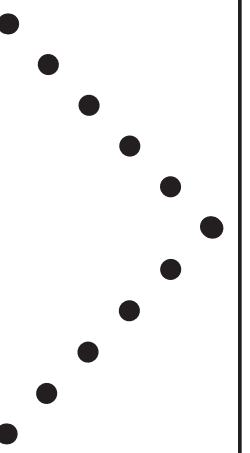
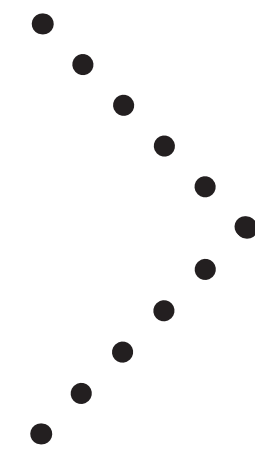


Marcellus by Design



HISTORIC ROUTE 6

SENSE OF PLACE

HABITATS AND CORRIDORS

RECREATION

HISTORIC SITES AND LANDSCAPES

WATER

FOOD WATER ENERGY FUTURES

Food Water Energy Futures



Costs for many essentials, like food, water, and energy, depend on markets across the county and overseas. It is becoming necessary to buffer against volatile price changes that occur from events outside our control. The ability to provide enough food, water, and energy to meet local requirements is important to communities. Our focus is the ability for communities in Tioga County to create for themselves food, water, and energy, security and to create scalable models that allows people with different requirements and resources to adjust them to their needs.

