



The Sullivan County Design Charette
The Pennsylvania State University
Landscape Architecture
2013

Sustainable Watershed

“Sustainable development is the master balance of meeting our own needs without jeopardizing the future generations’ ability to do the same.” - Light of Mine

Problem Statement:

The goal of the sustainable watershed project is to design a watershed that is **sustainable on three levels; Energy, Food, and Water**. If a self-sustaining watershed can be achieved, this area could act as a model for surrounding watersheds to reach the same level of independence.

Sustainable initiatives bring many benefits. A sustainable food practices turns the focus to local markets, **improving the local economy**. Sustainable energy creates a local industry that is **cleaner for the environment**. This ensures a brighter future for generations to come.

Energy

Sustainable energy is a viable option for this watershed. It means a cleaner environment and a reliable energy source that will be renewable for generations to come.

Food

Through focusing on sourcing food within the watershed, farmers will be able to maintain and improve their livelihoods in addition to bringing their community members closer to the land. Furthermore, local food sources tend to be less intensive on the environment, leading to a greener future.

Water

The key goal is to move the water through the watershed as natural as possible while preserving the quality. The water should act as though the watershed is not impacted by the development occurring there.



“The Endless Mountains”

Personal Image



Gas Compression Station

Personal Image

M a r c e l l u s X D e s i g n

Historic Precedents

This is not the first time that Sullivan county has witnessed an rush of change due to the nation’s demands for energy. Over the past 200 years and more, Sullivan County has experienced both the timber rush and the rise of coal. Now, this pattern seems to be reoccurring with natural gas.

Once these industries faltered, the sources of income for those who worked for them disappeared. This caused a “Boom and Bust” pattern for the population and economy of northeastern Pennsylvania.

T i m b e r :

Between the 1760’s and 1890’s, the demand for charcoal and wood caused more than four million acres to be harvested multiple times. The Civil War, in addition to the need for coal mine supports and railroad ties only exacerbated the demand for lumber from northern Pennsylvania. By 1900, over 60% of Pennsylvania’s forests were gone. The first forest commissioner, Joseph Rothrock, called this area the “Pennsylvania Desert”.

Fortunately, over the past century substantial action by the government has allowed for about 60% of Pennsylvania’s land to be covered once more with forest. (ExplorePAHistory.com “Penn’s Woods”)



Circa 1890.



The “Pennsylvania Desert”, Circa 1920.

A n t h r a c i t e C o a l :

By the Civil War, coal was emerging as the primary source of energy for the burgeoning Industrial revolution. In order to access the mines and have a large supply of workers, coal barons rapidly raised many company-owned “patch towns” where the workers lived in over-crowded situations. Eventually, striking workers and the Great Depression hit gave the fatal blow, when cities and other industries to look for more affordable fuels, such as electricity, oil and gas.

With the decline of jobs in the anthracite industry, families and younger generations left northeast Pennsylvania, causing a localized economic depression due to a “painful deindustrialization process that many Pennsylvania towns and cities continue to experience”. (ExplorePAHistory.com “Mining Anthracite”)



Young Mine Workers, Circa 1910.

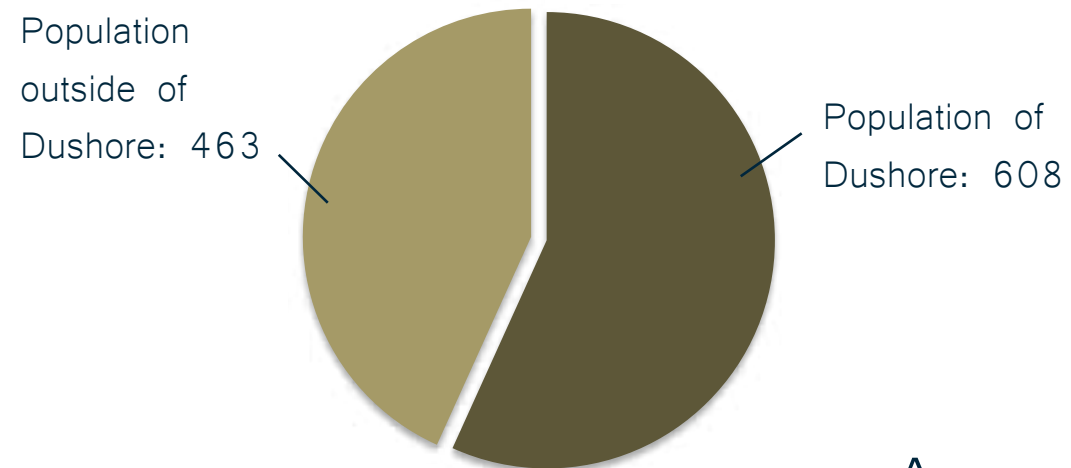


Workers in a “Patch Town”, Circa 1900.

