sugar Grove Farm.

Open-pollinated- Plants that self-pollinate, or are pollinated by another representative of the same variety. The resulting seeds produce plants roughly identical to their parents.

Polyculture- The simultaneous cultivation of several crops or kinds of animals.

Restorative agriculture- The act of growing perennial food crops by creating agricultural systems that imitate nature in form and function while still providing food. This system takes advantage of all the benefits in a natural, perennial ecosystem.

Silvopasture- The practice of combining forestry and grazing of domesticated animals in a mutually beneficial way.

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Introduction

Problem Statement:

A state built for agriculture, Iowa is known for its highly disturbed natural landscape. More ground is covered in corn and soybeans than in any other state in the country. Iowa was once covered in thick prairies and oak savannah forest, but little of that remains. Shifting glaciers flattened most of Iowa two and half million years ago, leaving behind its current topography of small rolling hills and grasslands. As the glaciers shifted and moved, they pushed layers of sediment across the Iowa landscape, leaving extremely rich, dense topsoil in their place. Pioneer settlers' actions started the decline of ecologically diverse land into landscape more suitable for food growth. This change has resulted in a state with a booming economy due to its successful agriculture, but not without the consequences of extreme degradation to the forests, prairie, and soil.

Indian Creek Nature Center (ICNC), a privately funded 501(c)(3) nonprofit, was recently gifted a 200-acre parcel, Sugar Grove Farm, just north of Cedar Rapids, Iowa. Presently the farm consists of large row crop fields for corn and soybeans, a farmhouse, icehouse, walk-in chicken coop, 3 large barns, 3 large silos, and 13 acres of woodland. Adjacent to this primary property sits a 9-acre parcel that was once the site of an old grain mill; ICNC owns it as well. Sugar Grove Farm, under ICNC management, will become an economically and productively sustainable working farm. Through the processes of polyculture, restorative agriculture, and agroecology, Sugar Grove will grow large quantities of produce and restore the native landscape of the farm. Educational programs offered at the farm will highlight the impacts and outcomes of sustainable farming practices.

The goal of this capstone is to develop a community supported agriculture (CSA) program to showcase the farm's food growing abilities using sustainable practices, and to provide healthy, affordable, fresh food for a variety of people in Linn County. This CSA will be one of many programs developed at the farm, but the CSA is unique in that it will provide a tangible connection for participants to the sustainable agriculture practices used onsite. This CSA program also provides community support for initiatives at the farm. Indian Creek Nature Center has been a consistent leader in sustainability for both its city and state. Sugar Grove Farm will showcase the state's history and the future of agriculture through sustainable practices that will ultimately restore the farmland.

Background Information:

Many challenges face the future of agriculture in Iowa, including the diminishing, non-renewable resource of crude oil, the effects of climate change, and the threats current farming systems place on natural resources like water and soil quality. Iowa currently faces such challenges, each of which affects the production of food, a staple that all human beings need to survive and a livelihood for many of the state's farmers. In order for Iowa's landscape to stop deteriorating, current and future farmers' behaviors, attitudes, and practices must continue to evolve toward practicing agriculture that restores Iowa's natural resources.



Figure 1- A land cover map of the state of Iowa from the year 1850. This map gives a clear visual of the amount of prairie, forest, wetland, and water in the state of Iowa prior to the agricultural era.

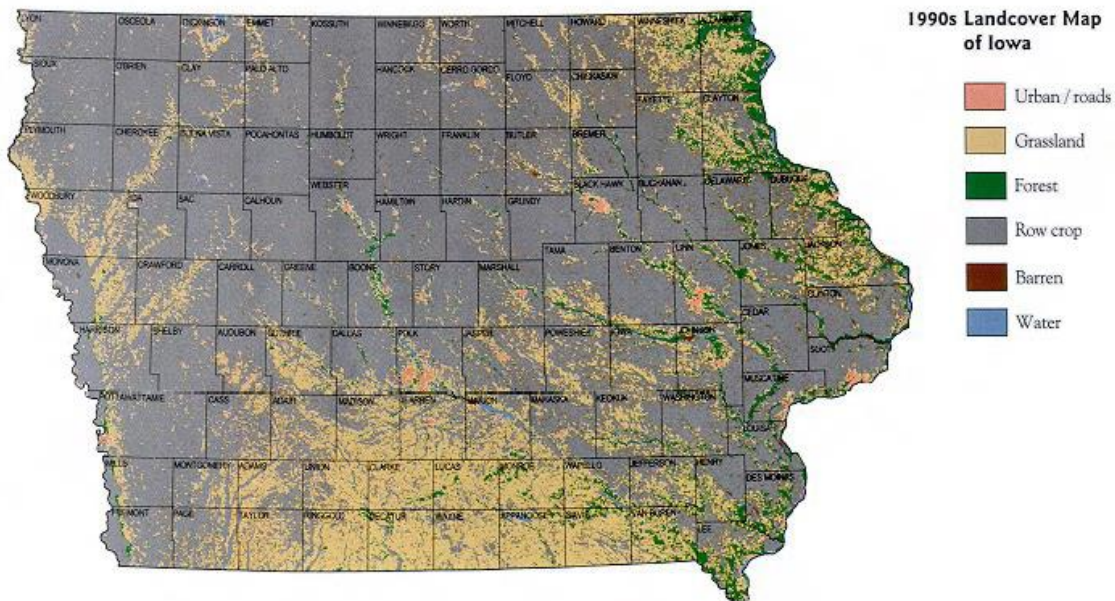


Figure 2- A land cover map of the state of Iowa from the 1990s. This map, compared to Figure 1, shows dramatic changes that occurred on the land during 130 years. Here, one gets a visual of how the land is being used for urban environments, grasslands, forest, row crops, barren land, and water.

In Figures 1 and 2, one can compare the change to Iowa's land cover over the years. By the year 1900, almost all of Iowa's 36 million acres were turned into farmland. In 1846, prairie, grasslands, and dense forests dominated Iowa, and these dense forests covered 19% of the land cover. Only 8% of forests remain in the state (Iowa DNR, 2016), approximately 2.85 million acres (Feely, Gipp, & Tauke, 2016). Aron Flickinger (2010), special projects forester for the Iowa Department of Natural Resources, observed that:

This dramatic change of diverse prairie to a monoculture of cropland altered the ecosystem. Twenty-eight million acres of bluestem, dropseed, compass plants, coneflowers, gentians, and 200 other species were transformed, in a relative eye blink, into a patchwork of corn, wheat, oats, hay and pasture. (p. 20)

The majority of these plots have now been transformed into the soybean and cornfields seen today.

