Ecological Restoration of Mowed Fields

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The Ohio State University, School of Environment & Natural Resources, EEDS Capstone Course

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Executive Summary

The Ohio Department of Rehabilitation and Correction (ODRC) approached our capstone group asking us to develop a design for an ecological restoration of a land site at one of their correctional facilities, choosing which native species would be best to plant for the soil type. Our objectives also included calculating the carbon sequestration of the land, and analyzing the monetary benefits for the ODRC once the ecological restoration is finished. Our mission was to transform this unused farmland into a sustainable and beautiful space that will be utilized by the incarcerated population and many others. A fully functioning garden and a multitude of additional native plants will be utilized and enjoyed by anyone that visits this site. By restoring this land, there will be more wildlife, an increase in native species, as well as healthier soil for the native plants, a decrease in greenhouse gas emissions, and it will give the employees and incarcerated peoples a chance to learn about horticulture and the environment. This ecological restoration will help the cosmetics of the land, which in turn will be beneficial to the mental health of everyone at the institution.

Through assessing other projects that are similar in other states, we came to the conclusion that there are educational benefits that help the incarcerated population, the employees, those training at the academy, and the surrounding community. There are no projects exactly like the one at the Correctional Reception Center in Orient, Ohio, however, assessing similar projects played a significant role in our recommendations to the ODRC.

We recommend that the ODRC restore the land by building a wetland, constructing walking paths from material already on the land, planting native species to supplement current wildlife, building an apiary near the wildflowers to help with pollination, adding a community

garden that the incarcerated population can tend to, and assembling seating areas around the land so employees and residents have a place to enjoy the beautiful site.

Introduction

Sustainability has become an important goal behind the operation of the Ohio Department of Rehabilitation and Corrections' 25 facilities across the state. One way of implementing more sustainable aspects to their facilities includes restoring and repurposing unused field sites within the very near future. The Ohio Department of Rehabilitation has a correctional facility known as the Correctional Reception Center, located in Pickaway County. Within this facility site, there are currently 18 acres of old grassland that are covered by invasive species and rocks. This plot of land needs to be mowed once a month, resulting in high mowing and baling costs, as well as increased CO2 emissions. In order to save money and decrease emissions, the ODRC wants to restore this land by reintroducing native species, constructing a wetland, and implementing programs within the institution to benefit employees and residents.

In order to achieve this goal, our group was tasked with designing the layout of the land and calculating how the restoration can save the ODRC money and resources. The objectives were to reintroduce native plant species into the land, construct a wetland, establish a garden program within the institution, estimate the greenhouse gas emissions before and after the restoration, identify how the ODRC can save money from this restoration, and identify which plants are best suited for the current soil type. We researched native wildflowers, trees, and prairie grasses in Ohio that would be best for the space. Adding an apiary to the land design increases wildflower pollination by having bees located directly on the site. Building a community garden is one of the main goals of this project since it has a lot of benefits according to the research done on similar programs at other institutions. The garden has many social

benefits for the incarcerated population, and it will help them learn to garden if they do not have previous experience in that activity. Adding a walking path and a seating area gives the employees, residents, and officers in training a place to walk and spend time in nature, which is proven to be beneficial for mental health. This pathway will be accessible to everyone, including anyone utilizing a wheelchair or other mobility device, making the site enjoyable for all who visit.

These recommendations that are a result of our research will help the ODRC to save money, preserve the land, emit less greenhouse gasses, and make the plot of land more cosmetically appealing overall. Our future recommendation to the ODRC is to implement a way to receive feedback from the people at the prison, which could aid in generating new ideas, as well as increase interest in outdoor space. The restoration at the Orient location could be a blueprint for other institutions in Ohio to do similar restoration and programs.