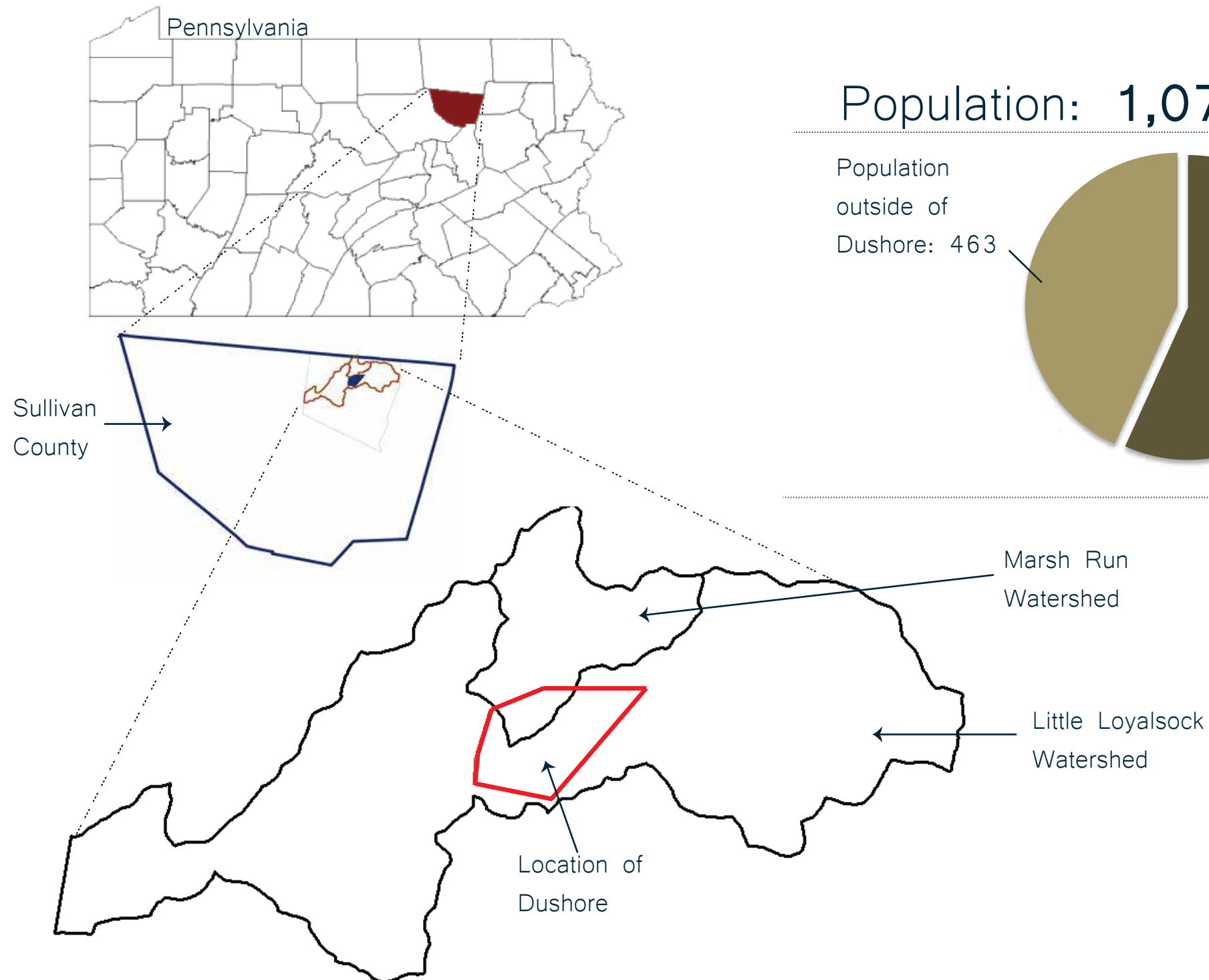
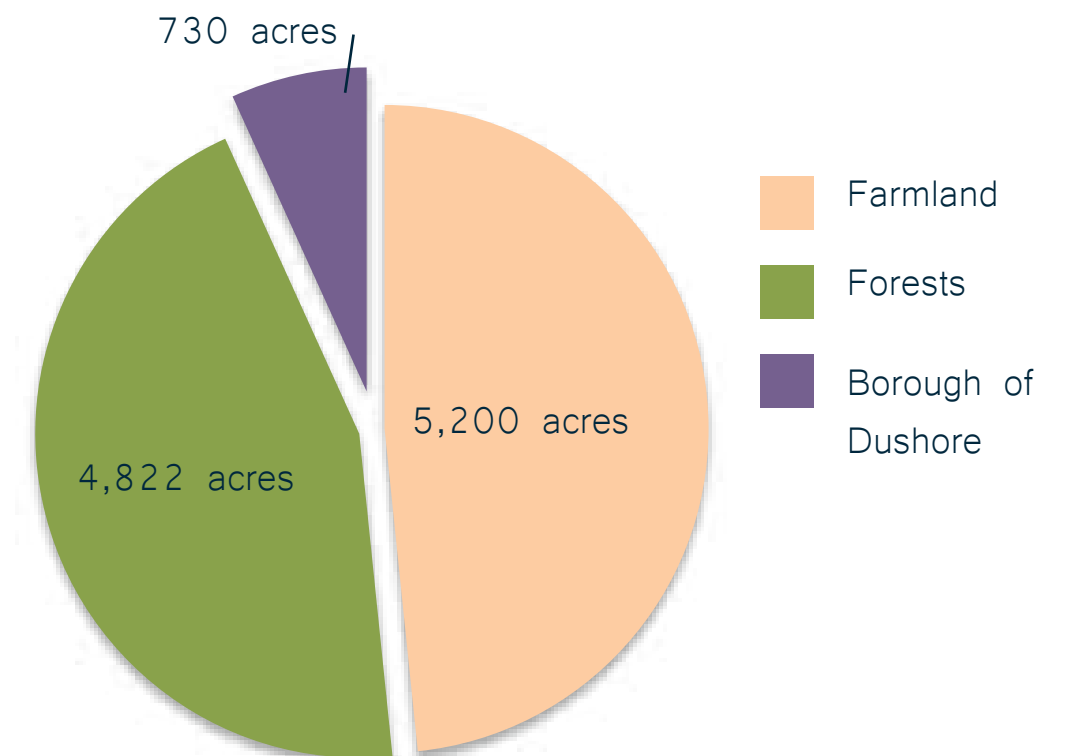


These watersheds were chosen for the sustainable watershed project because of their **proximity to a town center**, and the existing and future **gas industry** infrastructure that threatens visual, environmental, and social aspects.

Population: **1,071 people**



Acres: **10,752 acres**





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Supporting Local Farms

By: Kyrie Yaccarino



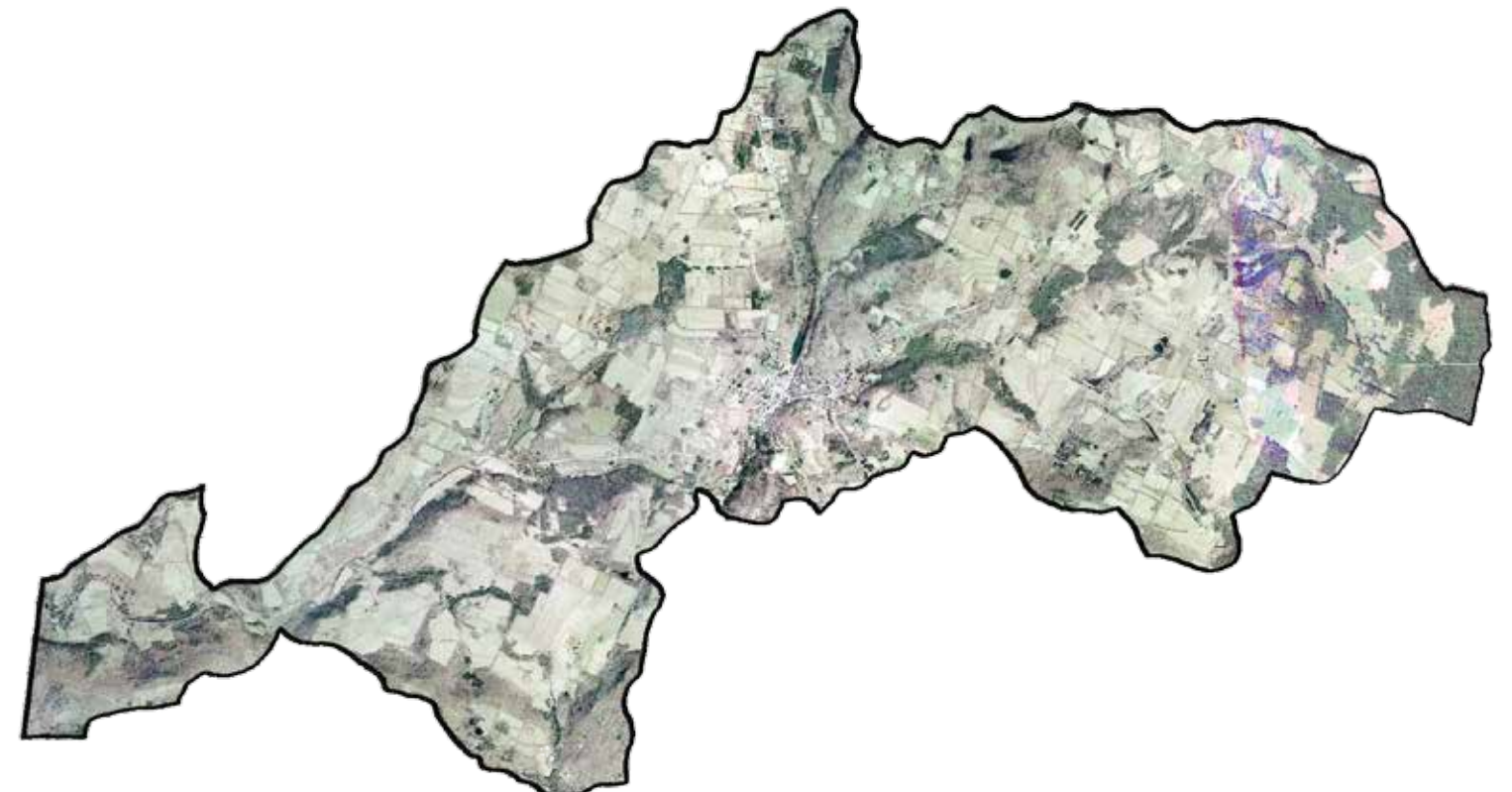
“There are two spiritual dangers in not owning a farm. One is the **danger of supposing that breakfast comes from the grocery**, and the other that heat comes from the furnace.”
-- Aldo Leopold, The Sand County Almanac

