Growing the Urban Ecosystem in Detroit, Michigan

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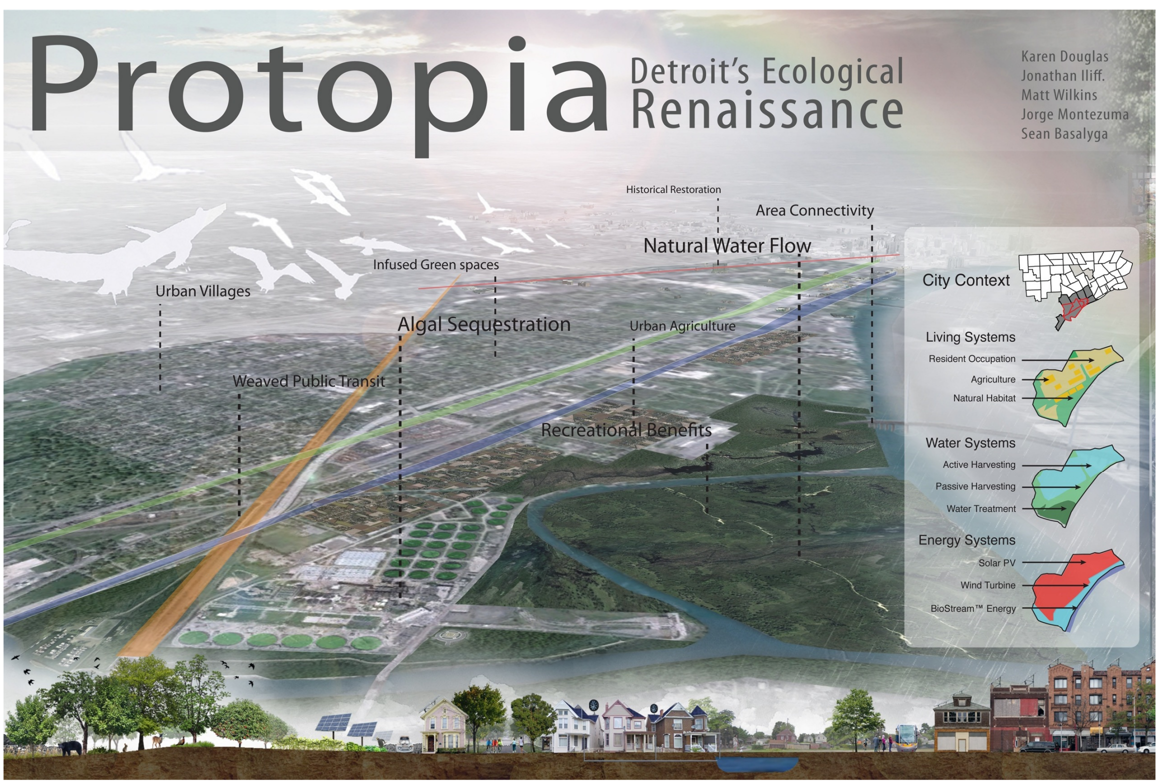
Dr. William Preston



Abstract

Growing the Urban Ecosystem of Detroit, Michigan

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Many views of the future are seen as bleak and devoid of the life where once stood beauty and abundance. However, the Living Cities Design Competition challenges these views and calls for a vision of the future that inspires hope, biodiversity, and a healthy interaction between human and natural systems. We chose to redesign the city of Detroit, Michigan to be a living city by the year 2035. As the earth scientist on an interdisciplinary team, I acted as an ecological consultant. By developing the urban ecosystem of Detroit, a number of social, economical, and environmental problems can be solved. Green infrastructure such as urban forests and ecological corridors should be implemented to lessen our impact on the environment. Urban agriculture should be developed in order to provide the community with healthy, sustainable, and local food as well as reviving the local economy. Protopia aims to provide a sustainable vision of the future in which the city replicates a natural ecosystem.

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A. Introduction

The following is an excerpt from the essay "Protopia: Detroit's Ecological Renaissance," submitted to the Living Cities Design Competition. The essay was collaboratively written by Sean Basalyga, Karen Douglas, Jorge Montezuma, Johnathon Illif, and Matt Wilkins.

Protopia: Detroit's Ecological Renaissance

"An ecosystem follows a model of efficiency that integrates biotic intelligences to form a highly evolved web of resiliency. Ecosystems are constantly being shaped by climatic and geological forces; advancing the evolution of adaptive traits in living creatures. Urban ecosystems can utilize this intelligence and holistically integrate human systems into the creation of the environment. Typically, urban ecosystems refer to individual cities, but modern metropolises have exceeded this scale to form complex webs of overlapping natural and cultural regions. Mass industrialization, expansion, and consumption of global resources has fueled these booming cities, and a blatant disregard for social and environmental truths has resulted in their inevitable declines. Detroit embodies this post-industrial condition, and its renaissance depends on a partnership between their inhabitants and natural environments."

"Detroit's strengths toward resiliency rely on its smaller population and mosaic of vacant lots, where ecological renewal is already occurring. It has the potential to evolve into an integrated network of habitats, housing a rich diversity of life within several regional ecosystems. Southwest Detroit embodies many of the city's strengths and weaknesses. An ecological approach to the revival of the Southwest bioregion will provide other neighborhoods with an adaptable model for the transition to urban ecosystems. The result is a biodiversity of cultural and environmental identities, united by a fundamental understanding of their interconnectivity."

"In the urban ecosystem human and natural habitats overlap in an organic gradient of shared and individual spaces to create dynamic edge effects where interactions between all scales of life favor greater diversity and abundance. Non-toxic vacant lots in early successive stages combine with riparian zones to provide wild habitats, linked together through a web of industrially damaged landscapes and greenways. Toxic sites are identified as bioremediation zones and can transition to thriving habitats as they detoxify. Multi-species interactions occur in recreational parks and greenway networks. "

"Neighborhood identities are focused around significant historical heritage sites, open spaces, and community centers, which support decentralized systems of food, water, and energy production. They also serve as meeting points for community building, helping neighborhoods establish their identity and celebrate their culture. Establishing effective growth management strategies starts with understanding bioregional carrying capacities. Our approach determines the area necessary for vital ecological habitats to provide vital life services first. Proposed human and wild habitats have a one-to-one ratio, establishing a total cap for all human development. A self-sufficient city requires that people live at higher densities to not demolish the biotic systems that provide essential services. "

"An integral part to repairing the urban ecosystem is reviving the urban agriculture that supports those living locally with the proper nutrients necessary to sustain life. By creating local and sustainable jobs for the currently unemployed, urban agriculture will revive self-sufficiency by rehabilitating abandoned land, reducing the carbon footprint, and providing the city with much needed fresh, healthy vegetables. After completing the life cycle, waste is nonexistent in nature; every byproduct serves a function. Composting, upcycling stores, and recycling facilities will act as the decomposers in nature to redesign the structure of the byproduct into a usable item, such as recycled clothing, fertilizers, and more. Carbon dioxide and wastewater will be completely transformed by biotic systems placed within the city, lessening the load on the current, expensive, and outdated infrastructure."