Research Methods

The data for this project came from a variety of sources, but most of it came directly from the ODRC. The first step we took was to look at other restoration processes and similar programs at prisons in other states. By analyzing and researching these projects, we decided what programs and restoration efforts have worked at other institutions around the country. Researching native species to Ohio was an important piece of our research, but before we chose the plants, a soil sample was needed to understand what would grow best. The ODRC provided us with a soil sample, showing an abundance of nitrogen in the soil and revealing a need for plants that would absorb the nitrogen. Our group then visited the site to see the land for ourselves and map out where each plant type should be placed. The next step was to create a map of the land including all the different sections; the seating area, the wetland, the apiary, the community garden, the

wildflowers, the prairie grasses, the orchard, and the walking paths going through it. The next step was to calculate the carbon sequestration from the native species and estimate how much money can be saved once the field is restored and will not need to be mowed every month.

All of the research done over the course of the project has come together in this report to give the ODRC recommendations for ecological restoration. The overall objectives for our research were to look at the current greenhouse gas emissions and money spent from mowing activities, research the native plant species that are best for the soil type in Orient, and research the social impacts of a garden program on the incarcerated population. The benchmark analysis looked at similar programs in other states in an effort to evaluate potential impacts of the project.

Benchmark Analysis

This project is unique in many aspects, addressing social, economic, and environmental sustainability. There is growing evidence that shows the social benefits of regular interactions with the environment, including improvements in mental and physical health. Although this project is a new venture for ODRC, luckily there are similar programs that have already shown impressive results at other state prisons. One example that seemed especially relevant to this project is the Sustainability in Prisons Project (SPP) in the state of Washington. The program, started in 2003, is a collaborative project between the Washington Department of Corrections and Evergreen State College. There are a wide array of environmental programs offered to the incarcerated people, such as: beekeeping, gardening, workshops in ecology, workshops in restoration, and general environmental education. The programs, 212 in total, are aimed to not only improve the social well-being of the incarcerated population but also address the prison's environmental footprint, the education of the incarcerated people, and future job attainment

possibilities. The annual reports of these projects offer key insights on the effectiveness of the programs both socially and environmentally, and even include recidivism analysis.

The Sustainability in Prisons Project has shown impressive results both socially and environmentally. According to annual reports done by the Washington Department of Corrections, SPP programs have "excellent records of participation" and have received overwhelmingly positive responses from incarcerated individuals (*Programs*, 2020). The point of the programs are not only to improve the environmental quality of prison land, but also to improve the social well-being of those who are incarcerated and provide opportunities in job acquisition and even hobbies to keep them from returning after release. According to statements from the incarcerated individuals this seems to be the case. Here, Susan Christopher, a participant in the butterfly programs, reacts: "There is an overwhelming satisfaction in knowing that we are contributing to our environment's recovery" (*Programs*, 2020). Chuck Roark from the beekeeping program said: "The thing is, I'm a beekeeper. I'll be a beekeeper in the real world. I'll be a beekeeper for the rest of my life" (*Programs*, 2020).

The SPP annual reports don't only look into the social well-being of the incarcerated population as a result of the program, but also compare recidivism rates of SPP program graduates to the general population of the prison. Recidivism rates are recorded by taking a sample of incarcerated individuals three years after their release and recording whether or not they returned to prison within that three year period. According to the annual report for 2019, SPP participants had a recidivism rate of 26% compared to the general population which has a rate of 34% (*Programs*, 2020). This is a remarkable achievement which shows the wide array of benefits of environmental programming in prisons, something which can be replicated through the community garden section and beehive section of this restoration.

Cost of Mowing Estimates

With substantial access to data we needed, the ODRC was able to provide us with a cost analysis of mowing and baling the field, as shown below. The analysis accounts for the fuel, labor, equipment, and supplies costs. The field is mowed, on average, 9 times a year and baled 4 times a year. In the warmer seasons, it is mowed monthly and baled once every 45 days.