Project Description:

Using a two small watersheds located in northern Sullivan County, this project intends on showing whether or not it is feasible for a population to be selfsufficient in regards to food. A watershed scale is chosen as an exemplary site, to show how this may also be feasible on a larger scale. Additionally, the city of Dushore is located within the study area, providing a higher population --and thus demand-- than just the rural areas of Sullivan County.

Project Intent:

- Educate readers about foodsheds and food security
- To determine whether or not the example watershed is able to sustain its own population with food
- To provide a means for local farmers and workers to make a living within the watershed
- To engender thoughtful food perspectives and practices
- To suggest more environmentally-conscious farming practices

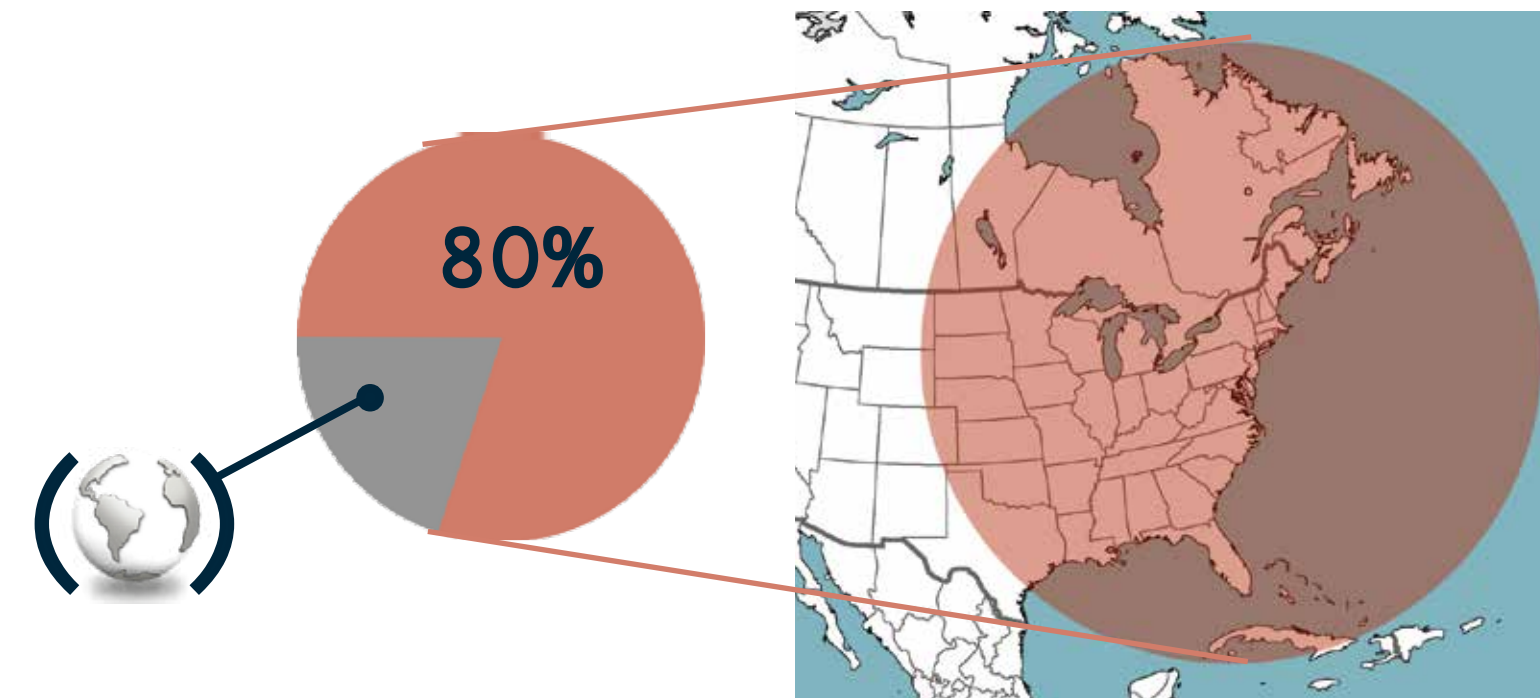


M a r c e l l u s X D e s i g n

The Larger Picture

Knowing Where Our Food Comes From

The Current Norm



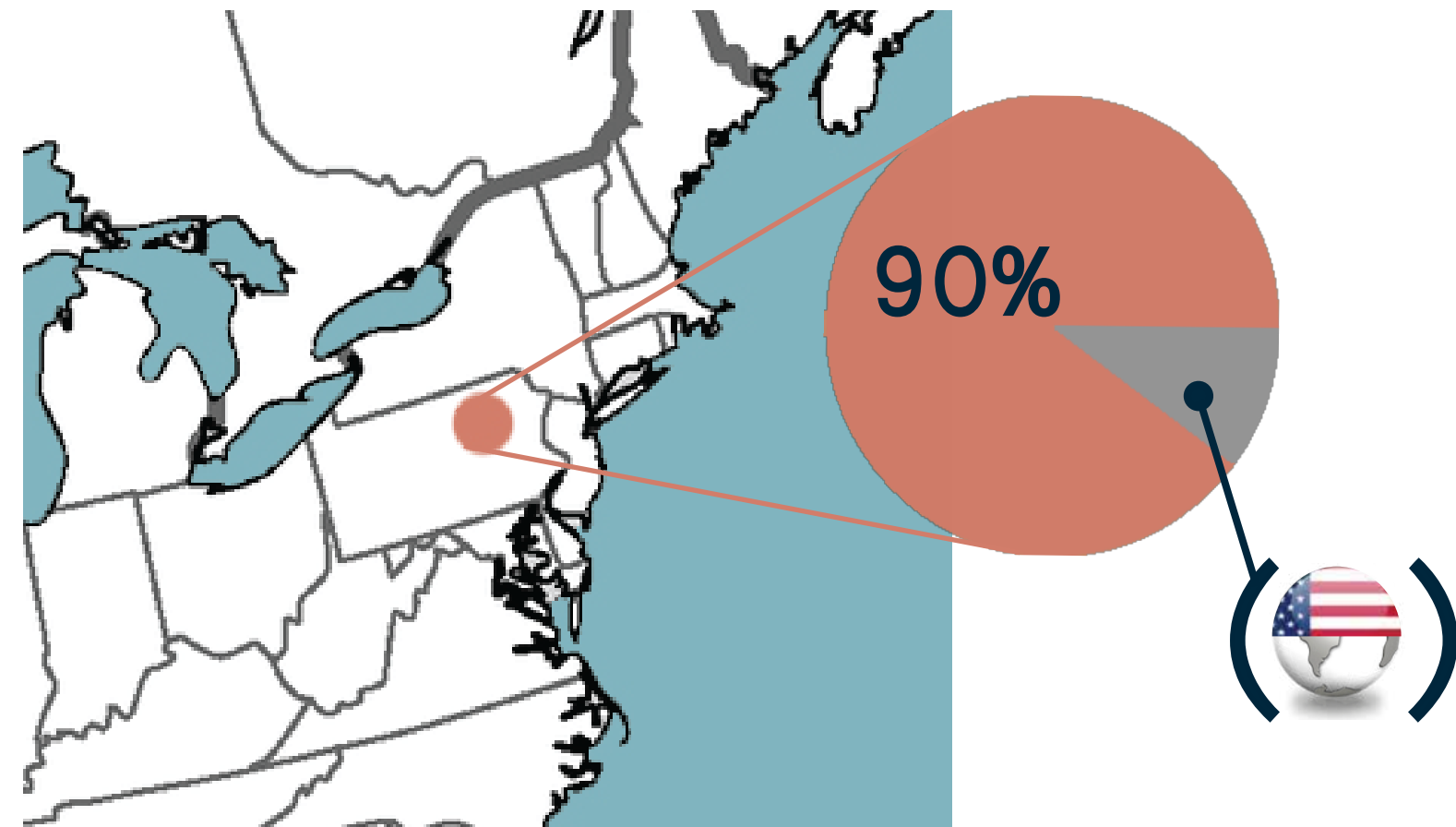
In total, **20% of America's food supply is imported.**

(2011. How Much of U.S. Food Is Imported?)

In 1998, Chicago measured **how far away its vegetables and fruits came from**, which came to an average of **1500 miles** to reach the windy city. If this is the same distance given for Sullivan county, this means that on average, its produce comes from as far as Denver, Colorado. Likewise, in 1997 an USDA study in Jessup, Maryland found the average distance exceeded **1,685 miles**.

As stated by the term 'average', these distances are not the furthest nor the closest that Sullivan County's produce may come from, but the common middle distance.
(Pirog et. al. 2001, 9)

The Goal



Instead of depending on external sources of food from thousands of miles away,, what if all of this food is sourced locally? This way, agriculture can be used as an environmental and economic tool by **providing most of a population's food needs** within a **set boundary: the local watershed**. This idea will be explored more in depth in later pages.

Marcellus X Design

The Larger Picture

Foodsheds are Where Food Comes From

A “Foodshed” is the total distance your food needs to travel to get to your plate from its original location.

For example, if you buy olive oil from Spain, your foodshed stretches to Spain.

A Foodshed is usually described in “Food miles”--that is the distance traveled.



How Large Foodsheds are not Necessarily Best