"Since the inception of human creativity, not only has nature provided humans with the models for adaptation, but it has inspired our artistic voices to express the spirit and intuitive understanding of beauty. Nature extends all the way from the inside to the infinity, and will serve as an eternal source of inspiration as we continue to evolve within it. It will inspire humans to educate the youth to restore a positive vision of the future. Protopia pushes for intuitive and interactive experiences to allow people of all different backgrounds to understand the life-nurturing processes and how they fit within the whole system. Protopia aims to elevate the human spirit to become positive agents of change acting in harmony, love, and respect with all the living beings."

b. Introduction to Living Cities Design Competition and Senior Project

Climate change has caused humans to rethink their niche within the world's ecosystem. Cities are typically thought as separate from "nature" and our anthropocentric systems are slowly being realized as unsustainable. Many views of the future are seen as bleak and devoid of the life where once stood the beauty and abundance of the Garden of Eden. However, the Living Cities Design Competition challenges these views and calls for a vision of the future that inspires hope, biodiversity, and a healthy interaction between human and natural systems.

For this competition we have chosen Detroit, Michigan to be transformed into a living city by the year 2035. Overwhelmed with problems of unemployment, crime, and pollution, we have taken up the ambitious challenge to put our visions of a sustainable future into a viable model of a living city. The urban ecosystem is a very important part of any city, regardless of its size and it is often overlooked due to our increasing separation from the natural environment. Urban agriculture is also a vital component of this ecosystem and sustains human life by providing it with sustenance. Where the city grows and gets its food will be very important, especially if envisioning a sustainable future.

Permaculture is a set of ecologically based principles aimed at designing human settlements and must be applied to Detroit's urban ecosystem in order to ensure its long term sustainability (Holmgren 2002). In this report, I intend to propose how developing the urban ecosystem of Detroit can help solve its social, economic, and environmental problems. Working on an interdisciplinary team composed of architects and engineers, I am the earth scientist working as an ecological consultant. For our site we chose to redesign the Southwestern neighborhoods, characteristic of the cultural and ecological history of Detroit, to provide the rest of the city and world with an adaptable model for the transition to urban ecosystems. We titled out project Protopia, which means "in favor of place."

First I will gain an understanding of Detroit's natural history to see what the native condition may have looked like and what future solutions will be based upon. Next I will show the cultural history of Detroit to provide context to the resultant failures of the post-industrial and post-consumerist society, and its implications on the city. Finally I will show how the development of the urban ecosystem in Detroit can address its social, economic, and environmental problems to transition Detroit to become a living city by the year 2035.

B. Earth Science

Before attempting to solve the problems of a city, one must understand the context. I will briefly address the natural history of Detroit to guide solutions to be specific to Detroit.

a. Geography

i. Geology

The bedrock of the Southern Michigan Peninsula, originating from the Ordovician and Penninsylvanian Eras, is relatively young in age,. The last major glacial period from the Pleistocene Epoch, the Wisconsinan, deposited surficial deposits of unconsolidated, nonstratified clastic sediments directly from continental glaciers (drift), and unconsolidated stratified gravels, sands, and clays deposited by glacial streams in glacial lakes (glaciofluvial deposits) upon the bedrock throughout most of the state. The Northern Peninsula contains the megatectonic-petrologic unit called the Canadian Shield, which contains essentially all of the state's metallic mineral resources of iron, copper, copper sulfides, and silver (Heinrich 1976).

ii. Soils

According to the Michigan Natural Features Inventory, Detroit's native plant communities were mostly Mesic Southern or Oak-Hickory Forests, which grew in predominately loam textured soils. Other soils that support mesic southern forests include sand, sandy loam, loamy sand, loam, silt loam, silty clay loam, clay loam, and clay. The soils are typically well-drained with high water-holding capacity, high nutrient and high soil organism content. Decomposition of deciduous leaves and woody debris input nutrients to maintain high soil fertility. American beech leaf litter can have a podzolizing effect on the soil, which increases the soil acidity. The soil pH ranges from slightly acidic to moderately alkaline (MNFI 2007).

Urban soils in Detroit face problems of contamination of lead from leaded paint, leaded gasoline, and a long history of heavy industry use. It is of great concern that soils should be properly tested before urban agriculture develops on vacant lots and other unused lands. Currently, the Urban Roots Action Movement, an organization based out of Detroit, provides resources on testing soils for contaminants and helps develop urban farms. Also, utilizing raised beds can help minimize soil contamination (Runk 2011).

iii. Climate

Detroit and southeastern Michigan have a humid continental climate with a Koppen Classification of Dfa. The climate is greatly influenced by the Great Lakes, which draw a lot of moisture into the region. Detroit experiences cold winters with moderate snowfall and can drop below freezing point for about three months out of the year. Snowfall averages about 43 inches per winter but most of the precipitation is received in the summer for a total average annual precipitation of 33 inches. The summers are warm and hot and can sometimes reach above 90 °F (NOAA 2000). Below (Fig. 1) is a climatograph of Detroit.