Cost of Mowing	Monthly	Annually
Fuel	$2,866.50	$25,798.50
Labor	$3,234.00	$29,106.00
Equipment	$716.63	$6,449.67
Total	$6,817.13	$61,354.17

Table 1. Cost analysis of Mowing

Cost of Baling	Monthly	Annually
Fuel	$2,866.50	$11,466.00
Labor	$3,234.00	$12,936.00
Equipment	$1,891.89	$7,567.56
Supplies	$420.00	$1,680.00
Total	$8,412.39	$33,649.56

Table 2. Cost analysis of Baling

Cost Savings	Monthly	Annually
Mowing	$6,817.13	$61,354.17
Baling	$8,412.39	$33,649.56
Total	$15,229.52	$95,003.73

Table 3. Cost summary of mowing and baling

To mow the field, the yearly cost on average is $61,354.17. This is because the monthly cost of fuel is $2,866.50, labor is $3,234, and equipment is $716.63 as shown by Figure 1. The field is mowed monthly for nine months of the year and is baled every 45 days, for on average, 4 balings per year. With an average annual cost of baling at $33,649.56 (Figure 2), combined with the annual cost of mowing, it would save ODRC a total of $95,003.73 annually to completely eliminate mowing and baling on the allotted land. While this is a large number, it is not entirely accurate. This is because the layout of the ecological restoration will have some small areas needing mowed and maintained. However, with a drastic decrease in mowing and baling, there will still be substantial savings for the ODRC.

Greenhouse Gas Emission Sequestration

Through a reduction in mowing and baling, not only is there a decrease in emissions, but the planting of native species will help to sequester greenhouse gas emissions in the area. Incorporating nearly 40 additional native plant species will sequester an estimated total of over 13 tonnes of CO2E per year. Figure 4 shows the specific GHG absorption rate per plant type per acre, and exhibits the acreage totals as well. These calculations were based on 1 acre and were then multiplied by the number of acres that each plant type occupied within our land layout plan. These numbers are averages from a range of researched sequestration rates. Occupying the most land, and sequestering the most GHGs, the wildflower/prairie and wetland plants provide the most environmental benefits. The amount of carbon emissions sequestered annually is double the amount that the average US home produces per year (*Strategic plan 2020 - 2025*). The sequestration is much higher with the addition of these plants, however, carbon was still being sequestered before. We do not have an estimate of carbon sequestration from the mowed fields,

as we do not know the current invasive species and how much of it is occupying the land. Nonetheless, we do approximate it to be a fraction of what it will be with the ecological restoration project.

Plant Type	Acreage	Sequestration Rate (lbs/acre)	Total (tonnes)
Garden	2.5	485.02	0.55
Wildflower/Prarie	6	661.39	1.80
Wetland	6	2,926	7.96
Trees	~100 trees (3.5 acres)	30.6	2.82
Total	**18**	**4103.01**	**13.13**

Table 4. GHG sequestration rates

Aerial Map of Plans for the Land

Figure 1. Landmap

The plans for the land are marked in figure 1 above. The green section on the right will be the community garden upon first entering the space. This will include vegetables such as beets, turnips, carrots, potatoes, and other vegetables that have a longer shelf life. These vegetables will be cared for by the incarcerated population and most of them will be given to local food shelters. The salmon colored block on the top of the map represents the wildflower field. This field includes flowers and pollinator plants that are native to Ohio. The blue section represents the wetland that will end near the creek. The small gray area is the garden shed and the pink next to it is the seating area for those who visit the site. The purple section in the middle is the orchard and next to that is the grasses and prairie plants, which are represented in orange. In the top left corner, the apiary and beehives will be kept. The white path going through is the walking path for visitors and the yellow path is through the wetland plants to the edge of the wetland.

We've selected which species to plant based on their nativity to Ohio, pollination contribution, soil recycling ability, and potential for animal habitat. This list is displayed below.

