Final Project: Envisioning the Future of the Canandaigua Lake Region

By

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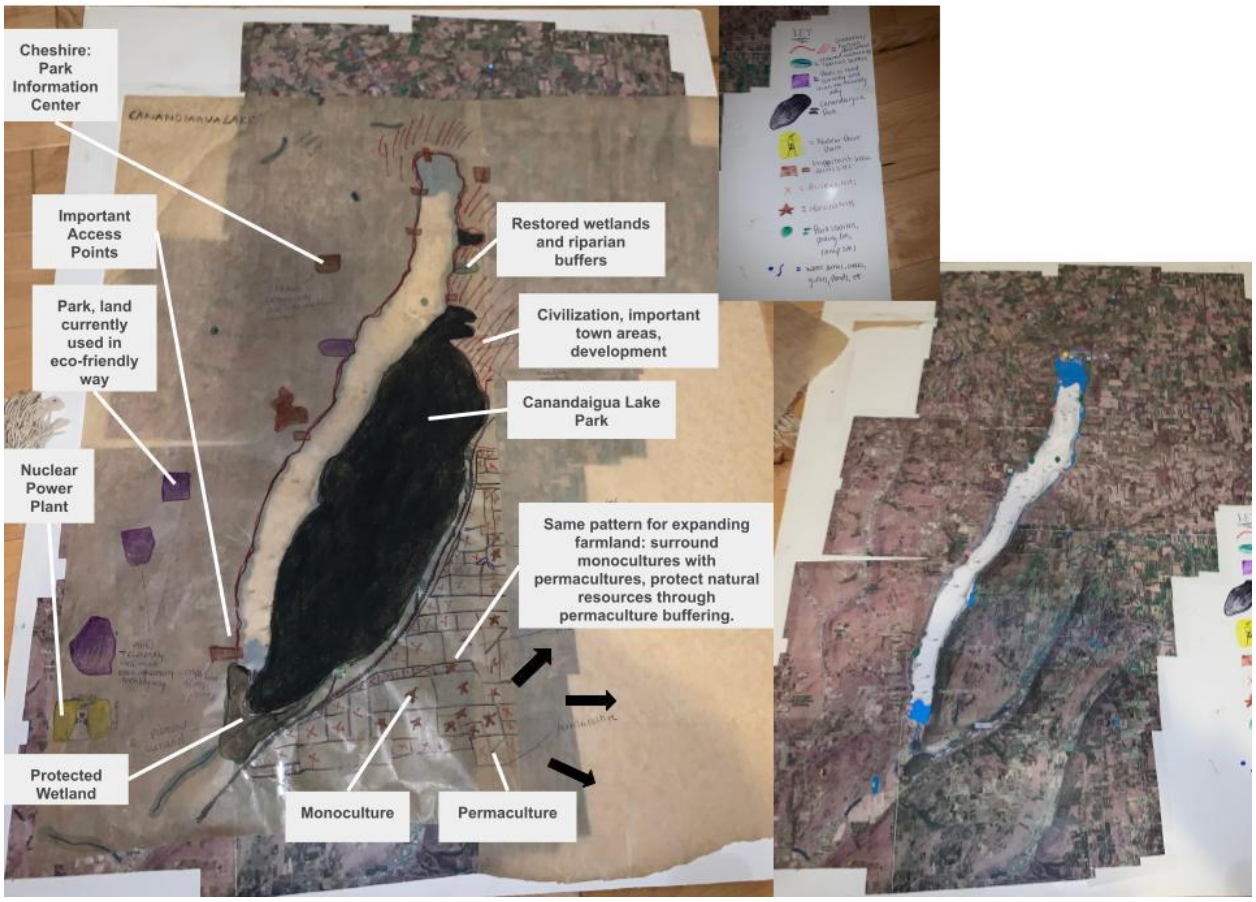


This image is the introductory roadmap for this project. It describes the general changes I would make to the Canandaigua Lake region in Upstate New York. A key is provided at the top of the image, as well as an unedited map collage (created for this project) to compare with the design idea I created. This project is focused on solving the Canandaigua Lake region's environmental, economic, and social issues through sustainable design ideas. All ideas are intended to leave the state of Canandaigua Lake's environment better off than it was. All ideas are also intended to use as little resources and have as little environmental impact as possible.