Trees and forests significantly affect Iowa's agriculture-based economy by protecting drinking water from pollution and conserving cooling energy, lowering average temperatures in the growing season. The remaining forests in Iowa are primarily not in city or government protected parks. Instead, 92% of Iowa's forests are on private property. Decisions of private individuals will shape the future of Iowa's forests (Flickinger, 2010). Sugar Grove Farm has roughly 13 acres of forest; it is our plan to manage and conserve this forest, and also to expand it. Sugar Grove's current row crop fields will be transformed with native and food bearing tree species, adding shade cover, erosion protection, and aesthetics to the current fields.

During the last fifty years or so, the U.S. food industry has promoted the fast and convenient. After World War II, Americans had more opportunities to get away from their scheduled lives, so quick and easy food was a convenience. Money for leisure activities grew

quickly and many families took long road trips and weekend getaways in summer. From fast food growth to changing how food is packaged and prepared in grocery stores, the food industry worked to make Americans' eating easier. In 1970, Americans spent about \$6 billion dollars on fast food. Fast-forward 30 years: in 2000, they spent more than \$110 billion dollars on it (Schlosser, 2000). Fast food and prepared foods became essentials in the American diet. More and more, American people are overweight and diagnosed with life-threatening illnesses, such as heart disease and diabetes. According to the American Diabetes Association, 29 million Americans have diabetes, and 1.4 million Americans are diagnosed every year (American Diabetes Association, 2016).

American farmers have had to make difficult choices since the rise of the fast-food industry in the United States. They could give up their independence and turn their land into corporate agribusiness, with absentee ownership. Another option is not much of a choice at all. Small farmers have been forced off their land due to the complexity of the food industry (Schlosser, 2000). The change in American agriculture and the number of independent farmers since the 1950s is undeniable. "The United States now has more prison inmates than full-time farmers" (Schlosser, 2000).

However, not all of the news is negative. Americans in many communities across the country are taking a stand for the availability of fresh, local food. Farmers markets, local food grocery stores, and CSA programs are growing and making a small, but mighty, impact. Community Supported Agriculture programs are a relatively new concept dating back less than 50 years in the United States, but the context and history of CSAs began when American communities first took root. From the times of these first communities, people understood where their food came from and knew the farmers well (FairShare CSA Coalition [FSCC], 2016). Many

people were their own farmers. It was in the 1960s in countries like Switzerland, Germany, and Japan where CSA programs, like today's in the United States, grew. Consumers began to worry about importing too much food, and the lack of food being grown in their homeland. These CSA-like programs have continued to grow. The largest in Japan, known as the Seikatsu Club, supplies food to 22 million people (FSCC, 2016). Most CSAs are not designed for that magnitude of production, yet all countries that run CSA programs have a similar mission: "seeing the farmer's face on their vegetables and shortening the supply chain to support local farmers, prioritizing environmental stewardship, and maintaining control of their local food system" (FSCC, 2016). Since 1984, when the first CSA operated in the United States, CSAs have become an integral part of the local food movement. They are consumer driven. In 1996, an estimated 500 farms were part of CSA programs. By 2012, that number had grown to an estimated 12,000 farms. The variety of positive benefits for the farmer, the land, and the consumers drive this movement forward (Gao, Vassalos, & Zhang, 2016).

However, not all CSAs are designed for low-income people. Eleven percent of Linn County residents are persons of poverty (US Census, 2016). Food insecurity, or the state of being without reliable access to nutritious, healthy foods, impacts nearly 1 out of every 6 children in the county (Grimm, Jones, & Neff, 2015). People of poverty are more likely to live in areas where fresh food is either non-existent or not as readily available, and more often convenience stores and fast food restaurants selling large quantities of calorie- and sugar-loaded foods surround these low-income neighborhoods. Grocery stores give low-income families and individuals a consumer perspective called a food mirage. This term refers to a full service grocery store where food appears plentiful, but food prices are high and economically inaccessible for low-income consumers (Grimm et al., 2015). These low-income families have

no choice but to avoid purchasing produce because it is not within their financial means. The Cedar Rapids Food Environment Alliance is working to change this current food model for Linn County. This group of approximately 30 individuals from local nonprofits and the public and private sectors share a mission that “healthy food builds strong communities” (Grimm et al., 2015). I joined the group to gain insight on food insecurity in Linn County and to find partners who could aid in the work of the CSA at Sugar Grove.

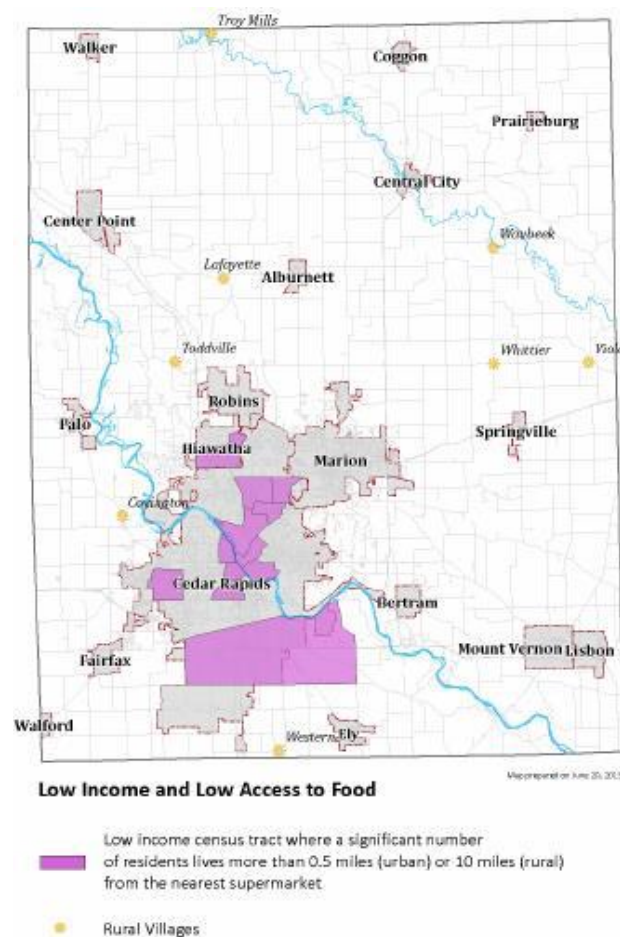


Fig. 3 This map above shows where in Linn County the neighborhoods of low-income residents reside and the distance to their neighborhood’s nearest supermarket.