Common Name	Scientific Name	Category	Bottlebrush sedge	Carex hystericina	Wetland
Common Milkweed	Asclepias syriaca	Wildflower/Pollinator	Pointed broom sedge	Carex scoparia	Wetland
Wild Geranium	Geranium maculatum	Wildflower/Pollinator	Spotted Joe Pye Weed	Eutrochium maculatum	Wetland
Woolly Sweet-Cicely	Osmorhiza claytonii	Wildflower/Pollinator	Beets		Community Garden
Spring Beauty	Claytonia virginica	Wildflower/Pollinator	Turnips		Community Garden
Bloodroot	Sanguinaria	Wildflower/Pollinator	Carrots		Community Garden
May Apple	Podophyllum	Wildflower/Pollinator	Potatoes		Community Garden
Striped Violet	Viola striata	Wildflower/Pollinator	Raddishes		Community Garden
Wild Strawberry	Fragaria vesca	Wildflower/Pollinator	Onions		Community Garden
Bluestem Grass	Andropogon gerardii	Prairie/Grasses	Garlic		Community Garden
Indiangrass	Sorghastrum nutans	Prairie/Grasses	Tomatoes		Community Garden
Swtichgrass	Panicum virgatum	Prairie/Grasses	Peppers		Community Garden
Rough Bentgrass	Agrostis scabra	Prairie/Grasses	American Beech	Fagus grandifolia	Orchard
Hairy Grama	Bouteloua hirsuta	Prairie/Grasses	Black Oak	Quercus velutina	Orchard
Prairie Coneflower	Ratibida pinnata	Prairie/Forbs	Shumard Oak	Quercus shumardii	Orchard
Sawtooth Sunflower	Helianthius grosseserratus	Prairie/Forbs	Black Locust	Robinia pseudoacacia	Orchard
Ohio Spiderwort	Tradescantia ohiensis	Prairie/Forbs	Red Maple	Acer rubrum	Orchard
Queen of the Prairie	Filipendula rubra	Wetland	Red Mulberry	Morus rubra	Orchard
Lake Sedge	Carex lacustris	Wetland	Virgina Pine	Pinus virginiana	Orchard
Shining Ladies Tresses	Spiranthes lucida	Wetland	Eastern Red Cedar	Juniperus virginiana	Orchard

The wildflower/pollinator plants were selected for butterfly, bee, and other pollinator populations. The milkweed will hopefully foster a safe haven for many butterflies throughout the year (Ohio Division of Wildlife, 2017). For the prairie plants and grasses, we selected these plants based upon their ability to be a barrier between runoff in the park and the Big Darby Creek. These plants will remove any imbalances in the soil and recycle nutrients back into it (Ohio Prairie Association). The wetland plants were selected based on their ability to keep the wetland balanced and healthy; they were also cross-referenced with a list of wetland plants naturally found in the Big Darby area. This opens up opportunities to relocate native wetland plants from Big Darby for use in this area as well as ensuring the ODRC wetlands have similar qualities to the creek (Daniel T. Moore et al., 2011, Sasson A., et. al., 2021). The community garden crops were chosen based on their longer shelf-life. ODRC plans to donate most of the food grown in this garden to local food banks, and these crops ensure that the food won't go bad as quickly (Stockton, 2020). The orchard trees were chosen based on their nativity to Ohio and their potential for the creation of native animal habitat on the land. It also acts as a nice barrier between guests on the land and the various eagles/raptors living on ODRC ground nearby (Ohio Division of Wildlife, 2017). These trees will be planted alongside trees dedicated to officers that were lost during the pandemic.

The walkways, sitting area, and garden shed will be built out of recycled materials found on the land during initial excavation. These materials will include rocks, stones, boulders, concrete, and a portion of the parking lot area. Additional materials needed to build the garden shed may also be recycled from other ODRC departments. The yellow path leading through the wetland plants may be constructed with these recycled materials or left more natural depending on the characteristics of the soil (i.e. too soft/saturated to walk on vs firm enough to walk on).

The apiary area will come from existing hives at ODRC and the bees will be kept by appropriate staff and incarcerated people. They are positioned in such a way that they will have plenty to pollinate with the wildflowers/pollinator plants and the prairie plants adjacent to each side. There is also plenty of separation between the apiary and guests with tree coverage and other pathways moving away from the location of the apiary.

