How can we apply the integration of new technology with permaculture practices in suburban neighborhoods to reduce waste and increase sustainability?

PERMACULTURE IN THE MODERN WORLD

By: Marley Doherty

https://gogreenhk.files.wordpress.com/2013/08/permaculture_image.jpg
PERMACULTURE IN THE MODERN WORLD

A Design Capstone submitted to the
Department of Urban Horticulture and Design
of the State University of New York,
Farmingdale State College

By Marley Doherty
in partial fulfillment of the requirements
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Professor Stevie Famulari
I, Jack Marley Doherty grant permission for the State University of New York, Farmingdale State College, and the Department of Urban Horticulture and Design to reproduce any portion of this capstone for any purpose they deem proper.

Signature ___________________________ Date ________________
Marley Doherty
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Abstract

Permaculture is defined by Merriam Webster’s dictionary as the development of agricultural ecosystems intended to be sustainable and self-sufficient. Bill Mollison and David Holmgren introduced the philosophy of permaculture in Australia during the 1970s. During his studies as a wildlife biologist, Bill Mollison witnessed first hand the destruction humans were causing in natural systems. With the realization of this destruction, he also observed how the natural ecosystems worked to keep and restore balance. In his book, Introduction to Permaculture, Bill Mollison writes “The aim is to create systems that are ecologically sound and economically viable, which provide for their own needs, do not exploit or pollute, and are therefore sustainable in the long term.” Basically, permaculture is humans designing a system for a farm, garden, or even something as simple as a planted container that is modeled on nature. The main question that I want to answer in my research is how can we integrate modern technology into this system. In order to find an answer to this question I will develop a design to encompass all of these practices through various features. This design will be set in a suburban neighborhood, on a 1-acre lot in Southampton, New York.
Key Words

**Compost** - a mixture of various decaying organic substances, as dead leaves or manure, used for fertilizing soil

**Diversity** – the degree of variation of living things present in a particular ecosystem

**Greenhouse** – a building in which plants are grown that need protection from cold weather

**Greywater** – household wastewater that can be reused for some purposes without purification

**Guild** – a species assembly of plants and animals which benefit each other, usually for pest control

**Keyhole Beds** – a circular raised garden bed with a keyhole shaped notch on one side with a compost pile in the center of the circle

**Landscape Design** – the analysis, planning, and design of exterior living spaces

**Microclimate** – the localized climate around landscape features and buildings; important for selecting sites for specific crops or species

**Organic Fertilizer** – substances derived from animal matter, animal excreta, human excreta, and plant matter that are added to the soil or land to increase fertility

**Permaculture** – the development of agriculture ecosystems intended to be sustainable and self-sufficient

**Rain Garden** – a depressed area in the landscape that collects rainwater from a roof, driveway or street and allows it to soak in to the ground

**Solar Panels** – a panel designed to absorb the sun’s rays as a source of energy for generating electricity or heating
**Water Harvesting** – the accumulation and storage of rainwater for reuse on site, rather than allowing it to run off
Problem Statement

How can we apply the integration of new technology with permaculture practices in suburban neighborhoods to reduce waste and increase sustainability?
Project Typology

Landscape

Landscape design

Sustainability

Systems Ecology

Permaculture

Organic Farming

Suburban Community

Suburban Residence

Permaculture in a Suburban Neighborhood
The Claim

By integrating practices of permaculture with modern technology, a suburban homeowner will benefit immensely. The homeowners will be affected by this because the layout of their home will change as well as some techniques used to maintain their residence. They will be able to reduce waste and increase the sustainability of their property. Suburban homeowners will also need to initially invest money for these practices to start, but they will receive a much larger payoff in the long term. Other people who will be affected by this integration of technology and permaculture are the contractors, and the community as a whole. The contractors will be affected because they will need to learn new skills to install and maintain these landscape designs. This will create larger revenue for the installation of their projects but will have less revenue for the maintenance. The community as a whole will be affected because if each residence is practicing these methods there will be less pollution and waste, as well as less maintenance required for the community.
Unifying Idea

The role of human activity has played a large part in the change of our climate and more importantly at the rate as which it is warming. It has been concluded by the Intergovernmental Panel on Climate Change (IPCC), which consists of a group of 1,300 scientists from across the world, that in the past 50 years there is more than a 90 percent probability that human activities have warmed our planet. This rapid change is increasing and we can find a solution for it. Some people might think we need some big governmental regulation to do this. Even though, in many cases that would help, people need to understand that each individual can make a difference right at home. For example, according to the National Resources Defense Council (NRDC), “Forty percent of the U.S. food supply is wasted”. If a homeowner composted this food waste, they could add it to the soil to help plants grow instead of going to landfills where it will release methane. Another example of how a homeowner can help fix this problem is by using green power such as solar panels. Solar energy is clean and renewable and according to Jay Orfield, a renewable energy analyst at NRDC, “If you can offset your home energy consumption, that might mean eliminating a quarter to a third of your carbon footprint.” Through the use of modern technology such as solar power and implementing them into practices of permaculture such as composting a suburban homeowner can reduce their waste tremendously, decrease their bills, and most importantly help fight climate change.
Project Justification