One overarching way that far-flung foodsheds are not ideal are through lower **food security**. Food security is **the ability for a community to regularly obtain the needed nutrition to lead healthy lives without risk**. In areas that do not have ready access to affordable fresh produce through conventional means (ie supermarkets that import all food) find themselves in a predicament. Additionally, a centralized food processing system “implies the food contamination could be spread quickly and rapidly” and larger systems are less able to adapt to changing conditions, such as rise in price of fossil fuels or climate change. (O’Hara 2011 “Full Report”, 15)

Food Goes In...



- + food can be purchased in even when out-of-season in local region
- produce travels long distances
- usually picked when unripe
- significant amounts of energy is needed to transport from farm to destination
- local community become dependant on larger economies to obtain food
- large scale processing

Money Goes Out.



- + food is usually affordable
- money used to purchase food does not stay in local community
- purchase dollars (or, “voting with your dollar”) are unable to make as much of an impact with more steps between producer and consumer

Foodsheds are Where Food Comes From

A “Foodshed” is the total distance your food needs to travel to get to your plate from its original location.

What happens if the amount of Foodmiles food travels is reduced?

A Foodshed is usually described in “Food miles”—that is the distance traveled.



How Local Foodsheds Help

Local foodsheds aid in **food security**. Due to their inherently decentralized system, **there is a lower risk of food cross-contamination**. Also, smaller systems are **able to adapt to change more readily**, such as climate change. Additionally, localized food system that has direct contact with consumers **is better equipped to meet the needs of the population**, such as location of food sales, more directly. (O’Hara 2011 “Full Report”, 15)



- + closer contact to producers
- + produce spent less time in transport from farm to consumer
- + fresher produce
- + healthier dietary choices available for community

Money is Invested Within.



- + Dollars spent are recirculated within community
- + Due to what is called the ‘multiplier effect’, local dollars are able to help the community multiple times more than dollars invested externally.

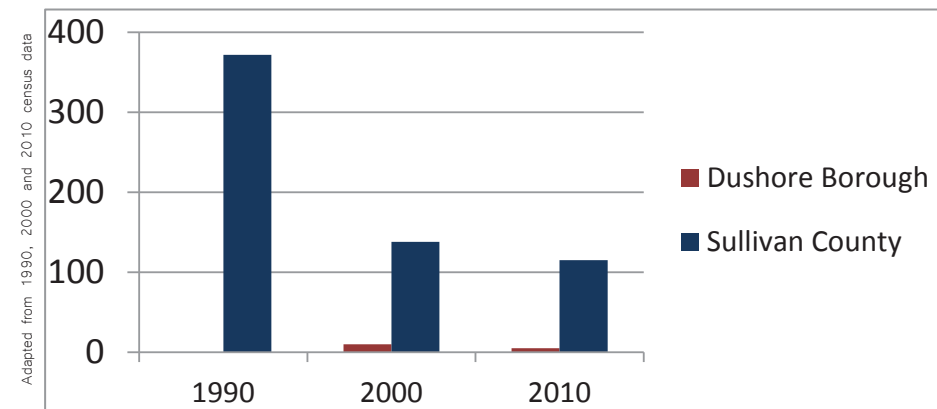
Industry and Agriculture

Tourism, Agriculture and Government employment are the most prevelent economic drivers in Sullivan County.
(sullivancounty-pa.org)

Farming, specifically dairy farming, has historicallylly been the primary agricul-
tural industry in Sullivan county. Over the years, as the population has
steadily decreased and the forest has recovered, tourism has become a
large source of income for the county.