Recommendations

Initial steps

The ecological restoration of the Orient land site will have immense positive environmental, social, and economic benefits. With the help of ODRC, our capstone group has generated a comprehensive restoration plan that will be the blueprint for other field projects in the future. However, it is important to establish and prioritize initial steps for the physical planting and maintenance of this field plan. We have identified seven key initial steps that will aid in the creation of the project, which include the following:

1. Excavation of rocks and remaining rubble
2. Construction of pathways
3. Wetland construction
4. Planting previously identified native species
5. Seating area construction
6. Apiary and beehive placement
7. Planting the community garden

Currently, there are rocks, cement, and various rubble that is residing in the field. The first step should be utilizing a construction crew or ODRC maintenance crew to remove and

excavate these materials. It is important to note that we also have plans to reuse the larger rocks and cement for our walkway and decorative seating area, so they should be saved near the site if possible. Our second step includes utilizing these saved materials and any additional cement that is needed to pave and place the walkway. Wetland construction is our third step, which is included as its own step given the importance of creating a specific space for these plants. Runoff will be collected by some of the wetlands and grasses to keep runoff pollutants from entering Little Darby Creek. The fourth step includes planting the natives species that our group has identified as beneficial for the field site (holding off on the garden species until the end of construction/planting). Rough estimates of the acreage of each plant group have been included in our plan but will likely be altered when physical planting takes place. Once the seasonal plants are placed, the seating area should be created. This area falls within ODRC's discretion and personal preference, as we believe that many different types of seating areas would work well within this space, with specific consideration for visitors with wheelchairs, canes, or other disabilities. The apiary and beehive placement should follow suit (which could be heavily dependent on the season that is occurring while construction is taking place). Planting the community garden will be the final prioritized step that our group has identified. We believe that this step should be last in order to lend the opportunity for the inclusion of the incarcerated peoples or any other group that could benefit from learning how to plant garden foods.

Discussion of Limitations Within Current Analysis

Overall, we believe that our project experience and restoration field plan have been laid out with few barriers to success. Our group had streamlined access to the information that we needed, including native Ohio species lists, mowing costs, acerage information, and soil samples. The two largest limitations that our group expected to face included budget restraints and

members at ODRC not being in full support of the project. However, we had neither of those limitations come into play. No budget boundaries were put into place, and many of the faculty and supervisors at ODRC heavily advocated for the creation of this project.

One limitation that we did experience included very few benchmark analyses. There was a strong lack of examples from similar programs, and it would have been beneficial to see the challenges that similar projects experienced. There was also a limitation with calculating the amount of cement and rubble that is currently in the field, and we do not know how much cement will need to be utilized to generate a pathway. However, this did not prohibit us from achieving the task at hand, and a full ecological restoration of the Orient can still take place even without these specific calculations.

Our last significant limitation came from attempting to generate a calculation for the GHG sequestration rate of the field *before* restoration. Extensive research showed a severe lack of cohesive agreement on the absorption rate of grass (and nothing was found on dead grass or the specific height of grass and how these factors could impact sequestration). Plus, adding in the CO2 emissions from mowing to find the net sequestration rate made calculating this total extremely difficult. Our group decided to list this calculation as a limitation instead of adding in an unreliable and disagreed upon numerical total to our final research.

This project is distinctive and does not seem to resemble any others that have been completed in the past. From the research that was found on projects slightly similar, we were assured that our specific ideas will incorporate the positive parts of projects from other states. Including each of the elements of our plan would have the most social, economic, and environmental benefits.

Recommendations For Further Research

Our recommendations for further analysis and continued research include implementing ways to receive feedback from the incarcerated population within the prison who use the restored sites, which could aid in idea generation, inclusion, and increased interest. Input from ODRC employees who visit and utilize the field could also aid in the consistent improvement of this restoration project or similar projects that are carried out in the future. Periodic soil and water testing would also help further the research and analysis that is carried out at the site, and could help ODRC make adjustments to the site if they see fit. We hope that these recommendations help ODRC carry out the restoration at the Orient and many other fields in the future, pushing us all towards a more sustainable future and improving the quality of living for incarcerated peoples in Ohio.

Conclusion

In order to successfully create a space that provides environmental, social, and economic benefits, the ODRC has allotted 18 acres of mowed land to be ecologically restored and used as a space to benefit the community. Through research of other environmental projects involving the incarcerated population, an analysis of cost savings, and a survey of the land's needs and what native species would be helpful, we have created a restoration plan with recommendations that will benefit the community.