Historic Sites &
Landscapes

Historic Route 6

Water Dynamics

Food, Water &
Energy Futures

Habitat & Corridors

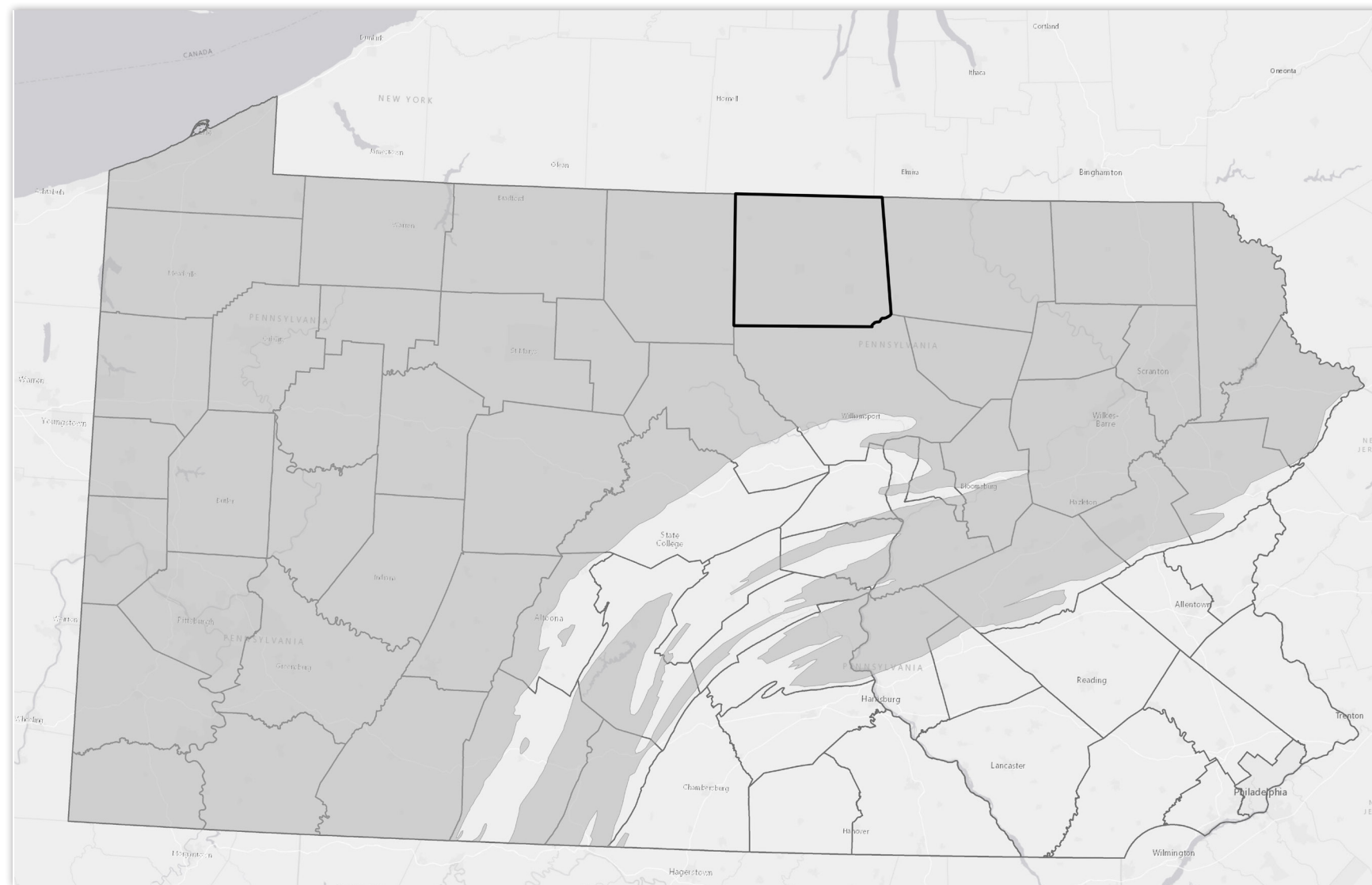
Sense of Place

Recreation

... Imagine living in a world where the **food** you eat, the **water** you drink, and the **energy** you use are produced by your land ...

Focus

The objective is to re-manage the resources in Tioga County so that they benefit the people, community, and landscape in Tioga County. The evaluation occurs in three sub-basins that are determined based on the criteria of: land mass, land use, population, town centers, and water bodies. These sites and the additions of families will examine priorities in each sub basin and guide design decisions and future potentials.



Marcellus Shale formation through Pennsylvania

Tioga County is a northern tier county that is centralized within the Marcellus Shale formation. Tioga is the third most productive county in gas within Pennsylvania.



Sub Basin locations through Tioga County

The three sub-basins chosen in Tioga County: Cowanesque (Northwest), Tioga River (East), and Babb Creek (South).



The Carters of Cowanesque

Ben and Abby Carter are an elderly couple who moved to Westfield for retirement to escape the urban city they lived in for 40 years. The two of them both grew up on farms in the region as children. They wanted to get back to their roots and grow their own food like their parents did. With the amount of land they purchased, they were able to grow enough food for themselves, and provide for the community. They decided to sell their extra food at the local farmers market to the community at a discounted price.



The Timmons of Tioga River

The Timmons family, Tyler, Marie and their four kids, Jared, Mike, Ashley and Jenna moved to Blossburg to continue to grow their family. They moved to Blossburg because of the youthful and active community and available schools. The Timmons bought acres of land to build their home on just Northeast of Blossburg. With their available land and young kids, they explored their opportunities to capitalize on sustaining themselves and supporting the community.