Throughout my life, I have tried to be conscious of my carbon footprint and have sought to live by the saying “leave no trace”. Although this is much easier said than done, I believe through the integration of modern technology and permaculture practices we can truthfully live in that saying. Modern sustainable technology is creating new ways every year for homeowners to save energy and waste. Such innovations as solar panels and battery-powered transportation are at the forefront. Although these innovations help tremendously, I believe some practices in permaculture are timeless and cannot be mimicked by human inventions. Most times when you see a permaculture system in play, it is running on a large piece of land with many animals integrated into the system. For example, a house is usually built near some type of fresh water, with a natural slope, the manure from cows will help feed the garden, the waste from the garden will feed the cows and so on. I want to find out how we can bring this into the suburban household. For instance, a house that is on an acre of flat land that is surrounded only by other houses and roads with limited vegetation. If we integrate these practices of permaculture with modern technology we will develop a new system that will be more effective for a suburban homeowner.
Narrative of Design Research

A majority of people in the United States and around the world, live in urban/suburban areas along the coastlines. These places are becoming more and more densely populated every day. With every house that goes up, resources are depleted and our waste is increasing. In a place such as Southampton, New York large houses are being built on properties right next to the water. These properties need large amounts of maintenance to be cared for every year. This includes pesticides and fertilizers dumped on the properties with little care of where they might end up. Not until very recently have people started regulating these practices and caring about the environment. I believe there is a different way we can design these estates that is both environmentally friendly and aesthetically pleasing.

The first aspect of my design, which is environmental technology such as solar power and wind power has been around for quite some time. Although the technology has been around, the residential implementation is just starting to catch on. Solar panels were first invented in the 1950’s to help power satellites in space. In the 1970’s, during the first energy crisis solar panels were starting to be installed residentially. Now the solar panels have been reinvented to look much more modern but still save a lot of energy. It is even possible to harness this energy and save it for later use.

Although these new innovations in environmental technology are incredible, we still have issues with waste. Most of this waste comes from our food. A lot of times consumers think we have to change the practices at the source
our food but they don’t think about changing the source of our food. If we were to use permaculture practices to grow 75% of our produce at home we could drastically cut down on this waste. I believe if we implemented the use of environmental technology with these practices of permaculture we could have a dramatic effect on our waste production and consumption of finite energy.
User/Client Description

The client of this design is relatively specific. Someone could not copy this exact design and implement it in the middle of New Mexico. This design is specific to an area that has all four seasons of the year. This design is also most realistic in an affluent, suburban neighborhood that currently has a lot of turf grass on the property. This design is meant for a family that has an interest in lowering their output of waste, and increasing their production of food.

There are currently four family members that live in this house. Two are the parents, who are male and female and are in their mid fifties. The other two members are the children of the parents, also one male and one female, who are both in their twenties. The parents are now retired from their previous careers but still maintain active lifestyles. The female child works in a corporate office environment but still enjoys the outdoors, and her current diet is vegan. The male child works on a farm just outside of New York City and frequently visits the house most weekends. This family only occupies this house during the spring, summer, and fall. Each family member owns a vehicle, so there must be enough room for at least four vehicles to park. This family is well off economically so the start up cost of this design is a non-issue. This family loves to enjoy the aesthetic of the landscape of their home but also want to make more use of their land. They are continuously growing with concern of where and how their food is grown and harvested.
**Major Project Elements**

Total Square Feet of Property: 46,609 (100%)

Existing Project Elements:

1. Existing structures (House, garage, and pool house) – 5,700 sq ft (12.2%)
2. Existing hardscapes (Driveway, patios) – 9,500 sq ft (21.2%)

Existing structures and hardscapes: 15,200 (33.4%)

Proposed Project Elements: (66.6% available lot space)

1. Tree Orchard - 8%
2. Greenhouse – 4%
3. Annual/Perennial vegetable/herb garden – 10%
4. Staging/storage area – 4.5%
5. Poultry area – 1.5%
6. Ornamental garden areas – 10%
7. Pond – 6.6%
8. Turf grass/ play areas – 15%
9. Wild/natural areas – 7%
10. Solar panels – (not included into the area calculation because they will be installed on top of existing structures.)
Site Inventory and Analysis

The site for my design is a residential property located on Foster Crossing Road, in Southampton, NY. This site has always been a residential site and was newly renovated in 2007. This site sits on 1.07 acres of relatively flat land, about a half mile from the ocean. The house is south facing and receives 8-12 hours of sunlight throughout the spring, summer, and fall months. The soil is a sandy loam mixture and the property has less than a 7 percent slope across the whole site. The prevailing wind in the late spring to early fall, is out of the South and in the late fall to early spring, is out of the Northeast.