Unfortunately, due to the issues listed below, the amount of farmers have
dropped significantly from over 106 dairy farms thirty years ago, and now
there are merely 16. (Sullivan County 2013)

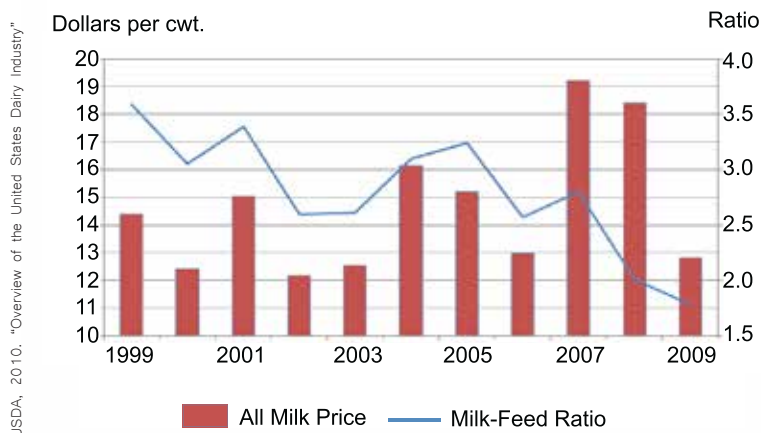
Agriculture, mining, forestry and hunting Industry



Farming as an occupation
has been **decreasing** since
the 1950's, particularly in
the **past 20 years**.

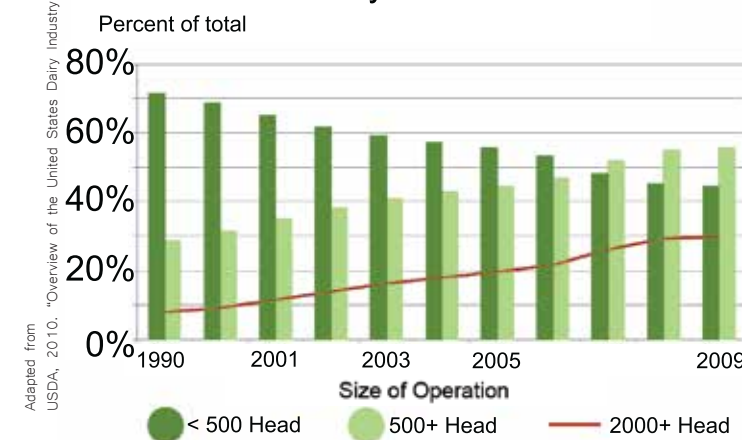
Obstacles facing Dairy Farming today

All Milk Price and Milk-Feed Ratio- U.S.



As shown by the graph to the
left, milk prices have been ex-
ceedingly unstable for the past ten
years, causing farmers to struggle.
In addition, rising feed costs have
reduced farming profits to a large
extent.

Milk Cow Inventory Distribution - US



Due to this, small dairy
operations have been
steadily declining for the
past twenty years.



M a r c e l l u s X D e s i g n

Envisioning the Potential

Based on these Challenges, What can be Done?

Instead of having an agricultural system that is based on exporting dairy goods to other areas and importing food, why not grow food for the local population? This way, there will be a steady market to demand products, and there is less dependance on profits based on global market, in comparison to rising corn feed products due to biofuels.

Arable land for food is increasingly rare as development and biofuels compete for land internationally. Additionally, as climate patterns change to make agricultural production less predictable, food prices and other related markets will begin to rise in price. Sullivan County is especially vulnerable to this, as while there are many exportable agricultural products based in Sullivan County, their main products are animal products; this means that many foodstuffs that Sullivan County residents depend on are grossly imported. With long-distance transportation being a major facet of their food market, there is a significant dependence on transportation-oriented energy. Thus, Sullivan County's food prices, like the majority of the United States, are inherently dependent on market costs of oil and other fuels. (Neff et al, 2011)



- + supporting more local economies and farms
- + reducing the amount of energy spent on transportation
- + utilizing available land and skill resources while transitioning to a more viable system
- + greater public control over the food system

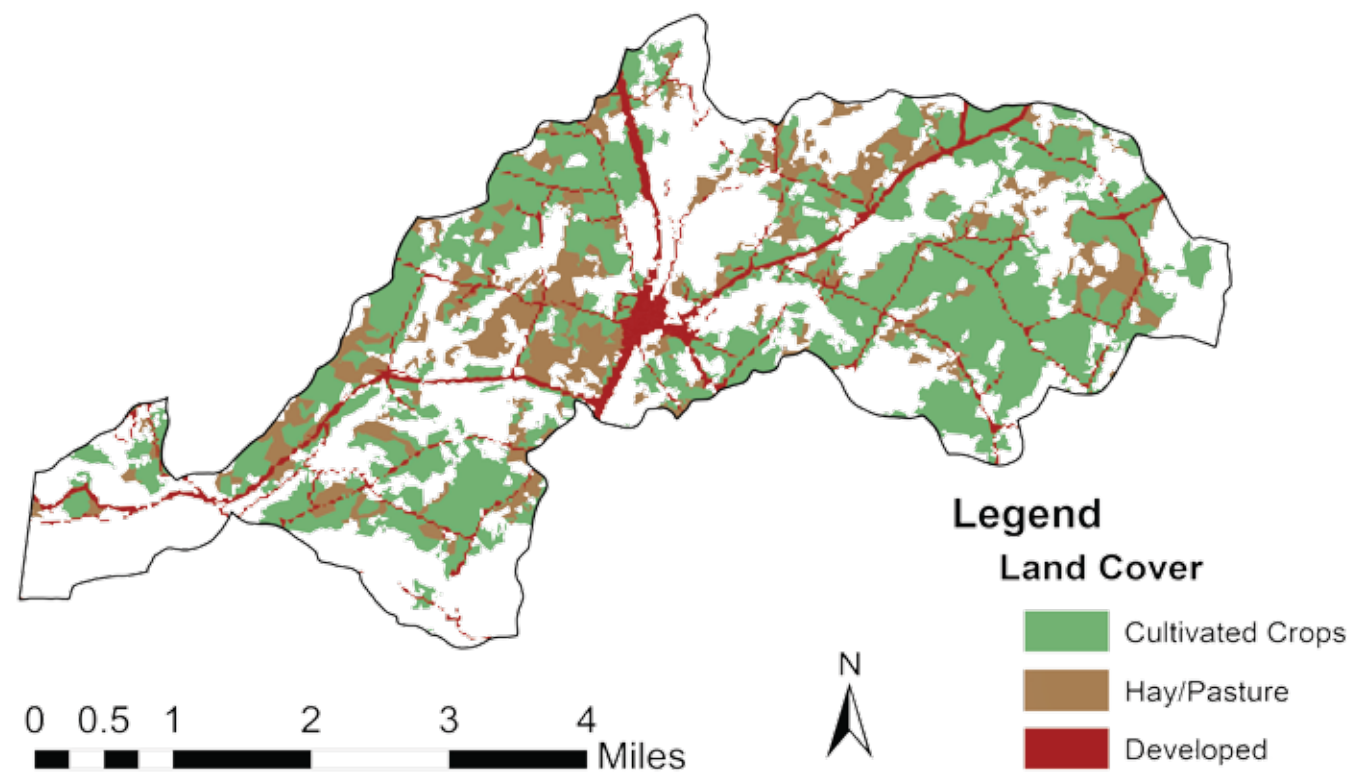
- + diversified farming operations (not monocultures)
- + farmers markets
- + maintained or increased visual appeal of landscape
- + increased sense of community
- + a strengthening of the local economy from within

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Suitability Within the Watershed

One goal of this project to explore the ability of the watershed to create its own food only using the farmland currently available. This way, farmland can still utilized and other land is not converted from natural systems to agriculture.