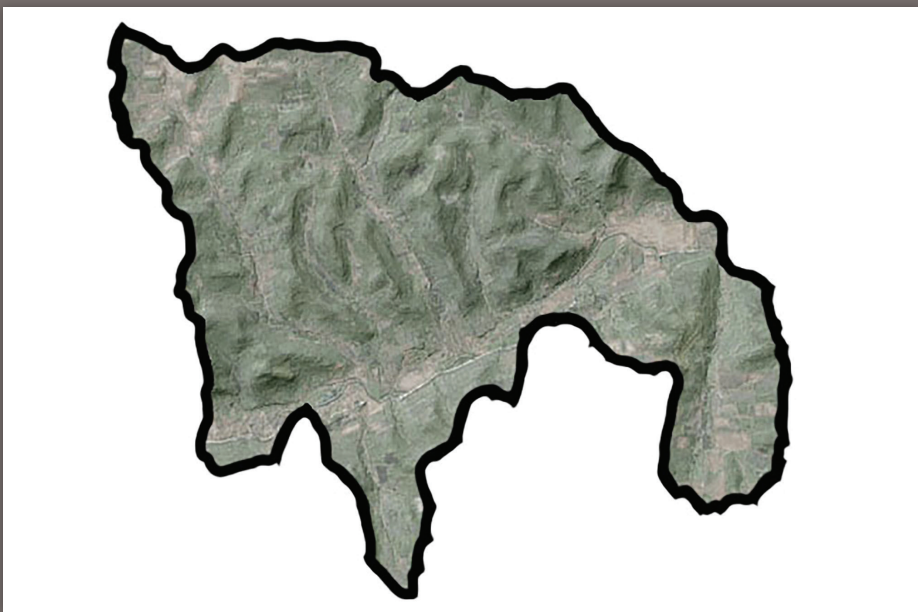
The Bryants of Babb Creek

The Bryant family, Jarret, Karen, and son William, have lived in Tioga county their entire lives. They were originally farmers but their land began to diminish in production. Plus, with the dwindling population in the basin, revenue, profit, and income was declining. Their farmland is no longer supporting them and they need to earn money elsewhere. The renewable energy resource is where they sought to find a new income opportunity.

Food Water Energy Futures

What Drives Design

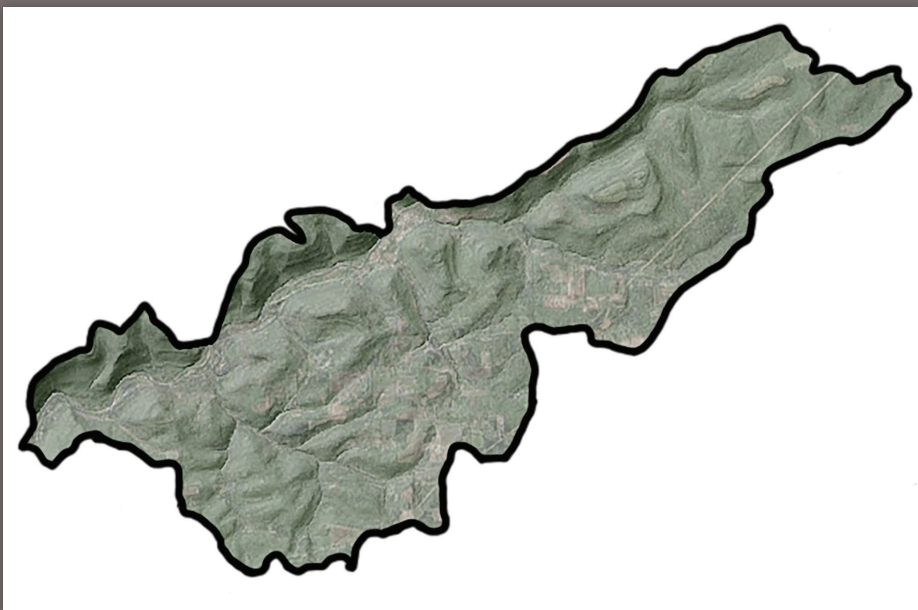
With the Carter retired lifestyle and main intention to give back to the community, their landscape, framework, and design service their ideas in a practical and sustainable method.