The Linn County Food Systems Council was created in 2012 by resolution of the Linn County Board of Supervisors with a mission that reads,

Bringing together agriculture, food industry, educators, economic development, conservation and hunger representatives onto one council that can guide and advise the County on the necessary policies and progress that will make Linn County's food system economically, environmentally, and socially resilient. (Grimm et. al., 2015).

The council conducted data collection and found that in Linn County there were 107 convenience stores and 130 fast food restaurants in the year 2012, many near low-income schools and neighborhoods. It was apparent To Linn County that this situation needed to change. Through the food coalition group, I have begun a partnership with the Hawkeye Area Community Action Program Inc. (HACAP), and asked the organization to list Sugar Grove on their map of food pantries. Sugar Grove's CSA will be listed as an agriculture resource on the local food pantry map so low-income individuals can find Sugar Grove's CSA program.

Project Goals and Objectives:

Sugar Grove's CSA program has three goals:

1. Help consumers build personal connections to farming.
2. Educate participants of the CSA on agroforestry and restorative agriculture.
3. Provide fresh produce to low-income families in the Cedar Rapids area through subsidized member prices and a partnership with Feed Iowa First.

Goal number one is to help consumers build personal connections to farming. After participants of the Indian Creek Nature Center CSA register for the program each spring, I will organize a "meet and greet" session. This includes introducing the families to the farm, giving them a tour of the land, and hearing from the farmer and his or her crew about their plans for the

season. A social hour will ensue to give time for families to get to know one another, and also to get to know the hired farm crew, consisting of a farm manager and interns. Along with the food baskets consumers will receive each week, there will be a social media site (blog, Facebook page, etc.) hosted by ICNC. The food blog will be specifically for members of the CSA, where an ICNC staff member can upload the weekly harvest items, recommend a recipe idea for a vegetable not often used, and encourage people in the group to stay connected with each other. This site will provide CSA participants a question-and-answer forum as well, so members can stay in touch with the farmer and staff of the nature center from week to week. A social media site will encourage sharing, which is what I want to see from this CSA. There are many ways to use a social media site to drive the connection of consumer to farmer. At the end of the season, participants will be invited for an autumn farm-to-table dinner, to thank the farmer for his or her yield, provide participants a chance to sign up for the following year's CSA, communicate changes or suggestions to improve the program for the following season, and of course, to eat delicious, fresh and local food.

Goal number two is to educate the CSA participants about sustainable agriculture. Programs like this CSA provide ICNC staff teachable moments that are connected to the organization's mission. The purpose of Indian Creek "is to promote a sustainable future by nurturing individuals through environmental education, providing leadership in land protection and restoration, and encouraging responsible interaction with nature" (Indian Creek Nature Center [ICNC], 2016). The CSA program at Sugar Grove Farm directly aligns with this mission and enhances the educational opportunities ICNC can provide. Each member will learn about the practices of agroforestry and restorative agriculture through touring the farm, asking questions about the weekly shares, learning through additional education programs, and by talking to the

farm manager and other staff about the CSA and food production on the property. As education programs continue to develop at Sugar Grove, additional topics could include, “How to Amend Soil Naturally,” “Environmentally Friendly Pest Control Options for Your Garden,” and “Growing Nut Trees.” All education programs will be available to the general public. Each CSA member will also receive education through the social media site, by sharing updates about the farm and also articles related to agroecology practices. Teaching about food and the sustainable processes Sugar Grove implements are ways Indian Creek Nature Center will provide education to its CSA participants.

Not only will this CSA provide direct education to its members, but it will also provide sustainable agriculture programs for other audiences. Indian Creek Nature Center is currently working on a few of these programs, including a Farm School for high school students. Students of the Linn-Mar School District could join the farm staff at Sugar Grove for weekly classes to learn about the environmental concerns around conventional farming practices in Iowa, and to receive encouragement, as future farmers, to adopt sustainable techniques. Students from Iowa BIG, an innovative Cedar Rapids high school that emphasizes experiential learning, will also participate in a citizen science project. We hope to start soil testing in the spring of 2017 and collect data on the soil’s recovery through the years of restoration. Our future nature-based preschool, which is in the beginning stages of development, will consist of one day a week of school at the farm. Each week the preschoolers will spend their morning at Sugar Grove learning about farming with their five senses. These school-related programs will run alongside workshops, lifelong learning classes, farm-to-table dinners, and much more for the general public.

Goal number three will be accomplished through a strong community partnership with a local nonprofit, Feed Iowa First (FIF), to fight food insecurity. Sonia Kendrick, FIF's executive director, is dedicated to providing food for low-income families in the Cedar Rapids area. Feed Iowa First, with its mission "to combat food insecurity today and tomorrow by growing food and farmers," partners with schools, churches, and community organizations to request use of their land for farming (Feed Iowa First [FIF], 2016). The organization acts in the belief that all people in Iowa are valuable, no matter their means and ability to feed themselves. Feed Iowa First also promotes the rich history of Iowa's farmland and protects it for future generations. To ensure no food is wasted from the CSA program, shares that are not picked up on delivery day will be donated to FIF. Feed Iowa First purchased an old school bus (called the Veg Bus) and transformed it into a fresh produce bus, parked in and around areas of low-income families. The seats were removed and replaced with built-in boxes that hold the vegetables, creating a portable market on wheels. People are encouraged to bring a bag and load up on as many fresh vegetables as they need. There is no quantity or weight limit, creating an environment of comfort in taking what is needed. My hope is the extra produce we provide can help support this fresh market on wheels and the families that rely on it for fresh, nutrient-rich food.



Fig. 4 Feed Iowa First's Veg Bus. This renovated bus parks in low-income neighborhoods of Cedar Rapids, loaded with fresh produce. Neighborhood residents are welcome to take what they need, at no cost.

For some Iowans, this is their only source of fresh produce.