1. **Site/Place:**

The surrounding land of Canandaigua Lake is made up of many farms, a variety of property types (ex: million dollar summer homes, decrepit barns), vineyards, and abundant natural resources. There is a big emphasis on the farming and vineyard culture in the Finger Lakes Region. Though Canandaigua Lake resides in both Ontario and Yates County, it is more predominantly a part of Ontario County. Despite rich, fertile land (Genesee shale) and economic opportunity, Ontario county trends against the norm of other NY counties in terms of housing, economic security, and overall economy and community vitality (Sherwood). In fact, 28% of

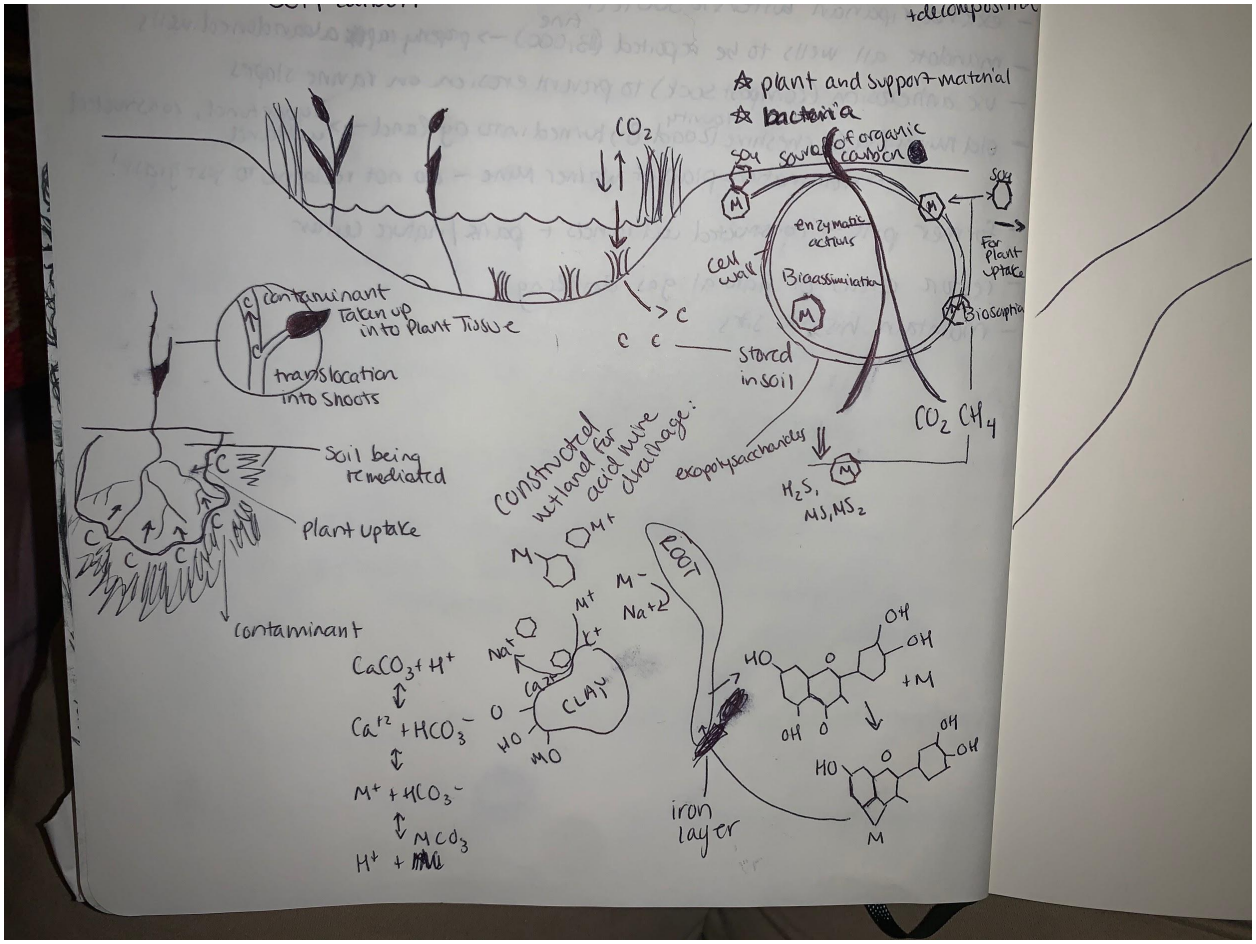
families in Ontario county earn income above the poverty line but still cannot afford basic necessities of housing, food, transportation, childcare and healthcare (Sherwood). As a long time resident of Ontario County, I have witnessed the unequal distribution of wealth, pollution of the environment, poverty, and culture of the region.