The site of the Carter farm

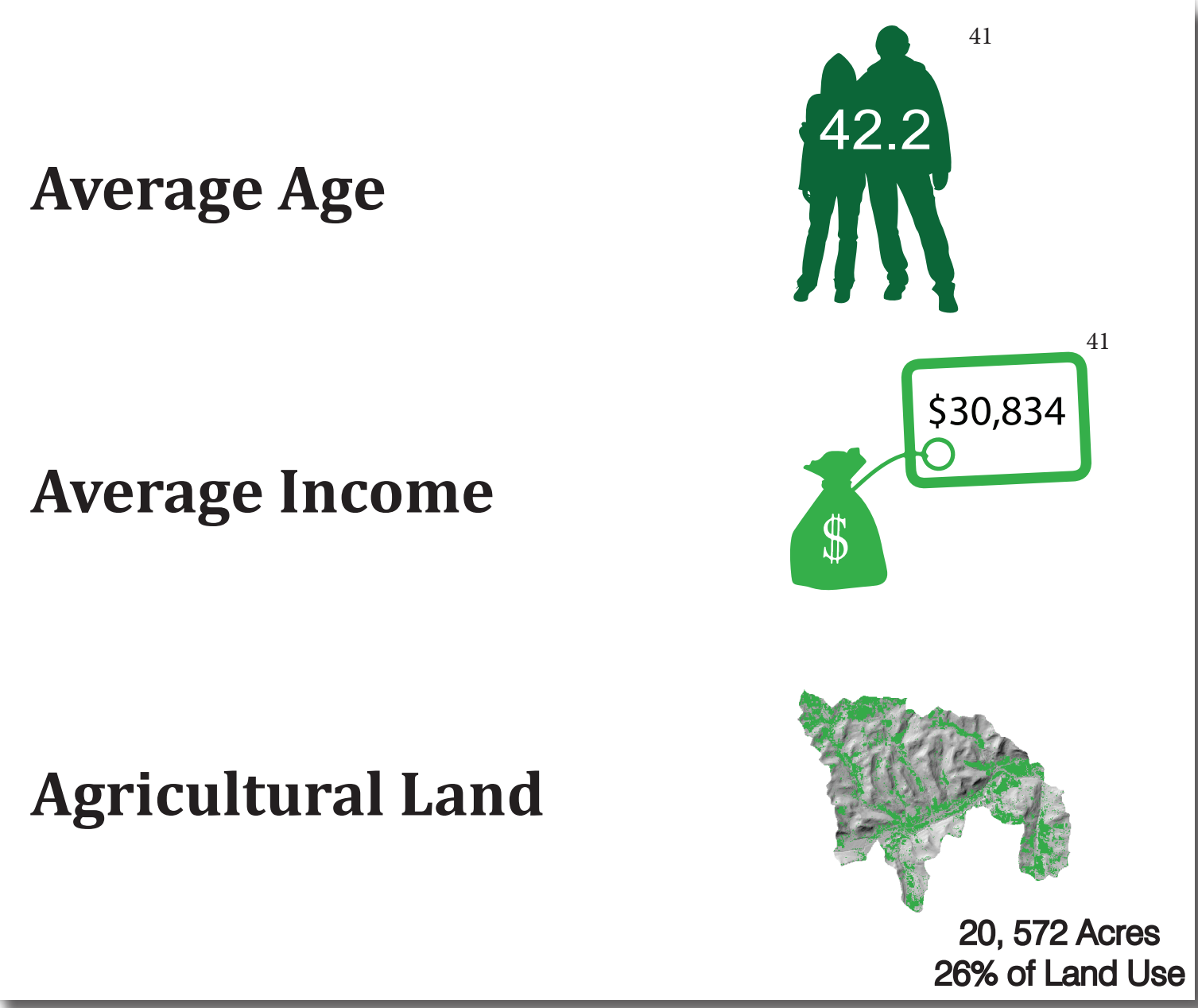


The framework of the Carter



The framework of the Carter

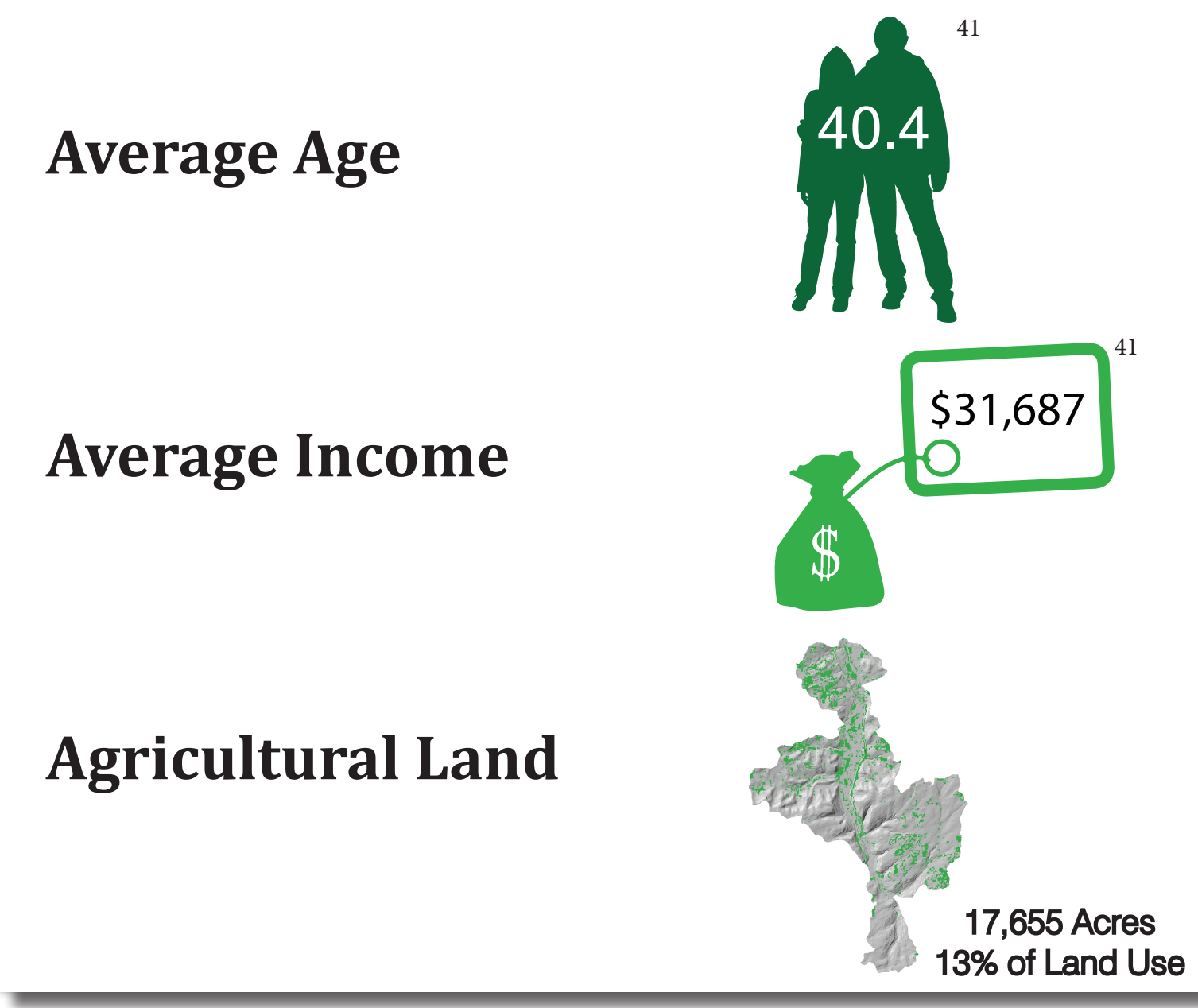
The Carter's of Cowanesque



Compared to the other two sub-basins, Cowanesque has a much larger area of land dedicated to agriculture. This fact makes it much more important to show that people living that lifestyle are also able to contribute to, and benefit from more sustainable ways of living within their communities.