Gao et al. (2016) identified the consumers most likely to join CSAs and factors that affect retention of CSA members. They found that most participants of CSAs are female (52%), Caucasian (76%), with a median age of thirty-seven years old (Gao et al., 2016). On average, CSA members are younger, more educated, with higher income than population averages. My hope is that if appropriately marketed, ICNC's CSA will break that barrier, making food available to families who fall outside of those demographics. Strong community partnerships are vital to reach the individuals and families who truly need Sugar Grove's CSA program.

Study Area:

Sugar Grove Farm is located in north Marion, Iowa, roughly 80 miles west of the Mississippi River and the Illinois border. Marion is part of Linn County and sits at 850 feet above sea level. The land area of Marion is 16.05 square miles (U.S. Census Bureau, 2010). Linn

County is the second most populated county in Iowa, with an estimated population of nearly 220,000 and 716.88 square miles of land area (U.S. Census Bureau, 2010).

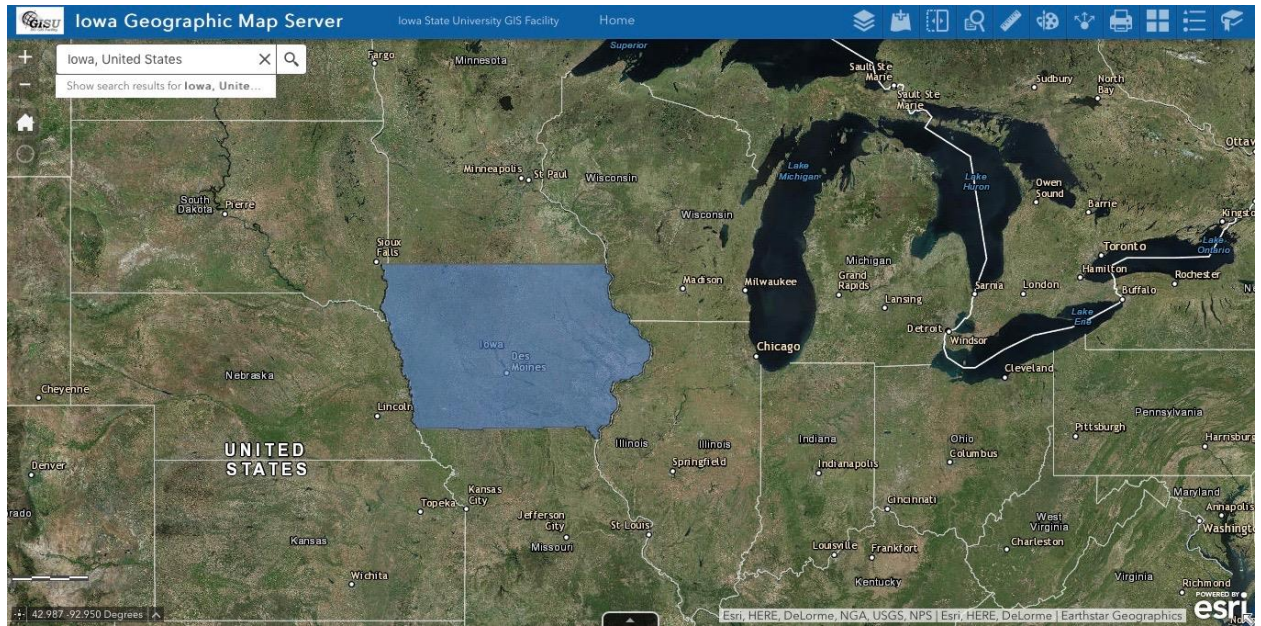


Fig. 5 Map to show Iowa’s boundaries in the Midwest region of the United States.

Sugar Grove Farm is 200 acres and divided up as shown in the map below. The two cornfields are the future sites for restoration in regard to my CSA project. The entirety of those fields will be transformed into a lush, dense food-producing forest and grassland.



Fig. 6 Map of the Sugar Grove Farm property. Using Iowa States GIS website, I created this simple map to outline how the property is currently used.

Methods:

In spring 2017, the nature center will begin collecting ecological data on Sugar Grove's property. Through a partnership with Iowa BIG, students from the high school will collect soil samples from different areas of the farm. Iowa BIG students are responsible for designing and implementing their projects, looking for help from outside resources where needed. Since Indian Creek Nature Center as an organization does not conduct soil tests, the students will design a plan to achieve testing and results. It is important that the nature center looks at current soil health and compares changes over time.

Sugar Grove Farm has operated since the 1880s and was farmed with traditional practices involving synthetic pesticides, fungicides, and fertilizers. As the nature center prepares for this restoration project, I sought to find someone in the field of agroecology and agroforestry that the nature center could engage with and use as a resource. Such a person is Mark Shepard, owner and developer of New Forest Farm, a 106-acre perennial agricultural savannah in Wisconsin, just 3.5 hours from Sugar Grove. He and his wife founded and stewarded this farm in 1994, and it is

now one of the most developed and productive perennial farms in North America. It is covered with trees, shrubs, vines, canes, perennial plants, and fungi, all planted in association to produce food for both humans and animals, fuel, medicines, and aesthetic beauty. New Forest Farm was converted from a typical row-crop grain farm to its perennial ecosystem. Using the oak savannah biome that was once there before euro-American settlement, Shepard has restored this brushland into an entirely solar- and wind- powered farm. The farm has now been operating for 22 years, and as of 2005, Shepard has planted an estimated 250,000 trees for production using agroforestry systems and alley cropping (New Forest Farm, 2016). I contacted Shepard and his staff, and told them about Sugar Grove Farm and the projected plans for the land. Shepard plans to visit the nature center in April to do a consultation with nature center staff at Sugar Grove to share his knowledge in agroforestry. Staff of the nature center, myself included, will also visit New Forest Farm in Spring 2017.



Fig. 7 Aerial view of New Forest Farm, located in Viola, Wisconsin.

Shepard's book, *Restorative Agriculture*, tells readers that the first step when restoring a piece of land is identifying which biome of the property prior to cultivation. For Sugar Grove, it is similar to the oak savannah woodland of New Forest Farm; however, the nature center's farm is a bit warmer due to its more southern location. Shepard says, "Wherever you live, and whatever biome it is, you will have greater success if you imitate what was there" (Shepard, 2013, p. 72). Further research undertaken by myself and other nature center staff will determine which vegetables, fruits, and nut-bearing trees will be grown on the farm. These plants will provide shares for the CSA program.