The property is currently surrounded with Privet (*Ligustrum vulgare*) because there are neighbors to the north, east, and west of the property. In the front of the house, there is a 275’ semi circle driveway that includes sections for at least 6 cars to park. There is an 8’ wide by 20’ long brick walkway that leads to the front door. The house itself is roughly 4,000 sq. ft. Off the back deck there is a large amount of turf grass that leads to the pool. The pool and brick patio amount to 2,200 sq. ft. Adjacent to the pool patio is a 900 sq. ft pool house. If you continue to travel north from the pool, there is more turf grass that brings you to a 800 sq. ft, 2 car garage. There is an access driveway from the front of the house that leads to this garage and a neighboring house.
There is a fair amount of existing plant material on site. The following list represents that material.

Shrubs:
- 13 – *Hydrangea paniculata* ‘Grandiflora’
- 23 – *Buxus sempervirens* (various sizes)
- 52 – *Hydrangea macrophylla* (various sizes and cultivars)
- 2 – *Viburnum dentatum 10’
- 1 – *Euonymus alatus 6.5’
- 20 linear ft of *Ilex crenata ‘Steed’*
- 1,500 linear ft of *Lugustrum vulgare*

Trees:
- 2 – *Platanus x acerifolia*
- 2 – *Acer saccharum*
- 1 – *Zelkova serrata*
- 2 – *Ilex ‘Nellie R. Stevens’*
- 1 – *Styrax japonicas*
- 1 – *Cercidiphyllum japonicum*
- 3 – *Betula nigra*
- 1 – *Fagus sylvatica ‘Asplenifolia’*
- 8 – *Acer x freemanii ‘Armstrong’*

Most of this plant material is currently only being used for an aesthetic feel. Although I will continue to use them for this appeal, I believe the material can be rearranged in a way for better usage, such as shade for the house in summer months. The biggest issue we have to address on this property is the amount of turf grass. Currently there is roughly 24,000 sq. ft of turf grass on the property. Almost all of this land can be repurposed for different, and more productive uses.
Pictures of site by Marley Doherty, taken on October 16th, 2018:
Photo taken from google earth:
Case Studies

1. Planned Suburban Areas – Village Homes in Davis, California

Village Homes is a seventy-acre subdivision located in Davis California. The focus of this development was to encourage a sense of community and the conservation of energy and natural resources. The construction of Village Homes began in 1975 and the primary designer was Mike Corbett. Surrounded by conventional suburban housing developments, Village Homes stands out as the
pinnacle as a self-sustaining community. Some design aspects that help the residents live in an energy-efficient manner are:

- **Orientation** – All streets are run east-west and all lots are oriented north-south.
- **Street width** - All streets are less than 25 feet wide and generally are not bordered with sidewalks.
- **Natural drainage** - This community uses an innovative network of creek beds, swales, and pond areas that allow water to absorb into the ground.
- **Edible landscaping** – More than thirty varieties of fruit trees line the streets of the community.
- **Open land** – This community also contains two large parks, orchards, vineyards, and common gardening areas.
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http://www.villagehomesdavis.org/

This case study is important to my design because it showcases how effective permaculture practices can be when they are designed correctly. This neighborhood should be an example to city planners of what is possible in terms of ecological community design.


2. Limestone Permaculture Farm – New South Wales, Australia

Limestone Permaculture Farm is a highly productive 1-acre property, designed and operated on permaculture principles and is located in New South Wales, Australia. This property was first purchased in 2010 and has been slowly transforming into the farm it is today. This farm is run completely by the
members of the Cooper family, who reside on it. There are four members to this family; two parents, male and female in their forties, and two children, one male and one female both under twenty years old. The father is a permaculture educator and practitioner and looks over most of the growing on the property. The mother primarily looks after the animal care on the property. The children help out in both fields. Some design aspects of this farm that consist of permaculture principles, components, and functions include:

- Intensive orchards
- Food forest on water harvesting swales
- Animal management and integration of poultry, sheep, and goats
- European and native bee keeping
- Native bush foods
- Seed saving and propagation