The benchmark analysis we conducted revealed multiple sustainability projects around the United States that incorporate the help of the incarcerated population. These projects, while not identical to this ecological restoration, have been valuable to incarcerated people as they obtain job training, learn new skills, and receive social, mental, and physical health benefits. By improving the wellbeing of the incarcerated people, those prisons have experienced a drop in

recidivism, showing the incarcerated people were more set up for success as they integrate back into society. These impacts are invaluable to the surrounding community. These projects also showed an improvement in environmental sustainability of the prison itself, benefitting the surrounding environments.

By restoring this piece of land at the institution, not only will it be beneficial to the environment as GHG emissions are cut, but thousands of dollars will be saved annually through a drastic decrease in mowing and baling. This project will actively improve the community economically, socially, and environmentally. We suggest that to best accomplish this project, the ODRC should take into account the needs of the land and plant native species that will balance out the soil as listed. We also recommend involving the incarcerated population throughout each step of the project. This will give them an opportunity to contribute to something greater than themselves and teach them new skills.

This project is an opportunity not only for the incarcerated people of Ohio but also for community members in the area as they use the land. Through the implementation of a community garden, people struggling to afford food are able to reap the benefits through a local food bank. As this ecological restoration is constructed, people will see the value and importance of projects that unite all people in a community. The social bonds formed will holistically strengthen the community as people come together to learn about, grow on, and use the land. These 18 acres of currently mowed land will be transformed into a space made to serve those who use and maintain it.

Works Cited

Arcgis dashboards. (n.d.). Retrieved April 5, 2022, from https://cec-tech.maps.arcgis.com/apps/dashboards/6654c19e61544c53a9c74625c30743b2

Attachment C. Forest Service. (n.d.). Retrieved April 5, 2022, from https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3794596.pdf

Darby Plains prairie plant species. Ohio Plants. (n.d.) Retrieved April 5, 2022 from http://ohioplants.org/DarbyPrairiePlants.htm

dcbel. *Reducing Carbon Emissions One Tree at a Time.* (2021, June 14). Retrieved April 4, 2022 from https://www.dcbel.energy/blog/2021/06/14/reducing-carbon-emissions-one-tree-at-a-time

McDowell, J., Ruis, S., & Blanco, H. (2019, March 11). *Cover Crops and Carbon Sequestration: Benefits to the Producer and the Planet*. Institute of Agriculture and Natural Resources CropWatch. Retrieved April 4, 2022, from https://cropwatch.unl.edu/2019/cover-crops-and-carbon-sequestration-benefits-producer-and-planet

Moore, Daniel T., et al. *Ohio Native Plant Suggestions for Horticultural Plantings.* (2011). Retrieved April 5,2022, from https://www.cuyahogaswcd.org/files/assets/nativeplantsforhorticulturalplantingsmetroparks2011nr05b.pdf

Ohio Division of Wildlife. *Spring wildflowers of Ohio field guide.* (2017, April). Retrieved April 5, 2022, from https://ohiodnr.gov/static/documents/wildlife/backyard-wildlife/Pub_5494_Spring%20Wildflowers%20of%20Ohio%20Field%20Guide.pdf

Ohio Prairie Association. *New Latin and Common Names for Ohio prairie plants.* (n.d.). Retrieved April 5, 2022, from http://www.ohioprairie.org/new%20latin%20names.htm

Programs. Sustainability in Prisons Project. (n.d.). Retrieved April 4, 2022, from http://sustainabilityinprisons.org/spp-programs-in-wa/conservation/

Sams, Craig. *Carbon Farming to Address Climate Change.* (2018, May 23). Retrieved April 4, 2022 from https://sustainablefoodtrust.org/wp-content/uploads/2013/04/Carbon-Farming-to-address-Climate-

Sasson, A., Boose, A., & Klips, R. (2021). *Darby Plains Prairie Plants*. Ohio Plants. Retrieved April 4, 2022, from https://ohioplants.org/darby-plains-prairie-plants/