Logistics of the CSA:

This section will explain how the CSA program will operate. Indian Creek Nature Center will begin by advertising the CSA program through the organization's website, social media, newsletter, local food pantry map, posters and more. The targeted audience will include those neighborhoods identified previously, to ensure promotion of the program reaches the demographics the nature center hopes to benefit. Individuals and families requesting the subsidized membership fee will complete a short application form. These forms will allow nature center staff to track the number of low-income citizens interested in the program, the number of people who qualify, and year-to-date data as the CSA program grows. [See Appendix C for the subsidized application]. Community members who do not meet requirements for financial assistance may enroll online through the nature center's website or by visiting or calling the nature center. Once subsidized memberships have been awarded, these participants can do the same: register online, in person, or by phone.

Once members join the CSA, each person will be provided an information packet. This packet will include a description of Sugar Grove Farm, practices used to grow the food, pick-up

location options, wooden ICNC crate sale information, online resources managed by ICNC staff, directions to Sugar Grove, and an invitation to tour the farm and meet the staff. These packets can be emailed, mailed, or available for pick up at the nature center's main building. Online resources, such as the nature center's CSA Facebook page or blog, will be optional for members. Each member is required to choose a share pickup location. This information can be shared by simply calling or emailing the appropriate staff person listed in the packet documents. It will then be recorded in our database.

The growing season for cool weather produce, like leafy greens, starts in April, meaning the first shares are ready for pick-up by early to mid-May. Monday pick-up times allow participants to plan meals ahead. There will be three options for pick-up locations: Sugar Grove Farm, Thomas Park in Marion, or Sinclair Park in Cedar Rapids. At each location, an ICNC staff person will have the participants' shares ready for delivery. Participants can pick them up between 5:00 and 7:00 PM each Monday night. On the Fridays before pick-up, a Sugar Grove Farm intern will contact participants to share the list of produce that will be in Monday's harvest. Indian Creek Nature Center hopes that this information shared beforehand will help with meal preparation, and thereby inspire healthier eating habits. Along with the share item list, the nature center will also provide a weekly recipe idea. If members cannot make their pick-up time, they have the option of sending another family member or friend to pick up their share. If they opt out of a week's share, due to being on vacation or forgetting, their share will then be donated to Feed Iowa First on the following day (Tuesday).

Each week food items in a share will vary, depending on the growing season. The CSA shares are available for purchase in three sizes: individual, couple, and family. The size reflects how many people are in the household, and each size will vary slightly in price to reflect the

amount of produce sold. Prices will be determined as the CSA program comes to fruition in the spring of 2018.

Data Collection:

Indian Creek Nature Center will track the following membership data: number of CSA participants per year; number of subsidized memberships; member background information, including address, phone number, email, gender, income (for subsidized members only), highest degree of education, share size purchased, preferred pick-up location, and preferred method of contact. The online registration system, called DoubleKnot, will handle registrations and payment processing of CSA participants. This program organizes all of this information in an easily accessible manner. Each CSA participant will also choose how they prefer to receive our newsletter (email or mail), so the nature center can stay connected with members about other programs and news at Indian Creek Nature Center.

As for the produce data the nature center will collect, a number of variables must be measured, much of which will be collected during the CSA program's first phase in early 2018. The nature center will keep an inventory of produce planted; a map of planting locations; yields for each vegetable, fruit, and nut grown; yields the CSA produces (in weight); and the percentage of the total produce donated to Feed Iowa First. The nature center uses Google Drive to share information with all staff. It works as a live system, where one employee can enter data while others are able to view those entries in real time. This system, which makes it easy to share data and information, is where data related to the CSA will reside. The nature center will have a running spreadsheet that tracks what and how much is being grown, how much is sold to CSA participants, and the percentage donated to Feed Iowa First. This process will also let us efficiently compare year-to-year data. Another important dataset to collect and manage is a seed

inventory. The nature center has partnered with Seed Savers Exchange, a nonprofit in Decorah, Iowa, whose mission is to “conserve and promote America’s culturally diverse, but endangered garden and food crop heritage for future generations by collecting, growing, and sharing heirloom seeds and plants” (Seed Savers, 2016). Seed Savers maintains a collection of over 20,000 heirloom and open-pollinated vegetable, herb, and plant varieties. The nature center joined their Community Seed Resource Program. The farm manager and staff will collect and share seeds from Sugar Grove with the estimated 13,000 members in the same program. In future years the nature center hopes to host a seed swap at Sugar Grove Farm, which will allow us to share crop seeds with other interested seed savers and new gardeners alike. The nature center currently purchases all crop seeds from Seed Savers Exchange, and Sugar Grove Farm will do the same.

The seed inventory will include data such as: brand of seed, type of seed (noting if seed is organic or heirloom), how many seeds were planted, and where in the fields they were planted (found on the map). The location provides valuable information for future plantings, as certain vegetables have companion plants, meaning they grow more successfully with certain plants on their sides. The same spreadsheet will be used for any seedlings (young plants) transplanted directly into the ground.

Natural Resource Management Analysis:

Ecological Approaches-

Conventional agriculture often poses threats to sustainability. Intensive tillage, irrigation, fertilizer and pest application, and monocultures put future productivity at risk (Gliessman, 2006). Resources like water, soil, and genetic diversity can be overdrawn and degraded, altering ecological processes that agriculture needs for a sustainable future. Iowa was once a rich, prairie

landscape, where elk and bison roamed and wild, native plants sustained a healthy soil. Prairies are important to Iowa for multiple reasons; one of them being that the decomposition of prairie plant roots sustains topsoil growth. As roots give way, they nourish the soil and grow the state's topsoil. Iowa's virgin prairie landscape has become farmland. An estimated 15 million tons of topsoil was lost in the state of Iowa through the spring and summer season in the year 2014 (Doering, 2014). The soil is rapidly being depleted of its most important nutrients. Intensive tillage combined with monoculture and short crop rotations leave the soil exposed to wind and precipitation, causing higher rates of erosion. Soil lost through erosion is mostly organic matter, the most valuable soil component. Erosion is a major problem in Iowa due to the lack of trees and other plants with strong root systems that keep the soil stable (Flickinger, 2010). Sugar Grove Farm and the CSA program will operate in such a way that the topsoil is replenished using agroecology principles. As stated by Altieri and Nicholls (1995), agroecology goes beyond "the use of minimal dependence on high agrochemical and energy inputs (p.30)". Instead, it works collaboratively with the biological components to build a system that supports its own fertility, letting nature do what nature does best, without the use of technology or industrial techniques.