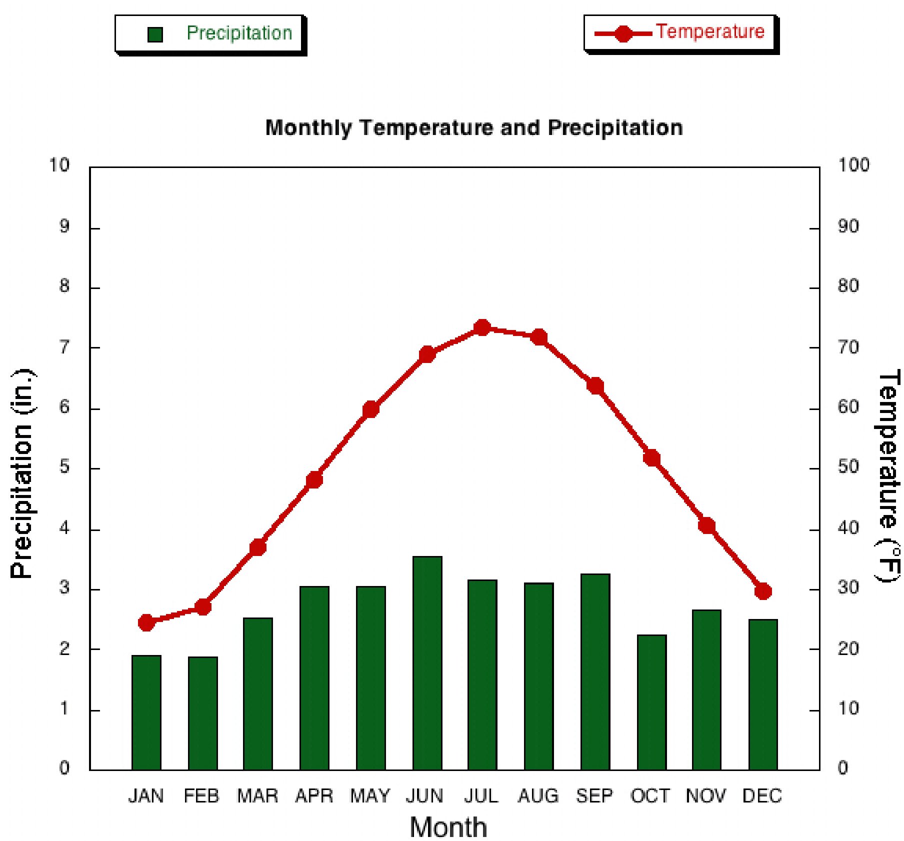

Figure 1: Average Temperatures and Precipitation 1971-2000 (NOAA).

Detroit is in zone 6 on the USDA Plant Hardiness Zone Map. The last spring frost is typically around April 26th and the first fall frost is around October 17th (City Data 2010). Although it may seem difficult to grow food with such high seasonal variation, greenhouses or hoop houses can help control temperatures to extend growth into the winter months (Colasanti, Litjens, Hamm 2010).

By the end of the 21st century, it is expected that average temperatures in the Great Lakes region may warm 2 to 4°C and precipitation could increase by 25%. However, due to higher temperatures, lake water levels are expected to fall by 1.5 to 8 feet by 2100, despite the rise in precipitation. Fewer cold outbreaks and less lake-effect snow could significantly decrease annual snowfall (Brennan 2008).

Climate change will definitely have an effect on urban agriculture. Although warmer temperatures may extend the growing season, heavier and unpredictable precipitation may damage sensitive plants. However, growing food in greenhouses can help control plant temperatures and can help mitigate the effects of climate change. The urban heat island also affects the downtown area, most notably at night when it remains a bit warmer than the suburban locations (City Data 2010). This could help food production by minimizing frost damage but probably would have little affect, as most food production will occur in the suburbs closer to where the residents live. Small changes in the temperature of microclimates in Detroit does not seem to have much of an affect on urban agriculture, as the region already experiences large seasonal variations that must be dealt with.

iv. Topography

According to the United States Census Bureau, Detroit covers an area of 143 square miles. It is relatively flat with the highest elevation of 670 feet in northwestern Detroit and the lowest elevation of 579 feet at the riverfront of the Detroit River. The suburbs of Detroit stretch about 30 miles from the city's core and the rural fringe extends to about 80 miles outside of the city (Google Earth). Figure 2 shows the Downtown Detroit area as well as the suburban fringes and Wayne County. Surprisingly, better maps could not be found. Figure 10 shows a better context of our site in relationship to the city, as well as the proposed living, water, and energy systems of the site.

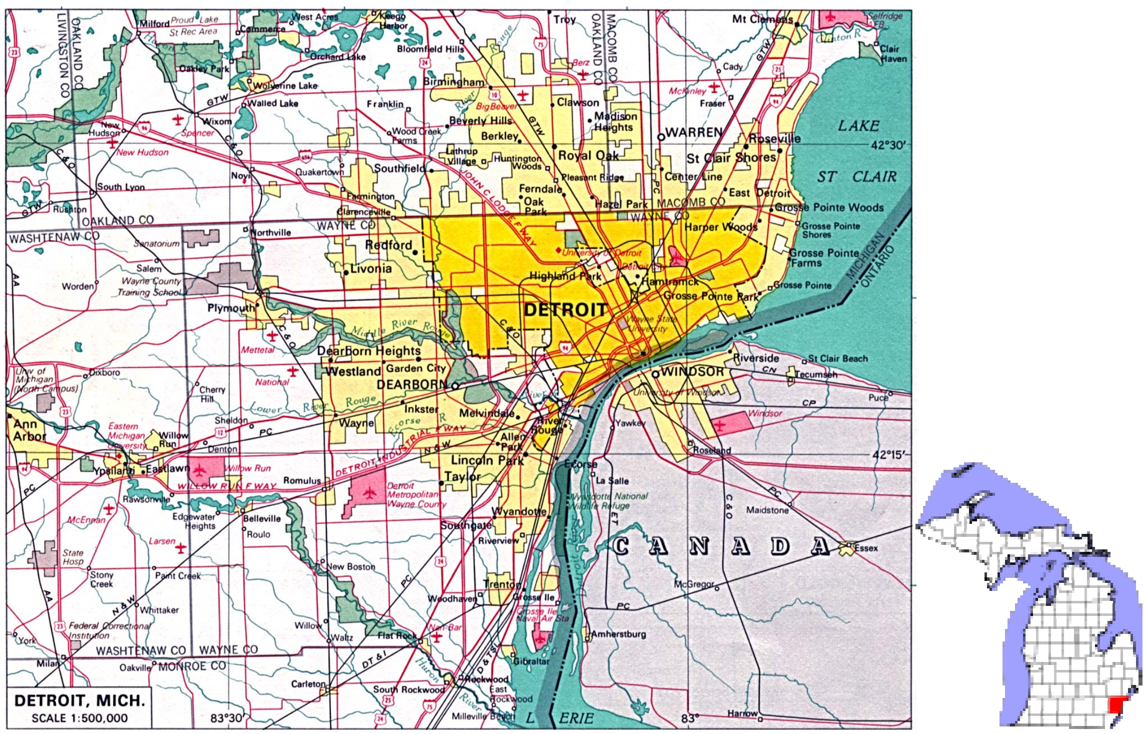

Figure 2: Map of Detroit, MI and Surrounding Suburbs, and Wayne County Relation to Michigan (City Data 2010).

v. Hydrology

According to researchers at Michigan State University, the Great Lakes have been estimated to form over 10,000 years ago at the end of the last ice age when the Laurentide ice sheet receded. The retreat of the ice sheet left behind a large amount of melt water which filled up the basins that the glaciers had carved, thus creating the Great Lakes as they now appear.