Current Land Use

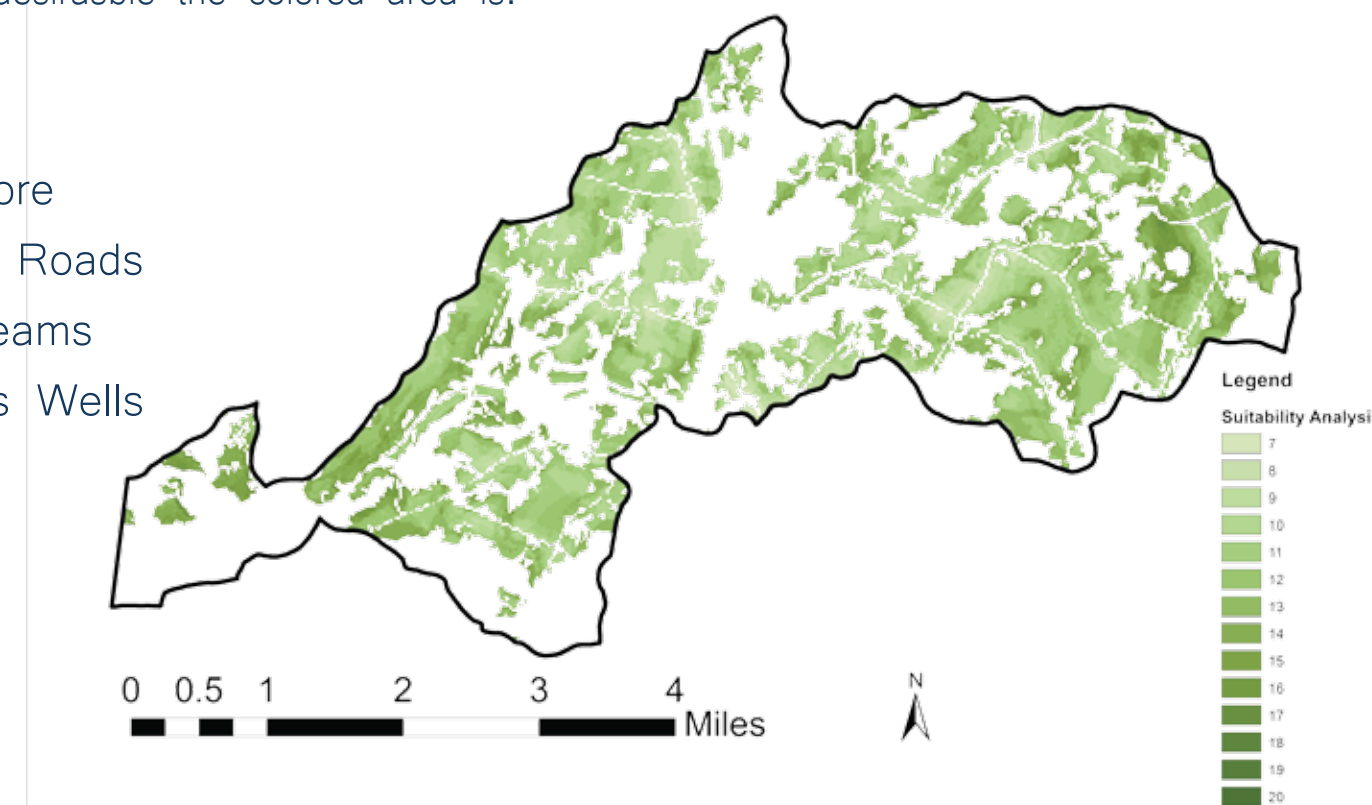


Between actively cultivated crops and hay/pastureland, there is about 5,200 acres available. This project will be working within this acreage.

Suitability Analysis

In a Suitability Analysis, a number of factors are given a number based on their desirability, then overlaid to see the best options overall. The lower the number --and lighter the color--the more desirable the colored area is.

Proximity to Dushore
Proximity to State Roads
Distance from Streams
Distance from Gas Wells
Soil type
Slope of land



This analysis shows that a majority of the existing agricultural land is already on desirable land, making specific placement of future agriculture not dependant on any of the factors considered above.



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Feasability within the Watershed

Is a Local Food System Feasible?

In order to know if a local food system is feasible, there needs to be a measure of how much land is needed for the population described.

Two dietary examples are used: the FDA MyPlate system, and an estimated measure of the current average American diet.

Based on this table and estimated caloric intakes, the amount of land needed was found for both cases.

Table 2. Land requirements per unit edible energy for selected foods and food groups based on crop yields in NYS.

Food	Land requirements		
	Cultivated crops	Perennial crops	Total
	-----m ² Mcal ⁻¹ edible product-----		
Animal products ¹			
Meat and eggs			
Beef, lean cuts	9.2	45.4	54.6
Beef, all cuts	5.3	25.9	31.2
Chicken, lean cuts	14.3	0.0	14.3
Chicken, all cuts	9.0	0.0	9.0
Eggs	6.0	0.0	6.0
Pork, lean cuts	17.9	0.0	17.9
Pork, all cuts	7.3	0.0	7.3
Dairy			
Milk, skim	2.2	6.8	9.0
Milk, whole	1.2	3.9	5.0
Plant products ²			
Fruits	0.0	2.3	2.3
Grains	1.1	0.0	1.1
Oils	3.2	0.0	3.2
Pulses	2.2	0.0	2.2
Sugar	0.6	0.0	0.6
Vegetables	1.7	0.0	1.7



FDA SUGGESTED DIET LAND REQUIREMENTS				
Food Category	Daily Mcal	Multipliers	Per person (1)	Total population (1071)
Fruits	0.2	2.3	0.46	492.66
Vegetables	0.15	1.7	0.26	273.11
Grains	0.83	1.1	0.91	977.82
Oils	0.24	3.2	0.77	822.53
Protein	0.57	31.2	17.78	19046.66
Land for beef		2.05**	2.05	548
Dairy	0.37	7	2.59	2773.89
Land Needed	Per Day in Meters:		24.82	24934.67
	Per Year in Meters:		9061.35	9101154.55
	Per Year in Acres:		2.24	2248.99
Land Available	Area in acres			
	hay/pasture	1319.89		
	cultivated crops	3880.74		
		5200.63	Acres Left Over:	2951.64
Land for Energy	Area in acres			
		134	Acres Left Over:	2817.64

** for one animal. Sufficient for one famiy (of four) for one year



CURRENT US DIET LAND REQUIREMENTS				
Food Category	Daily Mcal	Multipliers	Per person (1)	Total population (1071)
Fruits	0.2	2.3	0.46	492.66
Vegetables	0.15	1.7	0.26	273.11
Grains	0.83	1.1	0.91	977.82
Oils	0.25	3.2	0.80	856.80
Protein	0.53	31.2	16.54	17710.06
Land for beef		2.05**	2.05	548
Dairy	0.37	7	2.59	2773.89
Land Needed	Per Day in Meters		23.604	23632.334
	Per Year in Meters		8617.51	8625801.91
	Per Year in Acres		2.13	2131.52
Land Available	Area in acres			
	hay/pasture	1319.89		
	cultivated crops	3880.74		
		5200.63	Acres Left Over:	3069.11
Land for Energy	Area in acres			
		134	Acres Left Over:	2935.11

** for one animal. Sufficient for one famiy (of four) for one year

Even with including the land requirements needed for susbtainable energy sources, there is still an excess of 2,500 acres for both dietary examples.