Indian Creek Nature Center will follow each of the five principles of agroecology (Altieri & Nicholls, 1995) or the CSA program. First, the nature center will increase its recycling of biomass and enhance nutrient availability, while balancing nutrients to the plants. The organization already recycles and reuses organic matter at the current nature center, and will do so on a much larger scale at Sugar Grove, fueling production. Second, Sugar Grove Farm will ensure favorable soil conditions for plant growth by adding and managing organic matter. Composting will help replenish the soil's biotic activity and keep it healthy over the years of growing seasons. This principle of agroecology focuses on recycling nutrients in the soil, making

them stronger for future years of use. The third principle is concerned with managing the microclimate: solar radiation, air, soil and water. The nature center will protect the water quality of the local and regional watershed by eliminating runoff pollution on our property and reducing chemical pollution from neighboring farms. The nature center currently harvests rainwater at both of its campuses and will do so at Sugar Grove. Sugar Grove will be planted in such a way to help reduce solar radiation and wind: by planting trees and shrubs intermixed with the crop plants, the ecosystem can naturally defend itself. Principle four speaks of species diversity over time and space. As stated above, Sugar Grove Farm will not plant in row crop design, but instead will create a woodland biome that consistently changes through natural progression. Lastly, agroecology's fifth principle says these natural processes should result in ecological interactions that benefit the earth. Sugar Grove's restorative agriculture project will mimic the past, natural processes of the earth, leaving little manipulated footprint to the earth (Altieri & Nicholls, 1995). Agricultural systems like agroecology tend to be multifunctional within landscapes and economies. They jointly produce food, and contribute to a variety of public goods, such as water quality, wildlife and habitat quality, carbon sequestration, erosion and flood protection, groundwater, and landscape amenity value and leisure (Pretty, 2008).

Projects with Iowa Big students, like the soil and water quality testing on the property, will be useful data for the farm restoration, and partnering with these students will provide us continual data collection. This partnership will be ongoing at Sugar Grove Farm. Another partner, the Nature Conservancy, has discussed the possibility of building a nutrient reduction wetland in Sugar Grove's pasture to help reduce the amount of chemical runoff from the neighboring farmer's tiles. There is potential for Sugar Grove Farm to receive funding from the US Fish and Wildlife Service for this project. A meeting in January with Nicholas Longbucco,

local watershed coordinator for the Nature Conservancy in Cedar Rapids, will provide more details for this grant proposal and wetland construction.

Human Dimensions-

Human dimension studies look at understanding human values, attitudes, and behaviors of a management decision and how they as stakeholders affect or are affected by present and future management. For my capstone, I examined current trends in attitudes toward sustainable farming practices in the area. There are mixed attitudes in regard to conventional farming versus sustainable farming and social change is hard. Money is, of course, a dependent factor. The 95th annual meeting of the Iowa Farm Bureau Federation (IFBF) focused on innovation and how it has transformed the industry in the past and is expected to in future. Iowa farmers have been under a lot of pressure because of the amount of nutrients contributing to the Dead Zone in the Gulf of Mexico, and many farmers are improving their operations to reduce nutrient loss on their property. There are, however, farmers who are enraged by non-farmers' opinions of their conventional farming practices. Craig Hill, president of IFBF, said

Farmers are taking a serious, scientifically based approach growing crops and making decisions, but critics use terms like factory farming and industrial agriculture to try to label us as villains. We're not bad because we're using new tools or bigger tractors. We're doing the best we can to do our job and we are vilified for it by some people. (Swoboda, 2013).

Education and outreach play a large role in informing public audiences and changing people's behaviors on an issue. Sugar Grove Farm will guide and educate people about agroecological perspectives on how to sustainably farm, connecting humans to agroecology and sustainability. My capstone project directly correlates with humans and their values, attitudes,

behaviors, and relationships with natural resource usage. By creating awareness to citizens who are not on farms, but might pressure conventional farm operators through their buying practices, Sugar Grove Farm can hope for transformation across the state's agriculture practices. All Iowans are stakeholders in regard to agriculture's future. I believe social influence and conformity play a factor in conventional farming across this state as well. Pressure from society influences human behaviors and attitudes (Decker et al., 2012). Many stakeholders are involved in changing conventional farming practices, including farmers, produce purchasers, transportation drivers, pest control companies, fertilizer companies, machine companies, conservationists, agroecologists, local and state governments, and more. As discussed multiple times in human dimensions, economic factors affect local and state decision-making, and these economic factors will determine agroecological development beyond Sugar Grove (Uphoff, 2002). I hope Sugar Grove becomes an inspiring example to local and regional farmers, and that production data encourages and transforms attitudes about these sustainable practices. Systems such as agroecology strengthen communities, building stronger social organization at a local level while creating new norms for managing collective natural resources. Agroecology drives "better connectedness" to policy and governance institutions as well (Pretty, 2008, p. 456). In November 2016, a water quality initiative was on the ballot in Linn County. The bond referendum, which received 74% approval from voters, will protect sources of clean drinking water, improve water quality of the Cedar River and its tributaries, preserve natural areas for wildlife, and maintain land to provide natural floodwater storage (Linn County Parks, 2016). This tells me that many farmers in the local area want to see water quality improvement. Local citizens, who are one of the most important and influential stakeholder groups in the matter, successfully impacted this year's ballot.

Policy-

Indian Creek Nature Center is a 501(c)(3) nonprofit organization through the Internal Revenue Code. It is a tax-exempt entity and the only privately funded nature center in Iowa. With assistance from the Iowa Natural Heritage Foundation (INHF) the nature center was administered a conservation easement for Sugar Grove Farm. This easement permanently protects the land from development and any use outside of what is indicated in the easement. George Etzel, who donated Sugar Grove to the nature center, partnered with INHF because he valued his land, and sought an organization that would uphold his conservation mission. Conservation easements are legal documents between the landowner and the conservation partner. They protect natural, cultural, historic and scenic features. Regarding taxes and financial effects, an easement reduces the land's fair market value, which in turn reduces the donor's taxes ("Conservation Easement basics," 2007). In the form of a separate PDF document, I have submitted a copy of the official easement (Appendix D). Included in the easement is the list of approved and restricted changes that can be made to the property. There are also a variety of maps and photographs of Sugar Grove in the document.