2. **Community, Culture, Economics:**

Promoting socio-ecological sustainability would not only increase quality of life and improve the economy, it would also support prominent cultural activities. The people of the Canandaigua Lakes region enjoy the outdoors--recreational activities, hunting, trapping, fishing, and hiking are all popular past times. By focusing on restoring the landscape from monocultures (wetland restoration, watershed improvement, transforming farms to permaculture, etc.) and promoting sustainable practices (workshops for farmers, school programs on landscape natural history, etc.), the economy and community can become dependent on the environmental health of the region. If a large section of the lake's shore region (the least developed area on the lake) was purchased and conserved, a state park could be formed which would dramatically increase the rate of tourism. Though Canandaigua Lake is already a tourist hot spot, many of the tourists have little to do and only stay for a day or so. Setting up a park would mean installing information centers, recreational activity businesses, cafes, restaurants, and more. It would give tourists more to do, and more reasons to spend. Not to mention, the quality of life for the residents of the area would be improved.

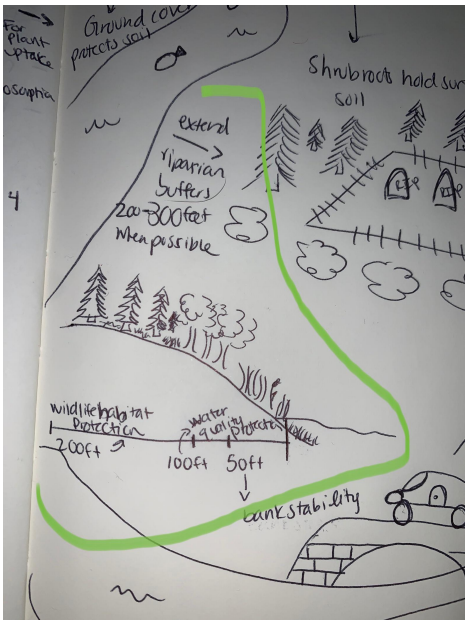
3. **Water:**

After knowing how polluted the Canandaigua Lake watershed is, I thought it was especially important to protect the water resources of the area and explain how I would do that in detail. Water resources in the area protect the culture, economy, health, and overall environment of the Canandaigua Lakes region. The area of Canandaigua Lake is 16.8 mi^2 and the length is 16.16 mi. The lake is very big and connects to a vast watershed system, a system which is impacted by all types of human activity. The first thing I would do would be to take a note out of Cranberry and Hemlock Lake's book (click here to learn more about Cranberry Lake: https://www.dec.ny.gov/lands/34715.html, here to learn more about Hemlock Lake:https://www.dec.ny.gov/outdoor/25580.html) and conserve a large part of land. Promoting forest and wetland activity brings resiliency back into the Canandaigua Lake system because forests and wetlands act as sinks for greenhouse gases, they also filter out pollutants (nitrogen, phosphorus, carbon heavy metals) through sorption, phytoextraction, bioassimilation, and photosynthesis.



The second thing I would do would be to restore historic wetlands in the region. After remembering to take culture into account, I made a map of Ontario County's most culturally significant and historic sites. Wetlands would not be installed in these areas. In sustainability, it is as important to preserve culture as it is to restore landscapes. If necessary, cultural sites would be protected and incorporated into the restored landscape.

According to the *Town of Canandaigua Natural Resources Inventory Update*, the most important areas in the Canandaigua watershed include Sucker Brook, Deep Run, Upper Canandaigua Outlet, Black Brook, Middle Mud Creek, and Upper Mud Creek. The West side of the lake would be chosen first for wetland restoration (or constructed wetlands) because it is the area with the most development and least amount of natural space. Currently, 150 foot riparian buffers are in place in these systems (Town of Canandaigua). I would, however, expand on this and instal buffers of 200- 300 feet. I would do this because any buffer 200 feet or more promotes wildlife activity (Sargent).