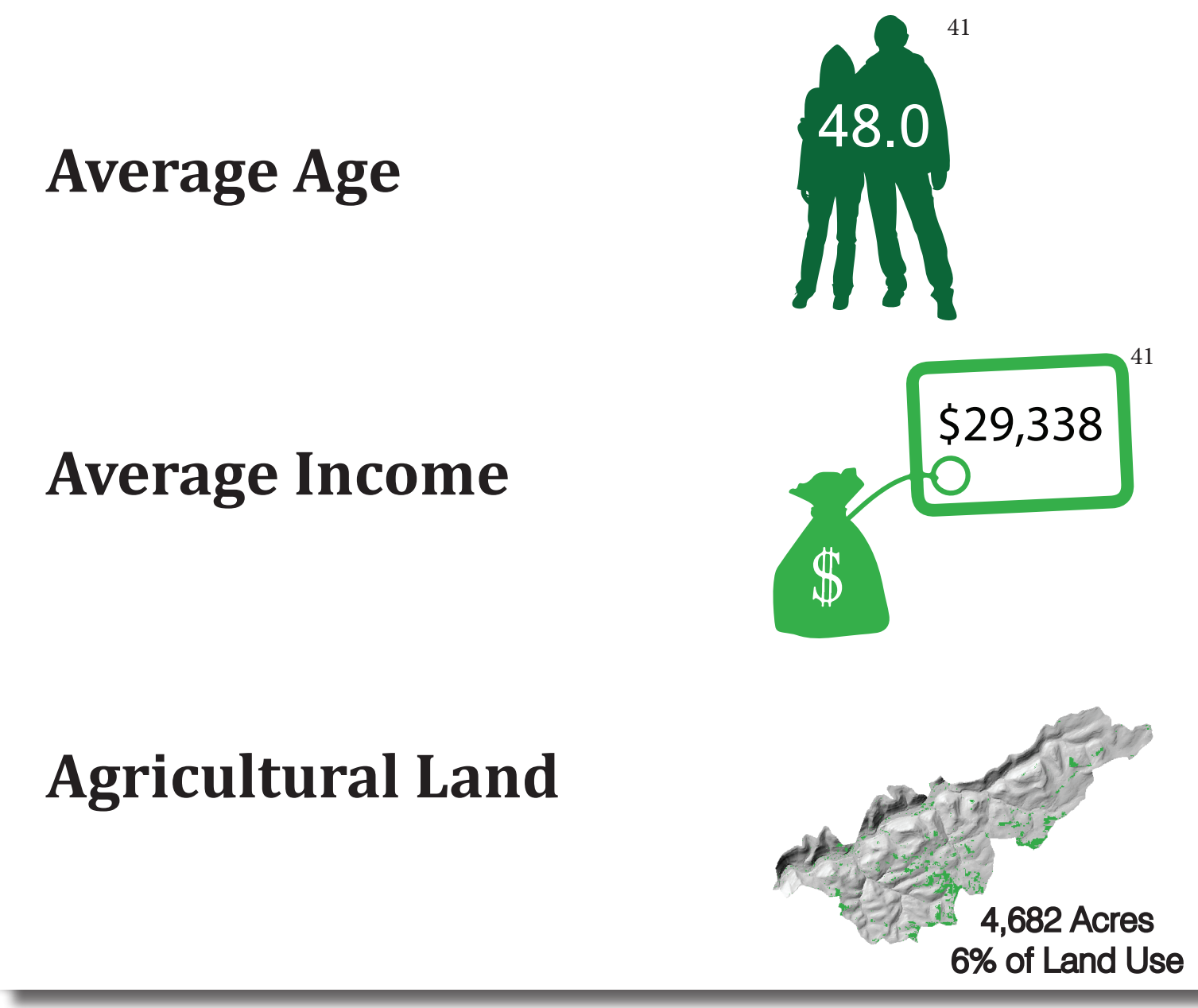
Timmons of Tioga River



The Tioga River sub-basin has the lowest average age of all three sub-basins we researched. Younger families are more likely to have smaller children, and thus be focused on community and child-rearing. Life lessons about the land and what sustains you can be very important to a family's growth and happiness, so a design based on sustainability and renewable energy needs to reflect that.