Michigan is now a peninsula that borders Lake Michigan on the west and Lake Huron on the east. On their way out to the Atlantic Ocean, both rivers drain into the Lake St. Clair Reservoir, which lies east of the Detroit metropolitan area. The Detroit River flows out of the reservoir to the south of Detroit and serves as the border between the United States and Canada. The Rouge River also flows out of the Rouge Watershed and through southwest Detroit (Larson 2001).

b. Biota

When rehabilitating land, the following native ecosystems should be replicated as much as possible. Habitats should be conducive to the protection of the local wildlife. Native plants should be planted and invasive species should eradicated whenever possible.

i. Native Vegetation

Figure 3: Native Vegetation Specific to Our Site.
Map created by Karen Douglas (MNFI 2007).

The map above (Fig. 3) shows that the native condition of our site was primarily composed of Beech-Sugar Maple Forests and Oak Hickory Forests (mesic southern forests). According to the Michigan Natural Features Inventory (MNFI), mesic southern forests are American beech and sugar maple dominated forests that occur on rolling topography and predominately loam soils. Small gaps in the tree canopy allow for shade-tolerant species. It is tolerant of icy conditions but is susceptible to wind disturbance from low-pressure systems and tornadoes, which can create large gaps within the canopy. Most native vegetation is old growth forest of about 50-200 years old. The forests are dominated mostly by large trees but can have a sub-canopy of young saplings, shrubs, and vines. The ground flora is characterized by a diversity spring ephemerals.

When enhancing biodiversity in a mesic southern forest, it is important to leave large tracts (especially old-growth) unharvested to allow natural processes to continue. Minimizing human impact will also prevent the threat of introduction of invasive species (MNFI 2007).

ii. Animals

Mature mesic southern forests provide habitat for cavity nesters, species of detritus-based food webs, canopy-dwelling species, and interior forest obligates, including numerous neotropical migrants such as black-throated green warbler (Dendroica virens), scarlet tanager (Piranga olivacea), and ovenbird (Seiurus aurocapillus). Vernal pools within mesic southern forests provide critical habitat for reptiles and amphibians (MNFI 2007).

iii. Rare and Threatened Flora and Fauna

List 1: Lists of Rare and Endangered Flora and Fauna of Mesic Southern Forests (MNFI 2007).

Rare Plants
Adlumia fungosa **(climbing fumitory, state special concern)**
Aristolochia serpentaria **(Virginia snakeroot, state threatened)**
Bromus nottowayanus **(satin brome, state special concern)**
Carex oligocarpa **(eastern few-fruited sedge, state threatened)**
Carex platyphylla **(broad-leaved sedge, state endangered)**
Castanea dentata **(American chestnut, state endangered)**
Dentaria maxima **(large toothwort, state threatened)**
Euphorbia commutata **(tinted spurge, state threatened)**
Galearis spectabilis **(showy orchis, state threatened)**
Gentianella quinquefolia **(stiff gentian, state threatened)**
Hybanthus concolor **(green violet, state special concern)**
Hydrastis canadensis **(goldenseal, state threatened)**
Jeffersonia diphylla **(twinleaf, state special concern)**

Liparis liliifolia **(purple twayblade, state special concern)**
Ophioglossum vulgatum **(southeastern adder's tongue, state endangered)**
Panax quinquefolius **(ginseng, state threatened)**
Phlox ovata **(wideflower phlox, state endangered)**
Polymnia uvedalia **(large-flowered buttercup, state threatened)**
Ruellia strepens **(smooth ruellia, state endangered)**
Scutellaria elliptica **(hairy skullcap, state special concern)**
Scutellaria ovata **(heart-leaved skullcap, state threatened)**
Smilax herbacea **(smooth carrion-flower, state special concern)**
Tipularia discolor **(cranefly orchid, state endangered)**
Trillium recurvatum **(prairie trillium, state threatened)**
Trillium sessile **(sessile trillium, state threatened)**
Triphora trianthophora **(three-birds orchid, state threatened)**
Viburnum prunifolium **(black haw, state special concern)**
Vitis vulpina **(frost grape, state threatened).**

Invasive Plants
garlic mustard (Alliaria petiolata)
Dame's rocket (Hesperis matronalis)
Oriental bittersweet (Celastrus orbiculatus)
Eurasian honeysuckles(Lonicera morrowii, L. japonica, L. maackii, L. sempervirens, L. tatarica, L. xbella, and L. xylosteum)
Japanese barberry (Berberis thunbergii)
common buckthorn (Rhamnus cathartica)
glossy buckthorn (R. frangula)
multiflora rose (Rosa multiflora)
autumn olive (Elaeagnusumbellata)
common privet (Ligustrum vulgare)
European highbush cranberry (Viburnumopulus)
Norway maple (Acer platanoides)

Rare Animals
Accipiter gentilis **(northern goshawk, state special concern)**
Ambystoma opacum **(marbled salamander, state endangered)**
Ambystoma texanum **(smallmouth salamander, state endangered)**
Buteo lineatus **(red-shouldered hawk, state threatened)**
Dendroica cerulea **(cerulean warbler, state threatened)**
Dryobius sexnotatus **(six-banded longhorn beetle, state threatened)**
Emydoidea blandingii **(Blanding's turtle, state special concern)**
Mesodon elevatus **(proud globe, state threatened)**
Microtus pinetorum **(woodland vole, state special concern)**
Nicrophorus americanus **(American burying beetle, federal/state endangered)**
Pantherophis spiloides **(gray ratsnake, state special concern)**
Protonotaria citrea **(prothonotary warbler, state special concern)**
Seiurus motacilla **(Louisiana waterthrush, state threatened)**
Terrapene c**.** carolina **(eastern box turtle, state special concern)**

c. Demographics

According to the U.S. Census Bureau estimates, in 2009, the city of Detroit had a population of 916,133 residents. The whole six county, Detroit metropolitan area has a population of 4,296,250 people. 77% of the population is African American while 15% is white. About 33% of city residents lived below the federal poverty level in 2007, and is currently the highest among large U.S. cities. However, the Metro Detroit suburbs are among the wealthier in the country. Seventy six percent of adults over 25 have a high school degree and 12% have a bachelor's degree or higher education yet 47% of city residents are functionally illiterate. The median household income is $29,447 and the median age is 33.7 years old (U.S. Census Bureau).