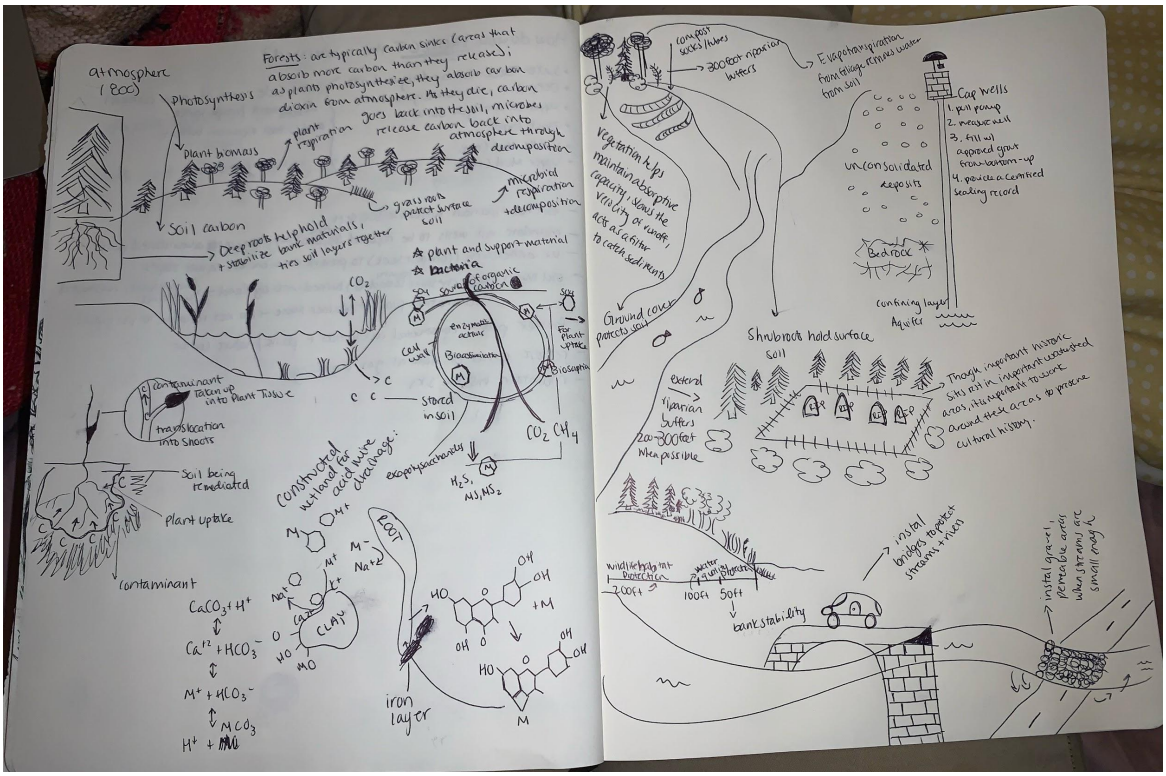


In order to fix the water issues at Canandaigua lake, it is important to take a whole-systems approach in solving ecosystem issues. As stated previously, wildlife is also important to the culture and overall health of the region. I would also form a new county-wide mandate for all wells to be reported to the NY State, issuing a $3,000 fine if a well is intentionally not reported. I would do this in order to protect the groundwater resources underneath the Canandaigua Lakes region. Many wells in the area have not been properly uncapped, this threatens the health of groundwater because uncapped wells allow contaminants to be directly introduced to groundwater (Simpson, et. al). Additionally, erosion is a large problem for the area. There are many steep slopes (located along gullies and ravines) that are prone to erosion, especially with deforestation (Town of Canandaigua). I would instal forest buffers and compost socks to prevent erosion. Forests are also good at preventing erosion because their roots hold soil in place during precipitation and runoff events (Roundy). A downside of using compost socks is that some types of socks are made from plastic. Plastic is durable, it is also very harmful for the environment. In the long run, however, the amount of pollutants the compost socks filter out will outweigh the small amount of plastic pollution introduced.