Yes, it is feasible to support the population's food needs within the existing farmland.

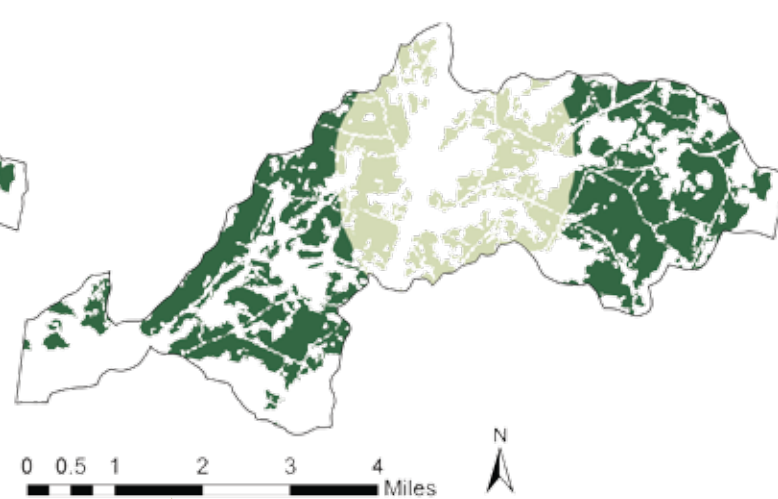
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Feasibility within the Watershed

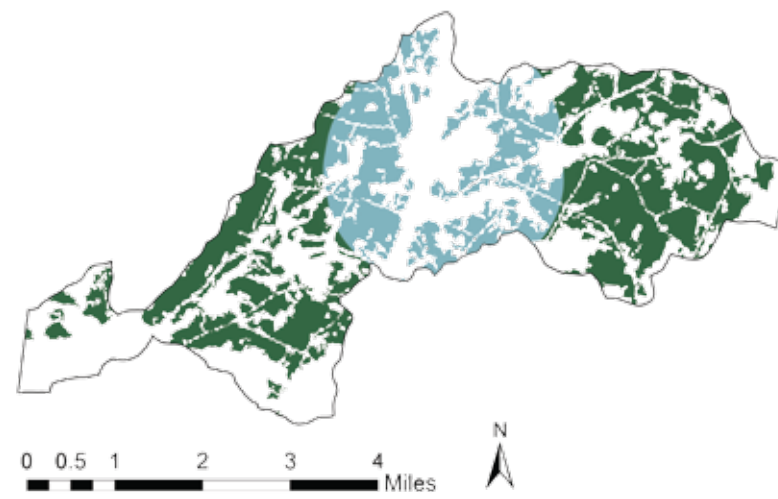
Land Needed: Available Farmland FDA Diet Average US Diet Energy Extra Farmland
(Icons to scale with each other and maps)



5,200 acres are currently used as **farmland**.



For the **FDA approved diet**, only **2,249 acres** are needed to feed the people that live in this watershed.



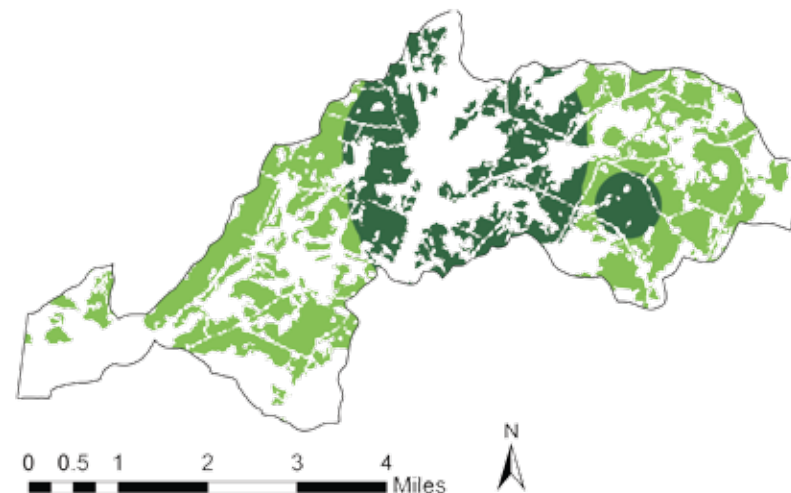
According to the **average American diet**, only **2,131 acres** are needed to feed the people that live in this watershed.



Other land uses include **134 acres** to create enough sustainably-sourced **energy** to completely support the current population.

Extra Farmland:

Even with both the diet and energy land requirements for people within the watershed, there is still **2820 acres left over** for other methods of income. Suggestions for this extra farmland include **more farm products** such as value added products and food exports; **additional energy infrastructure**; and **water mediation**.