C. Status Quo

a. Brief History of Detroit

Detroit was originally founded in 1701 as a French settlement for a port city but was passed to the United States through the Jay Treaty in 1796. The city grew steadily and became the 13^{th} largest city in the United States with 285,00 people by 1900. In 1899, Henry Ford opened his first automobile plant, which would revolutionize Detroit for the first time. The population skyrocketed to 1,568,000 by 1930 and peaked in 1950 at 1,850,000. With the growth of the automobile industry, the city flourished as it began to spread outward. After World War II, the riots of 1967 had started a movement of "white flight" to the suburbs. Detroit's population began to plummet as factories started to close. The remaining populations were impoverished as the suburbs took the wealth with them and the downtown area was neglected and abandoned (Mallach 2008).

Today, Detroit's population is about 808,000, less than half its peak population in 1950 with over 40 square miles of vacant land. In the last two years, Detroit has suffered from the economic crisis and erosion of the auto industry and is now the poster child for economic decline and urban decay (Mallach 2008).

b. Problems Facing Detroit

Detroit is faced with a myriad of problems stemming from the collapse of the auto industry, upon which the community was heavily dependent. According to the report "A Leaner, Greener, Detroit," in December of 2010, the city's unemployment rate was up to 19%. With little job availability, over a third of Detroit lives below the poverty line. Poverty also brings additional problems of crime, high school dropouts, and gang violence. Figure 4 shows how the poverty is concentrated in the downtown area but recedes in the suburbs (Mallach 2008).

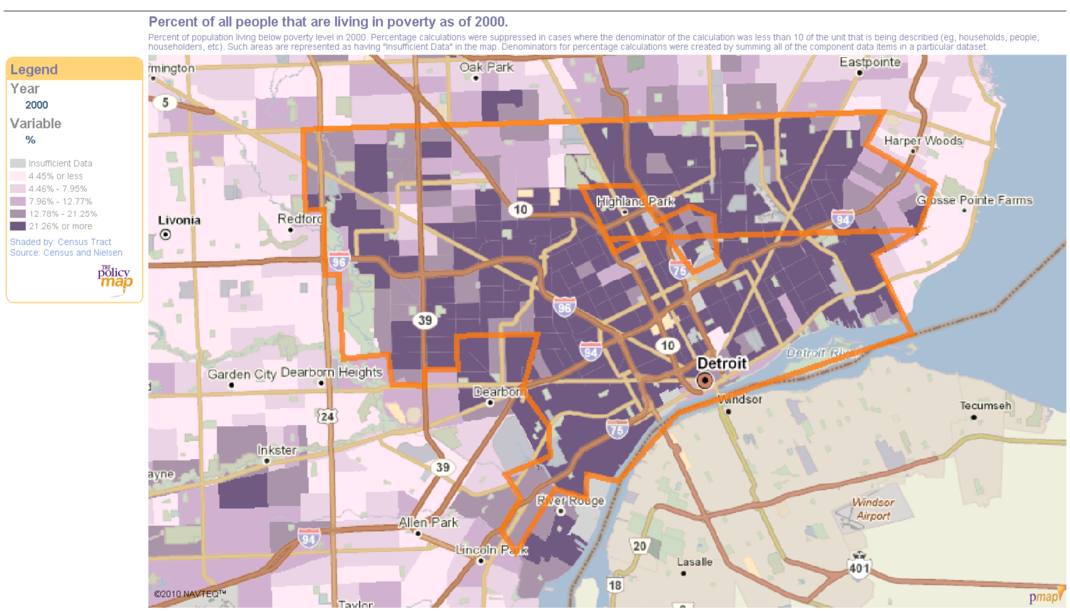

Figure 4: Percent Poverty Density map of Detroit, MI (Policy Map 2000).

The present food problem is represented by half of Detroit's population living in "food deserts" (places where healthy, affordable food is difficult to obtain) and three quarters of the population of Detroit's K-12 schools being enrolled in free or reduced price lunch programs (Peterson 2008). Figure 5 shows the distribution of these food deserts, areas which should be targeted for the development of urban agriculture.

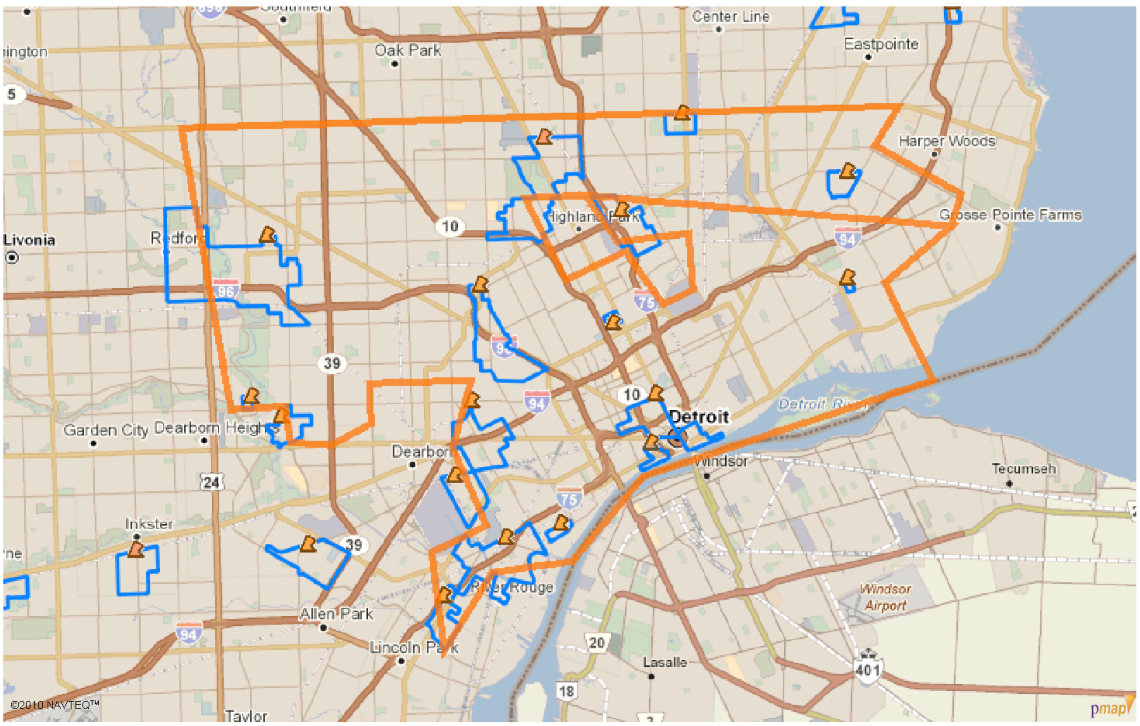

Figure 5: Food Deserts of Detroit, MI (Policy Map 2000).