There are many abandoned mines and former resource extraction pits in the region, constructed wetlands would be installed around or on top of these areas to filter out heavy metals. Resources used by ecological designers would primarily come from the local environment, depending on local species and plants to support constructed wetland operation. Some materials might need to be shipped in from other places, unfortunately. Though, it is

possible to maintain constructed wetlands without the addition of many foriegn resources. The city mainly gets their power from natural gas (Town of Canandaigua). As natural gas has the potential to pollute waterways and general ecosystem health, a more sustainable form of energy would be installed--a nuclear power plant. Though this is a lofty goal, nuclear energy has a low potential for catastrophe and could greatly improve the socio-ecological state of the region (Pandora's Promise). Unfortunately, many of the materials would need to be shipped into the area in order to build the nuclear power plant. Some materials might be sourced locally from local mines, this may further introduce contaminants into the ecosystem. Installing a nuclear power plant would be very profitable and it would protect the environment in the long term (as long as there was no nuclear meltdown). Other resources needed for this would be heavy metals, a lot of money, land, asphalt to build roads, construction equipment, and a host of other materials. The money would likely have to come from an outside investor, as the cost to build and maintain such a compound would far surpass anything Naples or Canandaigua would be able to afford.

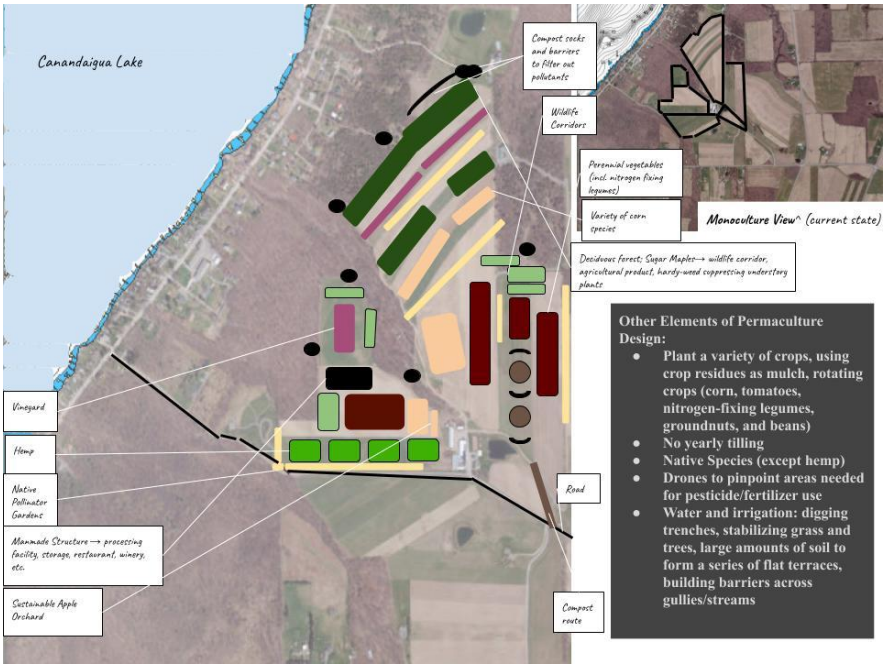
Finally, the park that would be developed on the eastern side of Canandaigua Lake would help to promote shoreline health and lake ecosystem health. The area would act as a carbon, nitrogen, and phosphorus sink (explained in detail by the diagram below). It would filter out any remaining pollutants from farmland and general human activity runoff. This section was chosen because it has the least development, and the highest ecological opportunity--given that it would replace some monoculture and be located between farms and Canandaigua Lake.



4. **Food:**

As farming and the Finger Lakes Wine Trail are both such important parts of the Canandaigua Lake region, I thought it fitting to focus on the food section in more detail for this project. Most of the land surrounding Canandaigua Lake is made up of monocultures. In recent years, Canandaigua Lake has been suffering from blue-green algae, invasive species, pest species, habitat destruction, watershed destruction, and general human disturbance (Town of Canandaigua). The monocultures surrounding the lake do not provide as much as they should in the way of economic prosperity to local farmers. Currently, the monocultures are able to sell off crops to Canandaigua, Rochester, Buffalo, and Syracuse (Town of Canandaigua). Additionally, nitrogen, phosphorus, animal waste, pesticides, and a host of other pollutants are uncontrolled and enter the lake's watershed. This decreases the abundance of consumable fish populations and other species some residents rely on (fishing, hunting, and trapping are all important parts of Canandaigua Lake culture). As a solution, I researched the use of permaculture design, pollutant removal technologies, and landscape design to construct a different food system approach than what is already in place in the Canandaigua Lake region. I wanted to emphasize the use of natural solutions, as there is already so much development in the region and also because I find natural solutions to be the most compelling types of ecological design. After watching a Ted Talk by Sam Gon, I was inspired to think about how working with the landscape and encouraging natural growth can increase prosperity in the Canandaigua Lake region.