Stockton, Lesley. *How to keep your produce fresh for weeks*. New York Times. (2020, June 30). Retrieved April 5, 2022 from https://www.nytimes.com/wirecutter/blog/keep-your-produce-fresh/

Strategic plan 2020 - 2025 - ccfpd.org. Champaign County Forest Preserve District. (n.d.). Retrieved April 12, 2022, from https://www.ccfpd.org/Portals/0/adam/Content/DvUDy92LGkezaqia8zqrcw/Link/Strategic%20Draft%201.4-2.pdf

Tallgrass Prairie and Carbon Sequestration. Tallgrass Ontario. (n.d.). Retrieved April 4, 2022, from https://tallgrassontario.org/wp-site/carbon-sequestration/

Trees of Ohio Field Guide. Ohio Department of Natural Resources Division of Wildlife. (2019, February). Retrieved April 5, 2022, from https://ohiodnr.gov/static/documents/wildlife/backyard-wildlife/Pub5488_Bees%20and%20Wasps%20of%20Ohio%20Field%20Guide.pdf

Wetland soil carbon sequestration. LSU AgCenter.(2015, October 12). Retrieved April 5, 2022 from https://www.lsuagcenter.comhttps://lsuagcenter.com:443/portals/communications/publications/agmag/archive/2013/spring/wetland-soil-carbon-sequestration

Appendices

Dataset 1-3:

Sources: ODRC Savings of Baling Over Mowing Doc

Description: This dataset is a cost analysis of both mowing and baling. Mowing occurs on average 9 times a year and baling occurs on average 4 times a year. It is categorized by fuel, labor, equipment, and tools.

Cost of Mowing	Monthly	Annually
Fuel	$2,866.50	$25,798.50
Labor	$3,234.00	$29,106.00
Equipment	$716.63	$6,449.67
Total	$6,817.13	$61,354.17

Table 1. Cost analysis of Mowing

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Baling	$8,412.39	$33,649.56
Total	$15,229.52	$95,003.73

Table 3. Cost summary of mowing and baling

Dataset 4: Orient_GHGSequestration.xlsx

Sources:

Carbon sequestration – tallgrass ontario: https://tallgrassontario.org/wp-site/carbon-sequestration/

CropWatch: https://cropwatch.unl.edu/2019/cover-crops-and-carbon-sequestration-benefits-producer-and-planet

Reducing carbon emissions one tree at a time:

https://www.dcbel.energy/blog/2021/06/14/reducing-carbon-emissions-one-tree-at-a-time

Carbon Farming to Address Climate Change: https://sustainablefoodtrust.org/wp-content/uploads/2013/04/Carbon-Farming-to-address-Climate-

Wetland soil carbon sequestration:
https://www.lsuagcenter.com/portals/communications/publications/agmag/archive/2013/spring/wetland-soil-carbon-sequestration

Description: This dataset includes the following information on GHG sequestration rates: plant type, acreage, sequestration rates per lb/acre, and the total presented in tonnes. These values were used to produce Table 4 in this report.

Plant Type	Acreage	Sequestration Rate (lbs/acre)	Total (tonnes)
Garden	2.5	485.02	0.55000298
Wildflower/Prarie	6	661.39	1.800007277
Wetland	6	2926	7.963261152
Trees	~100 trees (3.5 acres)	30.6	2.817622786
Total	18	4103.01	13.13089419

Table 4. GHG sequestration rates

Dataset 5: Orient_Landmap

Sources: Ohio Department of Natural Resources Database. *Ohio Prison Parcels.*

Description:

This dataset includes the field layout of the Orient site, which was labeled to show the sections of each plant type and where the seating/pathways will be located. This map was used to produce Figure 1 in our report.