Economics-

Economic impacts of CSAs have been measured and cost comparisons have been made between the same produce from local markets versus CSAs. In Illinois, which borders Iowa, "CSA members' produce value was at least as high as the share price and up to 1.2 times its value" (Brown & Miller, 2008, p.1298). CSA consumers value freshness, however, studies show that in states like Illinois, these members actually pay less for higher quality food. Share prices of CSAs are set to cover operating costs and yield a fair return for the farmer's labor, helping to return financial benefits to the farmer. Sugar Grove will determine its CSA membership costs as

the program is finalized and data for numbers such as staff salaries, equipment, supplies, etc., have been calculated. Share prices will vary for subsidized memberships, depending on the applicant's salary or the total household income if it is a family share.

Intangible benefits are certainly an influence for CSA farmers and affect the economics of the farm. Roughly 87% of farmers surveyed in 2005 in nine Midwestern states were not completely satisfied with their CSA operation but 84% were satisfied most of the time, suggesting that intangible benefits play a big role in the decision to continue their CSA programs (Brown & Miller, 2008). According to Brown and Miller, more research is needed to tell how CSAs will change our food system, and they may always only play a small role. Farmers markets certainly have high impacts across the country for local and state economies. In 2004, estimates of total Iowa farmers market sales were collected. The total economic impact from farmers markets in Iowa was \$31.5 million. This calculation includes direct sale totals and personal income due to jobs created from farmers markets. The equivalent of 471 full-time jobs were directly impacted by these farmers markets (Brown & Miller, 2008). In spite of the current economic benefits for farmers that CSAs may lack, consumers will continue to help improve these benefits because "as they eat, they gain opportunities to increase their understanding of food, the challenges faced by farmers, the needs of the environment, and the potential role informed citizens can play in reshaping food and economic systems" (Brown & Miller, 2008, p. 1300).

The adverse effects of conventional agriculture on the planet's natural resources are called externalized costs. "They are real and serious, but because their consequences can be temporarily ignored or absorbed by society in general, they are excluded from the cost-benefit

calculus that allows conventional agriculture operations to continue to make economic “sense” ” (Gleissman, 2006, p. 8). If no one degraded the soil, then no one would need to purchase fertilizer and add mineral amendments or rotate their crops. Farmers spend more money each year on the integration of industry seed and chemical products, looking for more tolerant crops. In 1998, Iowa farmers spent an average of \$26 per acre on genetically engineered seeds, compared to \$18 per acre for conventional seeds (Altieri, 2005). In 2014, the cost for 1 acre of genetically modified corn costs a farmer on average \$762 dollars (Royte, 2013). These seed-plus-weed control management systems represent 35-40% of variable costs today, because many farmers are willing to pay for simplicity (Altieri, 2005). Restorative agriculture, however, significantly reduces a farmer’s cost of production by choosing crops that are locally adapted, that are bred for harvesting when young, and are site-adapted to soil conditions. Mark Shepard uses New Forest Farm as an example. In 2010, the annual production cost came to a total of \$8,672 or \$86.72 per acre. This is a third of the production costs on an annual crop farm. In 2016, a 100-acre corn farmer annually spends \$43,000 or \$430 per acre (US Dept. of Agriculture, 2016).

Spatial Analysis-

Geographic Information Systems (GIS) is a great resource for Sugar Grove Farm. With 200 acres of land, conceptual maps help both in the planning stages and as projects begin to develop on the property. By mapping the plans for each planting, we will have locations marked for each crop, making harvesting of a certain crop easier. It will also be helpful to create soil maps as the results of soil tests are completed. Geographic Information Systems will also help us map other projects on the property, like building a system of trails through the 13 acres of woodlands. The potential application of GIS will also help with farm management tasks.

Administration-

The CSA program at Sugar Grove Farm will be administered by the nature center's executive director, director of education, land stewardship director, and the farm manager. Indian Creek Nature Center will handle all registrations, payments received, and communications with participants, will organize weekly shares per member, and update the social media site. Other administrative tasks to be done include marketing the program, a responsibility of our business development coordinator. These administrative tasks are a key component of a smoothly run program. The easier it is for participants to get the correct information, and feel comfortable asking questions and relying on the ICNC staff, the more successful this and future programs will be at Indian Creek Nature Center. Administrative tasks I will handle also include building the network of partner relationships in Cedar Rapids, and evaluating the program as it progresses.

Technical Writing-

At ICNC, we consistently write articles about programs, land conservation, and sustainability of the nature center's main campus building. These articles are published on our website, in our newsletter, and often in the *Gazette*, Cedar Rapids' local newspaper. Other kinds of technical writing for the CSA program will include job descriptions for the farm employees, marketing plans for the CSA program, newsletters, questionnaires, scientific articles about the property, and a web page for Sugar Grove Farm on the nature center's website. I suspect many articles will be written about the CSA program at Sugar Grove Farm and the agroecology restoration happening on the property, for both promotional and educational use. Grants will also be written for specific projects at Sugar Grove Farm. Understanding how to plan and execute

these technical writing assignments will benefit the nature center. Many staff will play a role in these technical writing pieces, depending on staff skills and knowledge.

Quantitative Methods-

Experimental design and statistical analysis will play a large role in development and restoration work at Sugar Grove Farm. As a farm planning to replicate certain ecological approaches and methods of practice, the nature center will become a site for research. This research can be used as a resource for other farms looking to apply the same practices.

One of the first quantitative inquiries staff of the nature center will research is quantifying how much soil we are growing or replacing on the property. Through agroecology practices, we will be rebuilding topsoil for Sugar Grove Farm. This is important data to quantify and collect to statistically evaluate the methods of agroecology. Plants such as Iowa's state flower, *Rosa arkansana*, or Wild Prairie Rose, is both a food source for people and wildlife, and also a native species, whose roots can grow many feet in length. These root systems not only help hold the soil together, but also infiltrate water on the surface and combat erosion. These root systems are what made Iowa's soil so rich and nutritious. With the loss of prairie plants like the prairie rose, and the growth of conventional farming practices, much of the state's soil no longer benefits from natural decomposition, such as the decaying of these prairie rose roots.