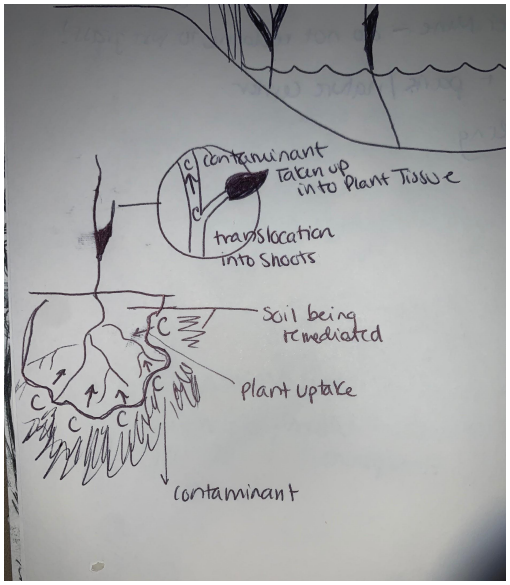
This first diagram below represents the type of changes, in very simplistic terms, that could be done to farmland in the Ontario County region. The top right of the diagram shows what the land looks like presently, as a monoculture. This specific farm plot is connected to essential river and stream systems that run into the lake. The farm is also connected to the lake via roads--areas which provide pathways for pollutants to enter into the lake during nutrient runoff.



Elements of this diagram include incorporating economically sustainable and environmentally sustainable crops that will benefit the region, such as hemp, grapes, apples, maple syrup, a variety of corn species (to combat the endangerment of corn species), and perennial vegetables. Including all elements of this design in most farm plots in the Canandaigua Lake region may not be realistic, which is why this diagram should be looked at as a set of options for permaculture design. Industrial hemp is a phenomenal economic opportunity, acts as a carbon sink, has recently been legalized as of 2018, is moderately affordable to produce, and requires little maintenance compared to other crops (Kolodinsky, Lacasse). Perennial vegetables are important to include in this plot because they support the biodiversity of the region, are rich in nutrients, and also are meant to be grown in this environment (Root Cellar). Perennial vegetables are fantastic at promoting soil sustainability, because they live in a no-dig zone (areas with no tilling). This perennial vegetable category is also meant to include nut trees, a variety of berries, and mushrooms.

Native pollinator gardens are essential in this permaculture design because pollinators have been proven to reduce the presence of pests, decrease farming costs (by pollinating crops for free), and increase the resiliency of the landscape (Buffalo Niagara Riverkeeper). These pollinator gardens have been placed between crops and at the edges of the farm to maximize pollination distance and reduce pollutants entering the lake. Native pollinator gardens are especially good at phytoextraction and phytoremediation (Buffalo Niagara Riverkeeper). In a study done by UVM affiliates, it was found that switchgrass, a common pollinator garden species, performed exceptionally well at taking up trace heavy metals when combined with amendments like compost (Shrestha, et. al). In order to stay true to permaculture, habitat variation was included in this design sample. Deciduous forests made up of sugar maples, red maples, and an understory of weed-suppressing and phytoextracting plants were included. This

will decrease the amount of pollutants (carbon, nitrogen, phosphorus, etc.) entering the lake ecosystem through plant uptake and sorption. These deciduous forests promote maple syrup production--a popular and culturally significant food market in Upstate New York. Wildlife corridors were included in this design because corridors promote overall environmental health, which will directly translate to the health of the food in the region.