Examples of Potential Land Use



Combined land use



Value-added Product



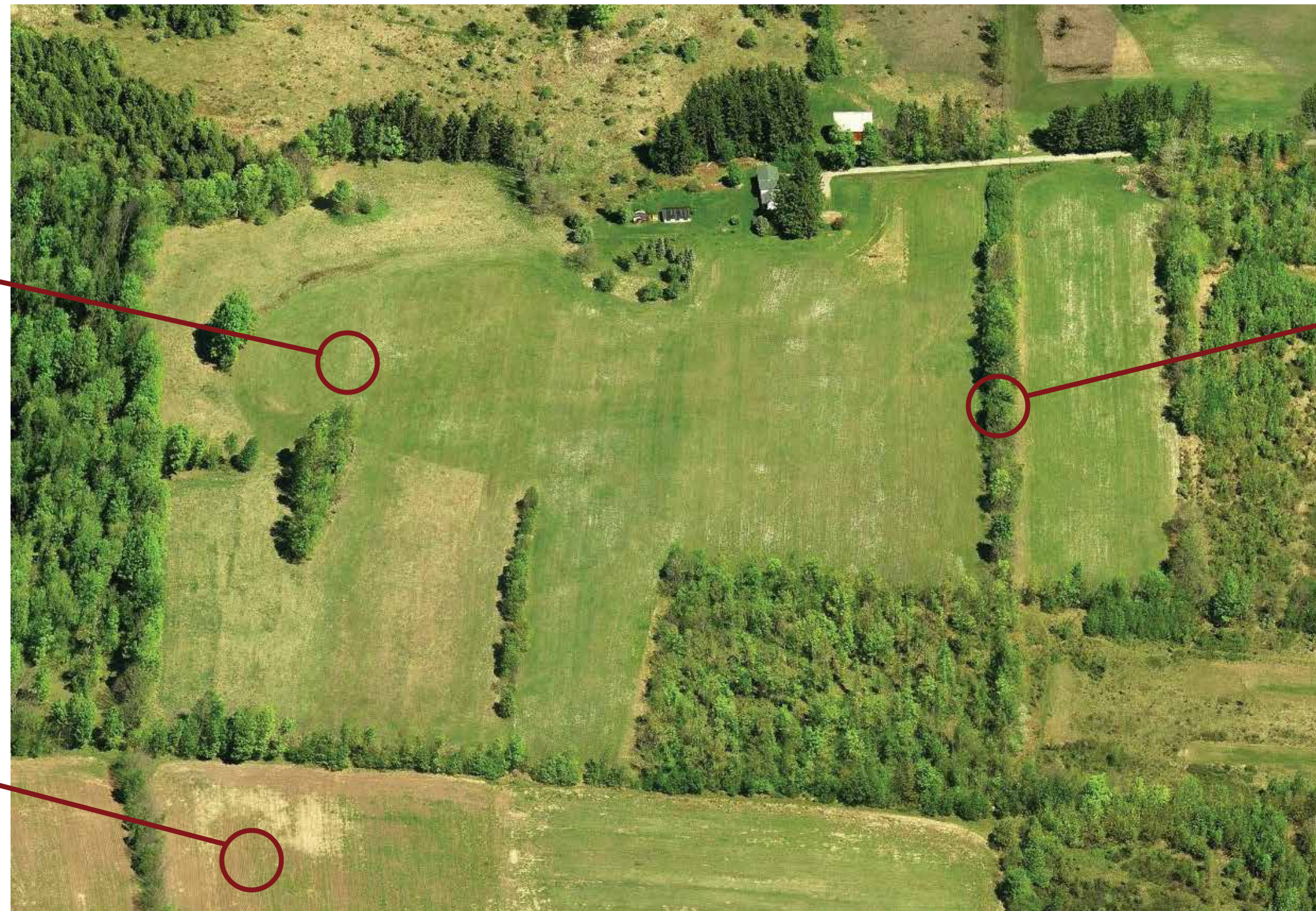
Imagining this Future

View 1 - Overhead of Sample Farm

A monoculture is growing, leaving soil to degrade over time by uptaking the same nutrients season after season

Tree wind breaks are minimal, leaving field exposed to element

Soil is left exposed, leaving erosion and leaching of nutrients a strong possibility

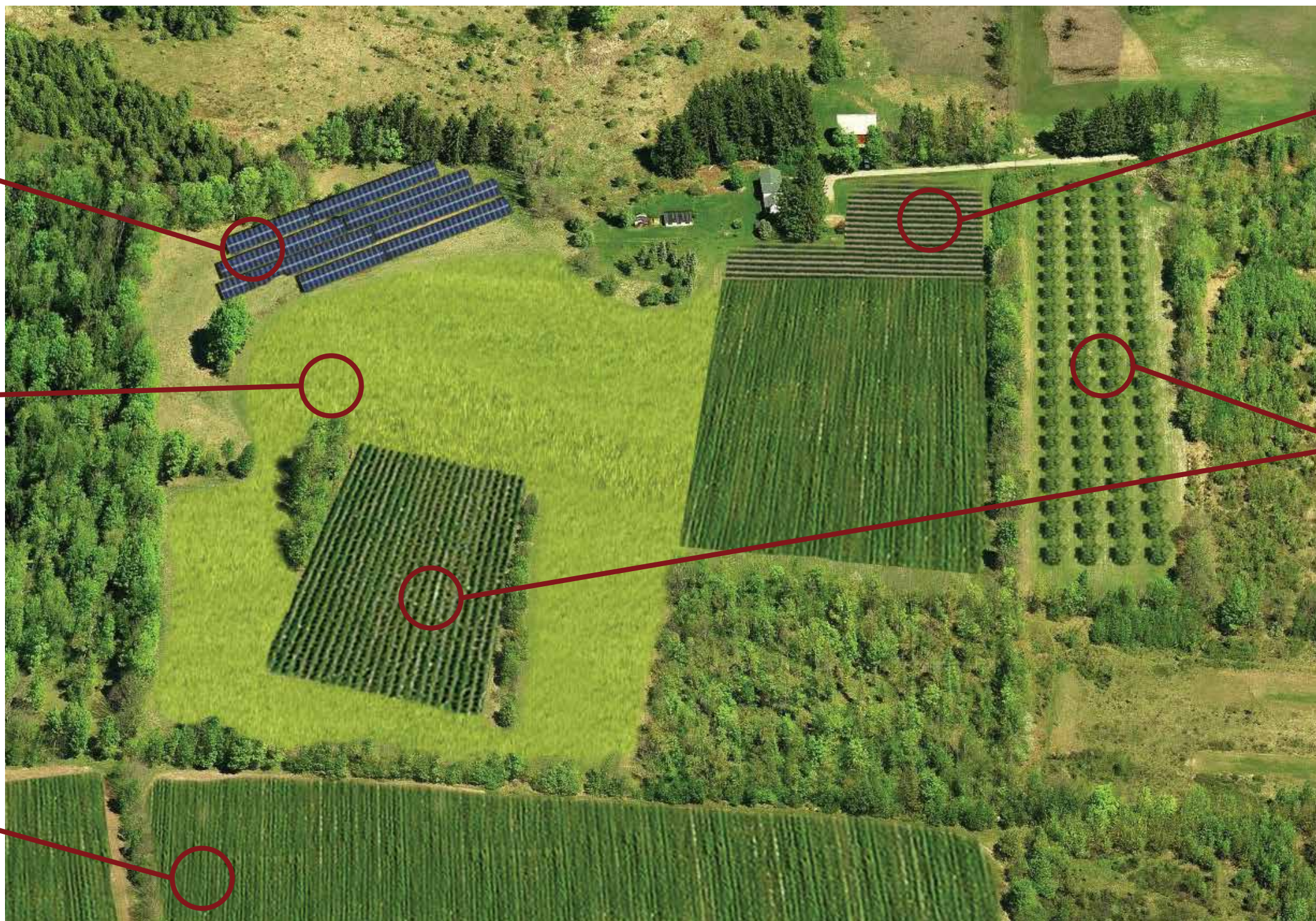


View 2 - Overhead of Progressive Farm

All of the operation's energy needs are produced on-site, and the extra is sold

grain is grown per local needs, not for an international market

vegetables and cover crops are intermingled and regularly rotated to ensure soil quality and coverage.



Value-added product such as herbs are grown for profit

Perrenial Fruits grown on site

M a r c e l l u s X D e s i g n

Imagining this Future

View 3 - What a it may look like on the ground



Interdespersed
vegetable crop

Apple orchard underplanted
with legumes and other
beneficial cover crops

livestock in same area as
plants so that fertilizing
by-products need not go
so far

Hops grown as value
-added product

Interdespersed
grain crop

Still allows access
to potential uses
of Gas equipment