Along with this, Detroit's urban ecosystem is also suffering. The current management of green infrastructure is declining and will only cost the city more money that it already does not have (American Forests 2006). Zug Island, a steel production facility, has visible piles of coal and iron ore lying next to open river edges contributing to the city's significant pollution problem. A regional wastewater treatment plant funnels filtered human waste and storm water into the Rouge River.

However, the citizens of Detroit refuse to give up and there is much opportunity for growth and renewal. Detroit is a blank canvas ready to be envisioned as the sustainable city of the future.

D. Methods

Research was mainly conducted by book and online research. Two of our group members visited Detroit to experience a first hand account of being in the city as well as to take photographs and video.

E. Suggestions for the improvement of the urban ecosystem

Now that I have provided the natural context, cultural history, and problems of Detroit, I will outline various strategies to address these problems; specifically the development of the green infrastructure and urban agriculture of Detroit.

a. Green Infrastructure

i. Urban Forests

Green infrastructure highlights the importance of the natural environment in land use planning and can have many economic, biological, and aesthetic benefits. The "Urban Ecosystem Analysis SE: Michigan and City of Detroit" report put together by American Forests in 2006, establishes a regional ecological context of growth and development by assessing eleven years of land cover change in nine counties using Landsat satellite imagery. The results have shown that tree canopy is the largest component of green infrastructure and that land cover changes have a direct impact on stormwater runoff and thus on water quality.

According to the report, there has been a net decline in green infrastructure (open spaces and tree canopy) over 11 years from 1995 to 2006. Wayne County, which contains Detroit city, has experienced a 33% loss of open space. The net decline in green infrastructure (open space and tree canopy) and increase in urban areas (impervious surfaces) increases stormwater management costs and decreases water quality over the whole county. Without green infrastructure, the cost of building stormwater retention ponds and other systems is valued at $1.12 billion for Wayne County. In Detroit, the runoff currently flows into the sewers and must be treated to reenter the hydrologic cycle and costs a significant amount of money. Detroit's current tree canopy provides 191 million cubic feet of stormwater management, valued at $382 million; 2.1 million lbs. of air pollution removal, valued at $5.1 million annually; stores 1.2 million tons of carbon and sequesters 9,334 lbs. of carbon annually.

Overall the land cover changes have a direct impact on stormwater runoff and thus on water quality. The Ecorse Watershed, which contains Detroit, has experienced an 18% loss of tree cover, 35% loss of open space, and a 23% increase in urban land, and a loss of 68 million cubic feet during the 11-year period of study. This loss of stormwater retention capacity is valued at $136 million. In addition, trees' ability to absorb air pollutants diminished by 194,000 lbs., valued at $459,000; 107,000 fewer pounds of carbon were stored and 800 fewer pounds were sequestered annually for the city of Detroit.

This report recommends that Detroit should create public policies that incorporate green infastructure including: increasing to 40% tree canopy citywide, maintaining vegetated buffer strips to improve stormwater infiltration, minimizing impervious surfaces, and preserving all natural vegetative buffers adjacent to water- bodies (e.g. 100 ft. from stream) for maintaining water quality, erosion protection, and wildlife habitat. Figure 6 shows the report's recommended development of urban forests along existing transportation ways (American Forests 2006).

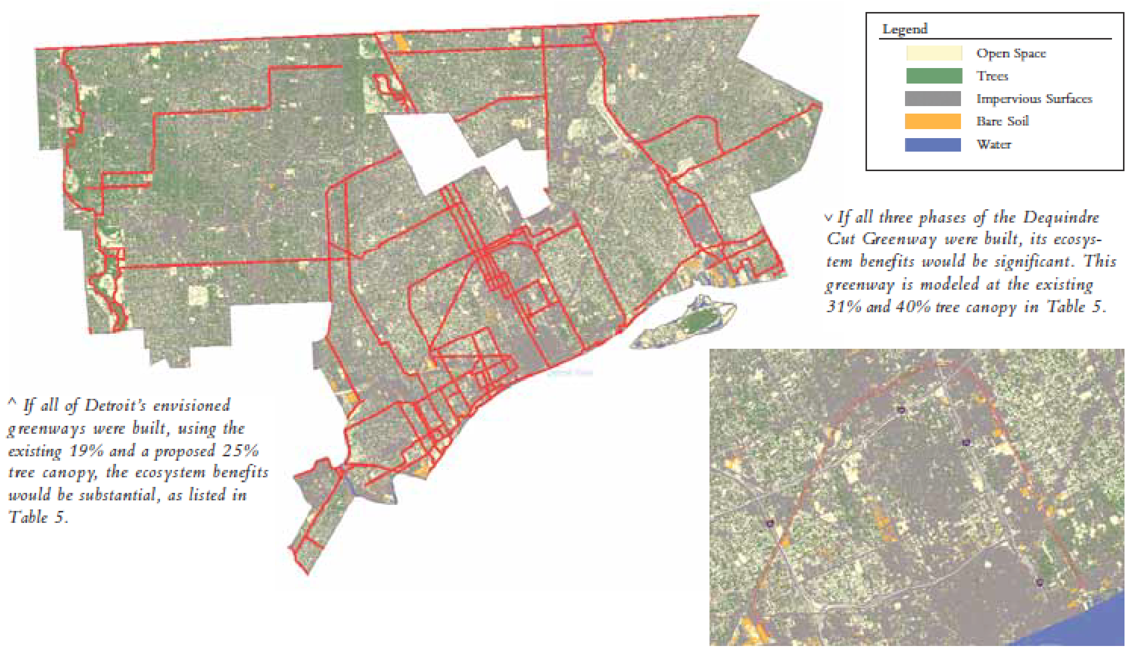

Figure 6: Recommended Greenways in Detroit (American Forests 2006).

ii. **Ecological Corridors and Greenways**

In the book, *Ecological Networks and Greenways*, published in 2004, Rob Jongman and Gloria Pungetti define an ecological corridor or greenway as "A framework of ecological components (core areas, corridors, and buffer zones), which provides the physical conditions necessary for ecosystems and species populations to survive in a human-dominated landscape" (Jongman and Pungetti 3). Greenways embrace the concept of protected lands within urban regions, located in close proximity to where people live and can have many benefits.

Ecological corridors can create temporary or permanent habitats and pathways for plants and animals, promote recreation by having nature close to housing, educate people and have them experience nature, and give an area a characteristic identity. They can benefit the ecology by connecting natural areas and serving as places for seed dispersal, migration, foraging, and reproduction. They are economically beneficial by implementing Smart Growth principles by concentrating development and demanding less infrastructure; attracting recreation, tourism, and business to parks and open space; providing flood protection, water storage and purification, air cleaning, degradation of organic wastes, and reducing the heat island effects (Jongman and Pungetti 2004).