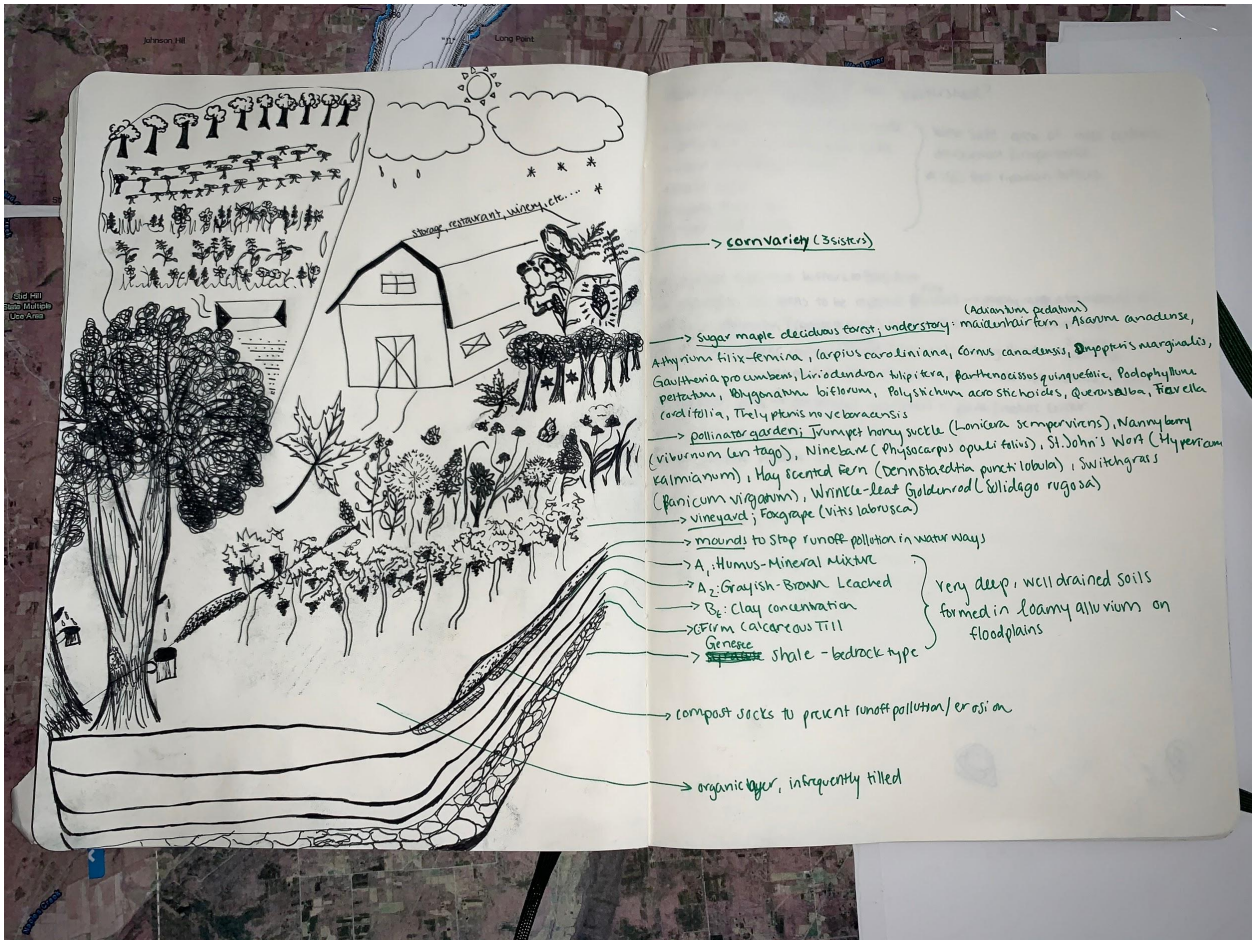


Compost sites are part of this design because composting is a great way to reduce waste (especially farm and animal waste), promote soil productivity, reduce costs, and support microbial life. Compost filtration technology, "compost socks", would be installed to prevent nutrient runoff from the compost site (NRCS). An issue that should be noted, however, is that a compost mound can attract local wildlife or be a burden if not operated correctly. Compost socks, compost berms, and soil mounds would also be installed throughout the permaculture site to filter out excess nutrients before they polluted the watershed, as well as to prevent erosion. Mounds would be placed over stream beds that run on farm property; compost socks and berms would be installed in steep-slope areas and areas of heavy nutrient runoff. Ideally, resources needed to build these compost technologies and compost soils would come from the farm itself. Occasionally, sawdust or wood chips might need to be added but these could be taken from the local environment with little environmental cost. Nitrogen might also need to be added, deepening on the C:N ratio. Nitrogen could be retrieved from nearby animal agricultural operations--reducing environmental harm if animal waste was just dumped.