Green: Community Garden
Salmon: Wildflower/ Pollinator Plants
Blue: Wetland
Pink: Seating Area
Gray: Garden Shed
Purple: Orchard/ Tree Cover
Orange: Grasses and Prairie Plants
Tan: Beehives and Apiary
Yellow Path: Path Through Wetland Plants
Red: Wetland Plants
White Path: Walkway for Visitors

Dataset 5: Native_Ohio_Species.docs

Common Name	Scientific Name	Category
Common Milkweed	Asclepias syriaca	Wildflower/Pollinator
Wild Geranium	Geranium maculatum	Wildflower/Pollinator
Woolly Sweet-Cicely	Osmorhiza claytonii	Wildflower/Pollinator
Spring Beauty	Claytonia virginica	Wildflower/Pollinator
Bloodroot	Sanguinaria	Wildflower/Pollinator
May Apple	Podophyllum	Wildflower/Pollinator
Striped Violet	Viola striata	Wildflower/Pollinator
Wild Strawberry	Fragaria vesca	Wildflower/Pollinator
Bluestem Grass	Andropogon gerardii	Prairie/Grasses
Indiangrass	Sorghastrum nutans	Prairie/Grasses
Swtichgrass	Panicum virgatum	Prairie/Grasses
Rough Bentgrass	Agrostis scabra	Prairie/Grasses
Hairy Grama	Bouteloua hirsuta	Prairie/Grasses
Prairie Coneflower	Ratibida pinnata	Prairie/Forbs
Sawtooth Sunflower	Helianthius grosseserratus	Prairie/Forbs
Ohio Spiderwort	Tradescantia ohiensis	Prairie/Forbs
Queen of the Prairie	Filipendula rubra	Wetland
Lake Sedge	Carex lacustris	Wetland
Shining Ladies Tresses	Spiranthes lucida	Wetland
Bottlebrush sedge	Carex hystericina	Wetland
Pointed broom sedge	Carex scoparia	Wetland
Spotted Joe Pye Weed	Eutrochium maculatum	Wetland
Beets		Community Garden
Turnips		Community Garden
Carrots		Community Garden
Potatoes		Community Garden
Raddishes		Community Garden
Onions		Community Garden
Garlic		Community Garden
Tomatoes		Community Garden
Peppers		Community Garden
American Beech	Fagus grandifolia	Orchard
Black Oak	Quercus velutina	Orchard
Shumard Oak	Quercus shumardii	Orchard
Black Locust	Robinia pseudoacacia	Orchard
Red Maple	Acer rubrum	Orchard
Red Mulberry	Morus rubra	Orchard
Virgina Pine	Pinus virginiana	Orchard
Eastern Red Cedar	Juniperus virginiana	Orchard

Sources:

Ohio Division of Wildlife. *Spring wildflowers of Ohio field guide.* (2017, April). Retrieved April 5, 2022, from https://ohiodnr.gov/static/documents/wildlife/backyard-wildlife/Pub_5494_Spring%20Wildflowers%20of%20Ohio%20Field%20Guide.pdf

Ohio Prairie Association. *New Latin and Common Names for Ohio prairie plants.* (n.d.). Retrieved from http://www.ohioprairie.org/new%20latin%20names.htm

Moore, Daniel T., et al. *Ohio Native Plant Suggestions for Horticultural Plantings.* (2011). Retrieved April 5,2022, from https://www.cuyahogaswcd.org/files/assets/nativeplantsforhorticulturalplantingsmetroparks2011nr05b.pdf

Darby Plains Prairie Plant Species. Ohio Plants. (n.d.) Retrieved April 5, 2022 from http://ohioplants.org/DarbyPrairiePlants.htm

Stockton, Lesley. *How to keep your produce fresh for weeks*. New York Times. (2020, June 30). Retrieved April 5, 2022 from https://www.nytimes.com/wirecutter/blog/keep-your-produce-fresh/

Trees of Ohio Field Guide. Ohio Department of Natural Resources Division of Wildlife. (2019, February). Retrieved April 5, 2022, from https://ohiodnr.gov/static/documents/wildlife/backyard-wildlife/Pub5488_Bees%20and%20Wasps%20of%20Ohio%20Field%20Guide.pdf

Description: A complete list of the specific species and locations to be planted on the ODRC plot.