Some examples of ecological corridors could be for birds: stones for feeding, rest, and shelter; Fish: fish ladders, and no dams; and for mammals and amphibians: hedgerows, brooks, natural features that offer shelter, road crossings, tunnels, or overpasses (Jongman and Pungetti 2004).

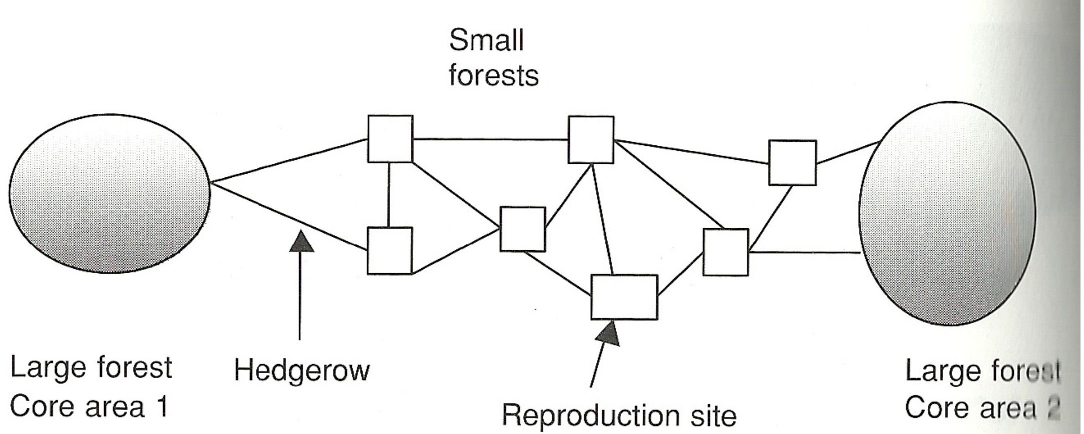

FIGURE 6.4.
Theoretical example of a combined reproduction and dispersal corridor for a ground-dwelling species.

Figure 7: Ecological Corridor and Greenways Diagram (Jongman and Pungetti 100).

Figure 7 shows how large natural areas called core areas are connected by smaller hedgerows to medium sized reproduction sites, parks, marshes, etc. Each area would contain buffer zones to serve as areas around the preserves. Below (Fig. 8) is a picture of a typical agriculture field converted to an ecological corridor by connecting hedgerows (Farr 2008).

Figure 8: Agricultural Field with applied Ecological Corridor (Farr 2008).

Adding ecological corridors could greatly help some of the rare animals of Detroit, especially the coaster brook trout, grey wolf, red fox, and red-tailed hawk mostly outside the city around rural fringes.

b. Urban Agriculture

i. Urban Agriculture Plan

The following is a summary of my research on urban agriculture models and my suggestions on how to best develop urban agriculture within Detroit.

At the house level, families can grow herbs, vegetables, and fruits to be consumed at home. Businesses and schools could have their own gardens as well to feed people while away from home. At the community level, local community gardens would be available for those who do not have space to garden at home and where resources can be shared. Farmers can lease vacant lots owned by the city and will be able to provide the community with fresh and local food. Farms such as Growing Power from Milwaukee, WI provide a good example of high biointesive farms that can provide the community with lots of food on little land. Using techniques such as aquaponics to grow fish, worm depositories for compost, apiaries for beehives, and vertical farming grown in greenhouses year round that use compost for heating allow high yields on low acreages. Also, sustainably raised livestock such as chickens, goats, ducks, and turkeys can supply the community with meats without taking up much land. Beef production will have to take place outside of the metropolitan area as they need more land for grazing and are not considered to be as sustainable.

To supplement additional food needs, fresh food can be purchased at local farmer's markets, grocery stores, through CSA programs, or at local co-ops. Farmers markets and natural food grocery stores will be placed in food deserts to ensure everyone has equal access to fresh, healthy food. Also, third party food preservation and freezing companies can ensure that local and healthy fruits and vegetables are available year round.

Also, social issues should be addressed whenever possible. Local non-profits could employ the homeless, unemployed, and poor and offer them a place to stay while working on the urban farm while providing jobs as agriculture moves away from mechanized, commercial practices and back to local self-sufficiency. Students can be taught sustainable agriculture to become the farmers of the future.

Detroit needs to eat 2.2 times more fruit and 1.8 times more vegetables and would require 163.2 acres to meet recommended USDA standards. This would provide a net increase of $919,207 to our project site annually (Conner, et al. 2008). Currently, 256 vacant lot acres are available within our project site (Colasanti, Litjens, Hamm 2010).

Urban agriculture has the opportunity to revitalize Detroit. By regaining self-sufficiency, food security, and equal access to healthy food, urban agriculture will provide local and sustainable jobs to the unemployed while rebuilding communities.

ii. Vacant Lot Potential

According to the "Growing Food in the City: The Production Potential of Detroit's Vacant Land" report from the CS Mott Group for Sustainable Food Systems at MSU, Detroit currently has over 44,085 vacant parcels on 4,848 acres of land. If this land were utilized to grow food, it could sustain the entire city with enough fruits and vegetables year round. This land already belongs to the city or is vacant with little trash or existing structures on the property.

Several conclusions can be drawn from these estimations, displayed on Figure 8. First maximizing the growing season through post harvest crop management and through season extension makes it possible to supply the city with roughly ¾ of its vegetables and nearly ½ of its fruits. If biointensive farming were used, it would only necessitate less than half the land. However, if Detroiters increased the amounts of fruits and vegetables in their diet to the levels recommended by the USDA My Pyramid Guidelines, approximately three times as many acres would be required to produce the same percentages of the food supply.

This is true for each of the yield levels and with each of the production scenarios. By utilizing all of the currently vacant land and high productivity biointensive techniques, Detroit could already sustain itself with fruits and vegetables year round (Colasanti, Litjens, and Hamm 2010).

In Detroit, soil contamination was one of the major concerns among those with no previous experience in food production. Soil tests must be conducted on sites previously impacted by industry so as to avoid lead contamination. Organizations like the Urban Roots Action Movement provide resources on testing soils for contaminants and helps develop urban farms (Colasanti, Litjens, and Hamm 2010).