Apple orchards and vineyards would be installed because they are both popular, culturally significant crops of the region and would produce high profits. Finally, a social solution to improving the food system would be to provide drones to farmers (specifically at monocultures) so that they can pinpoint specific areas of land that require pesticide use or fertilization, rather than treating a whole area. This would reduce costs and reduce the likelihood of environmental contamination. In order for this to happen, resources would need to be supplied

by Canandiagua or an independent operation. It is important to note that if drones got lost, this could introduce further environmental pollutants into the area, like heavy metals.

For this project, I recommended that a third to half of the current monocultures should be transformed into permacultures. Below is a picture of what this could look like. The orange “X” indicates a permaculture, the brown star symbol represents a monoculture. The permaculture farms would be placed at watershed sensitive areas and act as a barrier to monocultures to protect Canandaigua Lake.



This image explains the specifics of the species types to be included in the permaculture design, as well as other details.

The resources required to transform the landscape from a monoculture to a permaculture would include construction materials, new species, soil, farm, equipment, land, and building supplies. The building supplies could likely be taken from the surrounding environment (wood, rocks, soil, species), the construction material would likely introduce nitrogen, phosphorus, and carbon into the system. In order to avoid further pollution, compost socks and berms could be installed manually to prevent these pollutants--these technologies would filter out the contaminants during runoff. Native pollinator gardens could also be planted to take up these elements. Environmental impacts of transforming the landscape would be very positive, as long as soil health was the biggest priority. If the land is excessively tilled, turned, and moved--it could be detrimental for the watershed. However, in the long term the conversion process of monocultures to permaculture is very sustainable and environmentally-friendly.

5. **“Waste”:**

To reduce waste in the region, composting would become mandatory. Sewage systems would be updated in surrounding towns. Plastics and other materials that are not biodegradable (styrofoam) would be phased out of local businesses and stores. Vermont did a similar thing this past summer with plastic waste and composting. Overall, this system seems to be doing very well and has a great impact on the environment. Not to mention, the compost produced from food recycling could help to improve soil fertility in the Canandaigua region. Grocery stores might be more likely to donate foods to local shelters and food banks, rather than throw food out after they reach expiration dates. Systems would be put in place to make grocery store donation of food easier, such as state laws allowing grocery stores to give away foods after a certain period after expiration dates. Grocery stores could also be awarded with tax breaks if they went through the process of donating food, rather than just composting it.

6. **Energy:**

A nuclear power plant would be installed in the Naples, NY region (the south end of the lake). Naples NY has had a tough economic past--going in and out of industry failures. Currently, vineyards, tourism, farming, and mining keep the area afloat. If there was a nuclear power plant, the town would be revived. Nuclear energy is constantly improving, in fact scientists are continually making discoveries that have made nuclear energy much safer and one of the most renewable forms of energy in the world (Koning, Rochman). Humanity has to face the reality that, at the current moment, our other renewable energy technologies cannot meet the needs of energy demand that exist in the world today (Brook, et. al). The current power sources (natural gas, coal, and hydropower) in the Canandaigua Lake region should be replaced with the most sustainable option, using nuclear fission-- doing so would also reduce greenhouse gas emissions profoundly (Brook, et. al).

7. **Shelter:**

The structures incorporated in the Canandaigua Lake’s future would be made through the lens of permaculture shelter design. It is important to make structures part of the ecosystem and community culture. Many of the buildings and structures in the Canandaigua Lakes area do not serve the public as best as they can. There are many apartment buildings, condos, and decrepit buildings in the region. Though there is little to do about the structures in place (and in heavy use today), all future structures could be more holistic and community-centered. The passive comfort strategy would be used in new developments (Oregon State). Layout and orientation of buildings would maximize light (saving electricity), local and natural materials would be used (decreasing pollutants and environmental harm), and structures would be built in ways that were inclusive to a variety of needs (transportation, disabilities, etc.). Improving shelter has the potential to bind a community closer, improve daily life, and work within the socio-ecological landscape.

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