This case study is important to my research because it shows me that permaculture practices are in fact possible when working on a 1-acre plot of land. It also shows me that a family of four can easily care for this land if they have the time.
3. Willow Crossing Farm – Vermont, United States

Willow Crossing Farm is located on 30 acres of floodplain in northern Vermont. This farm is an educational and experimental organic family farm, and the birthplace of the Prospect Rock Permaculture Project. The Prospect Rock Permaculture Project is a hands-on ecological design immersion program. Students develop designs for their own site in a whole-systems ecological design while implementing permaculture solutions for multi-use community spaces. On the Willow Crossing Farm they grow a diversity of fruit trees, nuts, berries, vines, vegetables, medicinal and culinary herbs and teas, produce eggs, honey and much more. The goal of this farm is to continue to innovate, experiment, and educate about the potential to increase ecological health while meeting human needs through permaculture design principles.
Some major project elements include:

- Renewable energy
- Rain water collection
- Livestock
- Tree crops
- Annual/perennial vegetable growing
- Medicinal plants
- Vertical growing
- Beekeeping
- Composting
- Orchards

https://prospectrockpermaculture.wordpress.com/2014-pdc/

This study is critical to my research because it shows that practices of permaculture are effective in the northeastern United States.

https://prospectrockpermaculture.wordpress.com/2014-pdc/
Historical Context

1972-1976: Permaculture is born
- 1976 - An article in Tasmania’s Organic Farmer and Gardener newsletter is published about Permaculture

1978 - The term Permaculture is coined
- Permaculture One is published, written by Davin Holmgren and Bill Mollison

1979 - Permaculture Two is written, focusing on design

1981 - Permaculture the magazine is created

1987 - Crystal Waters, the world’s first permaculture eco-village was created
- Permaculture the magazine was turned into the International Permaculture Journal

1994 - Permaculture goes mainstream and the first nationally accredited permaculture courses are found in Australia
People in the 1960’s and 1970’s began to realize the harm humans have caused to the environment. Several events such as in 1969 a catastrophic oil spill from an offshore well in Santa Barbara, protesting against nuclear testing, and Rachel Carson’s book *Silent Spring* in 1962, all raised public awareness on the topic. A biologist, author, scientist and most importantly teacher, Bill Mollison was an advocate of spreading this awareness. He was most importantly a teacher, because it was at a school where he met his student and friend David Holmgren. David Holmgren was a student at the Tasmanian College of Advanced Education where he studied Environmental Design. Bill and David first met in 1974 when Bill Mollison spoke at a seminar at the College. The two hit it off and began an intense working relationship and shared a small farm in Tasmania. The two eventually wrote and published *Permaculture One* in 1978, and *Permaculture Two* in 1979 which focused more on design.

By molding the two words, permanent and agriculture together, the term permaculture was coined. This was at a time where the world was beginning to understand that our local actions could have a far greater impact on the biosphere than originally thought. The Norwegian philosopher Arne Naess further developed this type of thinking when he wrote about the philosophy of deep ecology. This philosophy argues that the world is a balance of inter-relationships between all organisms on Earth, and that all organisms are equal. In the 1980’s there were seminars all over Australia, continuously spreading the knowledge of permaculture throughout the continent. With each student who
attended a seminar, the knowledge of permaculture continued to spread throughout the world.

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Gray, A. (n.d.). 5 tech innovations that could save us from climate change. Retrieved from

https://www.weforum.org/agenda/2017/01/tech-innovations-save-us-from-climate-change/


http://www.theresiliencyinstitute.net/what-is-permaculture/


Students Previous Experience

Email: dohejm4@farmingdale.edu
Hometown: Southampton, NY

“I’m intelligent. Some people would say I’m very, very, very intelligent”

“I think I’m actually humble. I think I’m much more humble than you would understand”

-Both quotes by Donald Trump

1st year, Fall 2015, Horticulture 110
Dr. Iverson

1st year, Fall 2015, Horticulture 131
Professor Fogelburg
Projects include introduction to landscape drafting
2nd year, Spring 2017, Horticulture 372  
Professor Rusty Schmidt  
Projects include design of a residence on the north shore of Long Island.

2nd year, Fall 2016, Horticulture 340  
Professor Michael Veracka  
Projects include design of the remediation of FSC Campus Center lawn area.

3rd year, Fall 2017, Horticulture 371  
Professor Stevie Famulari  
Projects include introduction to 2d design on CAD

3rd year, Fall 2017, Horticulture 207  
Professor Stevie Famulari  
Projects include a group design of an indoor space in the student campus center.

3rd year, Spring 2018, Horticulture 220  
Professor Michael Veracka  
Projects include design of a residence in Muttontown, NY.