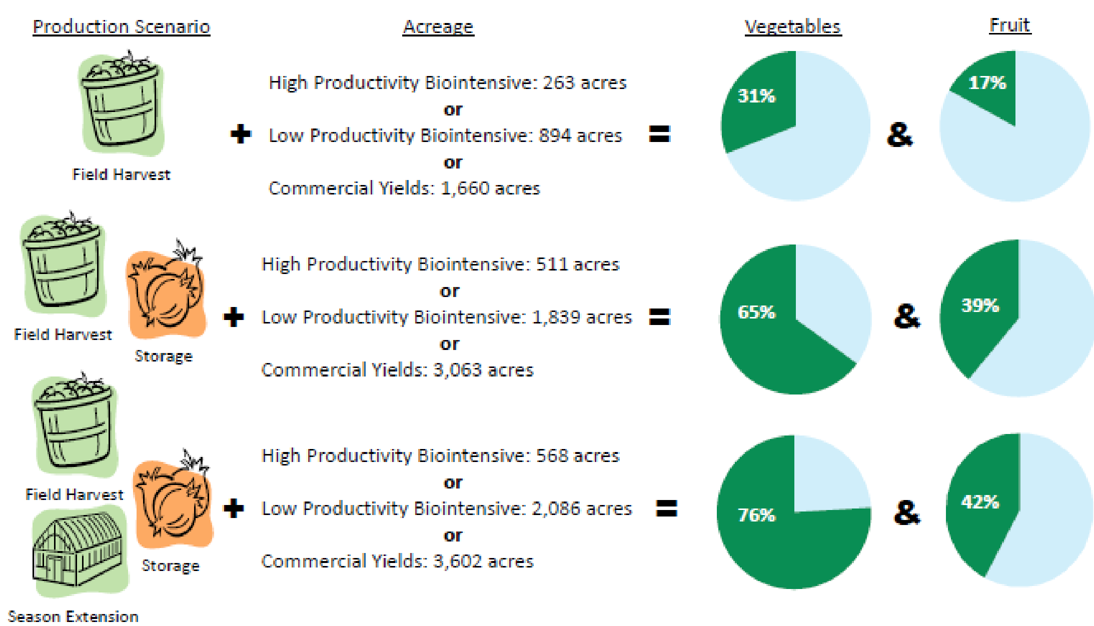

Figure 8: Growing Potential of Detroit's Vacant Lots (Colasanti, Litjens, Hamm 2010).

F. Conclusions

The goal of this project was to put a tangible vision of a sustainable, living city in the minds of those who previously thought it was not possible. We must have an idea of what the future should look like in order to work towards this goal. Implementing it will not be easy for it will take much collaboration, creative problem solving, and most importantly optimism and the willingness to try new things. The ways of the past have proven problematic; it is time to try something new, something sustainable, something that takes care of the earth and its beautiful and diverse forms of life.

Sustainability is about connecting back to what it truly means to be human, to realize what is truly important to us; happiness, health, community, love, friends, and family. We must realize that we are all born from mother earth, and we are not separate from nature. We do not need corporations and endless advertisements to tell us what we want or need, and we will not ruin this planet in the pursuit of temporary satisfaction. The earth is not ours for the taking we must share it with other people, plants, and animals and understand that our survival depends on learning to live together in unity and in harmony. Protopia aims to bring about a cultural and ecological renaissance of ideas old and new by planting the seeds of today to revive the abundance, resiliency, and self-sufficiency for the future generations to come.

Detroit is the perfect example of a post-industrial city that has fallen from the collapse of the automobile empire. However, once a city built upon the American Dream, it is a city that does not wish to be defined by its problems, but as a city that stands for American resiliency and prosperity. Amazing things that could have only sprouted from chaos have already begun within the city. Detroit has the opportunity to be the first sustainable city to rise from the post-industrial collapse. Although the solutions for this project are specific to Detroit, its rebirth can easily be replicated across the globe and serve as inspiration for cities that wish to become self-sufficient.

I. Presentation Boards

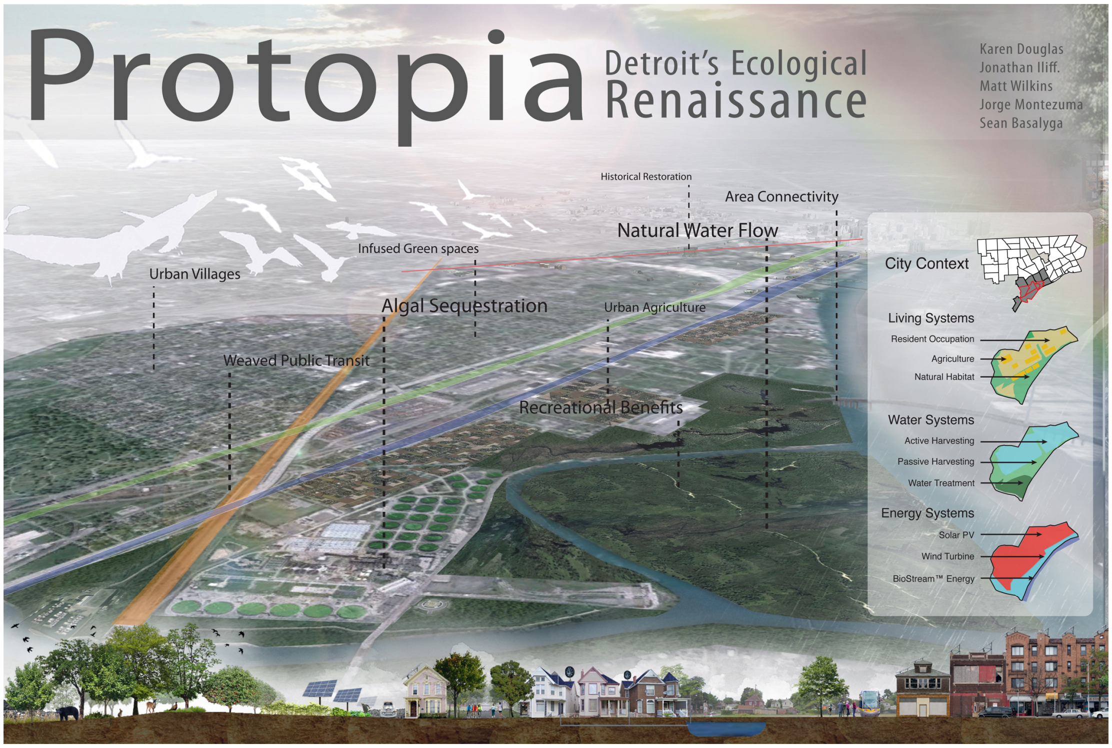

Figure 10: Final Presentation Board 1 (Protopia).

Figure 11: Final Presentation Board 2 (Protopia).

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