The second quantitative inquiry is water infiltration. Water infiltration varies from the woodlands to pasture to crop fields on Sugar Grove Farm. In woodland areas soil is protected from wind and heavy rainfall, and is not compacted by heavy machinery. These soils provide better infiltration. Crop fields such as the cornfields presently on Sugar Grove Farm contribute to leaching, runoff, and water availability. In a study conducted in Georgia (Franzluebbers, 2001), two sites of cropland were compared for water infiltration. One was conventionally tilled, and

left barren throughout the winter. The other had been planted with small grains for the winter, and had not been tilled for 14 months prior to sampling. The infiltration rate was three times greater in the plot planted with cover crops than the conventional plot. In the crop fields at Sugar Grove Farm, plants will be planted in canopy layers, supporting successful water infiltration. Trees and taller shrubs provide lower lying plants protection from wind, as well as create root systems that keep the soil intact (Flickinger, 2010). Comparison studies of water infiltration at Sugar Grove Farm before and after sustainable agriculture practices begin will lend credence to those beneficial actions and will demonstrate, with hard numbers, conservation concerns regarding traditional farming practices.

Lastly, and directly related to the CSA, is a quantitative inquiry on the number of people reached and educated about sustainable agriculture. The nature center strives to reach large demographics of people and hopes to influence each person to develop a stewardship ethic for the natural world. Tools like surveys and evaluations will help nature center staff guide programming and develop connections about sustainable agriculture with CSA members. It will be important to analyze how many CSA members also attend other ICNC educational agriculture programs. Their attendance at other related programs will show their desire to understand the methods of agroecology at a more in-depth level.

Conclusions:

The three main objectives of this capstone will help measurable success as the CSA project and Sugar Grove Farm move forward. Community supported agriculture supports the connection of people to the farmer, and people to their food. Programs such as CSAs create interest in food. Many CSA members care about food's place of growth, the methods used to grow it, and the people who work hard to successfully grow the food. By building a CSA, the

nature center will build a food community. Local food can create local economic growth, local stewardship, and local relationships, all of which are beneficial to the future of Linn County.

Goal number one is to help consumers build personal connections to food and farming. Community supported agriculture brings consumers, producers, and the environment together through a local food network, and there is a much greater degree of involvement by consumers in a CSA food system than when purchasing food from a grocery store. The consumer group of a CSA is willing to fund a whole season's budget in order to get quality, local food (Zsolnai & Podmaniczky, 2010). Many members of CSAs value not only food, but also knowing where it was grown. By developing a CSA program at Sugar Grove, Indian Creek Nature Center will connect people throughout Linn County to farming in a way that sustains both humans and the environment. Sugar Grove CSA members will have the opportunity to visit the farm, not only for share pick-up, but also for tours, CSA member social events, and other educational program opportunities. Community supported agriculture members are more actively involved in the farm as a whole, too, through social media, recipes, farm visits, and visiting with farm staff (Zsolnai & Podmaniczky, 2010).

The second is to educate CSA members on agroecology and restorative agriculture. The members of Sugar Grove's CSA will find educational resources in regard to the farm's methods through multiple means. The social media site, newsletters, membership packets, and time with highly trained and knowledgeable staff leading the CSA program will be able to supply ample knowledge of the implemented agroecology practices. Visits to the farm and social gatherings for CSA members will also provide staff the opportunity to give tours of the farm to CSA members. I believe one of the best tools for educating CSA members about agroecology is through

conversation. Every interaction staff has with CSA members will be an opportunity to share the techniques used to grow their food share.

Lastly, goal number is to build a partnership with Feed Iowa First. Sonia Kendrick has been a longtime supporter of the nature center, and shares a similar desire to reach low-income families with fresh food. The CSA, although not a constant source, will at times donate extra produce for her organization to distribute to citizens all over Cedar Rapids.

Recommendations:

Community supported agriculture programs can have many beneficial effects on a local community. These can include health benefits, such as preparing more home cooked meals, eating healthier food, getting more exercise, and spending time outdoors. Creating a healthier food system means creating healthier individuals. A CSA also can inspire stewardship among its participants, who may develop a greater connection with the land and our natural resources. Members may find themselves wanting to spend more time outside, start a garden, or care more about their own families' environmental footprint on the planet. Community supported agriculture programs contribute to a city and county's economy, keeping money local. New residents moving to Linn County may find cities like Cedar Rapids and Marion more progressive, due to the ability to host such a program, creating a stronger desire to live in these cities over others. For many of the CSA members, the program may give them a sense of belonging, a feeling that they are part of a community. A CSA builds connections with individuals who may not already be connected with one another (Lamb, 1994).

Sugar Grove's CSA also impacts and benefits the land. This CSA program is an educational, environmentally sustaining project, providing fresh produce to its consumers. Mark

Shepard tells us that by fundamentally changing the face of agriculture, we change the food system and the ecological health of the planet.

Restoration agriculture creates soil, increases biodiversity, purifies groundwater and surface water, prevents runoff and erosion, can re-create springs, provides habitat for wild pollinators, reduces the need for external farm inputs, removes carbon from the atmosphere, pays more per acre than corn, and never needs to be planted again. That sounds like permanent agriculture to me. (Shepard, 2013, p. 288)

I hope this CSA is the kick-starter to a new chapter of agriculture and ecological stewardship in Iowa.

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Appendix C- Additional Information

2018 Sugar Grove Subsidized CSA Share Application

Please completely fill out all the requested information below accurately. Contact Rachel Bailey, Program Registrar if you need assistance or have any questions. You can contact her at 319-362-066r or rbailey@indiancreeknaturecenter.org Please allow at least three day for response.

Applications can be mailed to Indian Creek Nature Center, 5300 Otis Road SE, Cedar Rapids, IA 52403 c/o Rachel Bailey or emailed to the above address.

First Name:	Last Name:
Address:	City, State, Zip Code:
Phone number:	Email:

Please write down household income and size for the last two years.

Year	Household income	Household size
2017		
2013		

Please list the relationship to you, and age of each member of your household. Do not list their name.

	Relationship	Age
Household member 1		
Household member 2		
Household member 3		
Household member 4		
Household member 5		

Please provide any additional information about any changes in your financial situation within the last 2 years.

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Do you own a home?
Highest degree of school completed?
Do you participate in any state or federal subsidy programs currently? Please explain.

Signature:

Date:

Appendix D-Conservation Easement

See separately submitted PDF document for the copy of the conservation easement for Sugar Grove Farm.