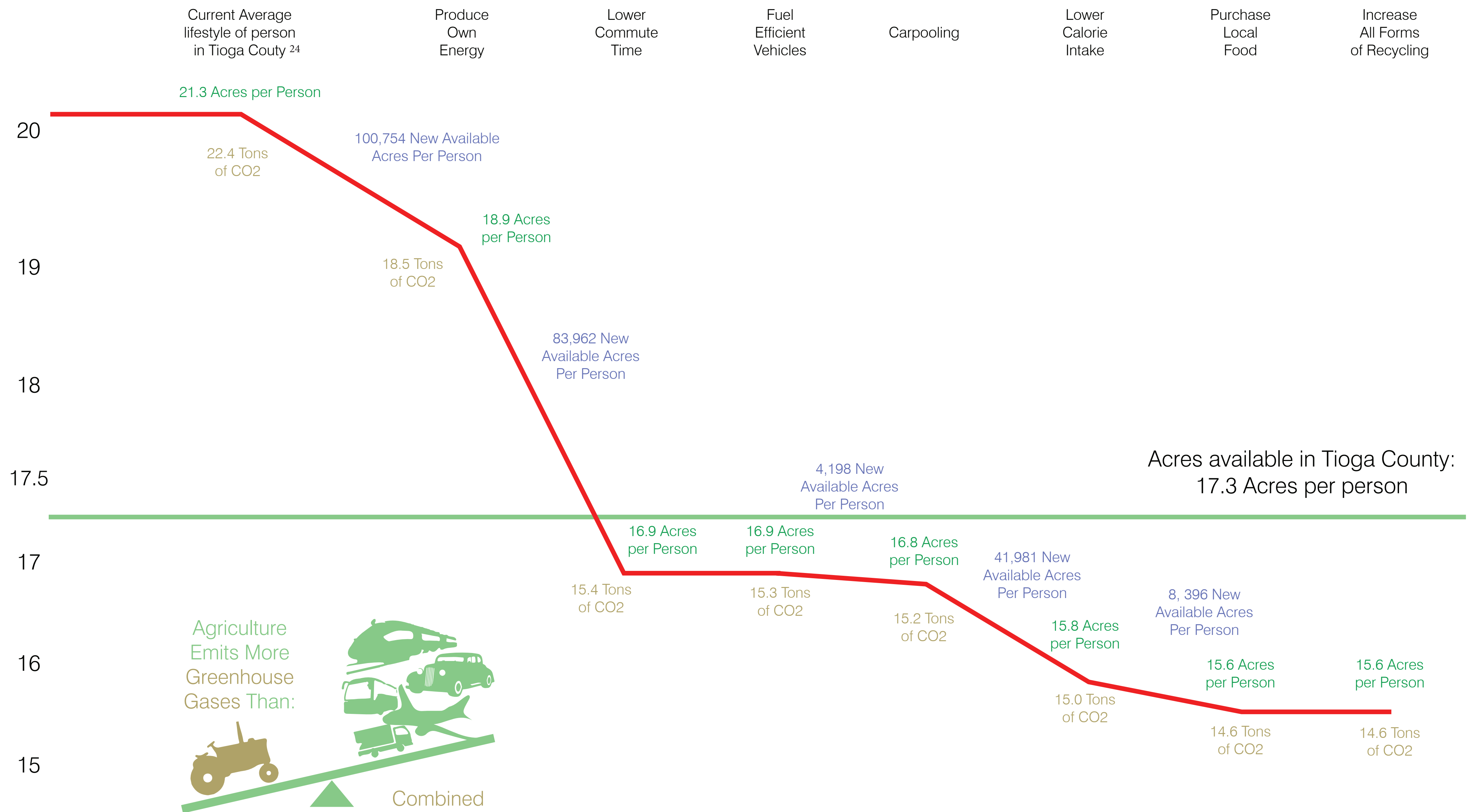


Bryants of Babb Creek



Residents of the Babb Creek sub-basin have the lowest average income in the group. This is particularly important as the costs of food and energy fluctuate greatly depending on global markets, instead of the locality in which they live. Using state, federal, and privately funded plans, residents can utilize their land in a way that provides benefits to both themselves and their communities.





Ecological Footprint

Ecological footprint is the impact of a person on the environment, expressed as the amount of land required to sustain their use of natural resources. This principle was measured through a representative resident of Tioga County who uses approximately 21²⁴ acres of land per person per year to support their current lifestyle. When examining the total population and available square miles of the county, the maximum available acres of land per person in the

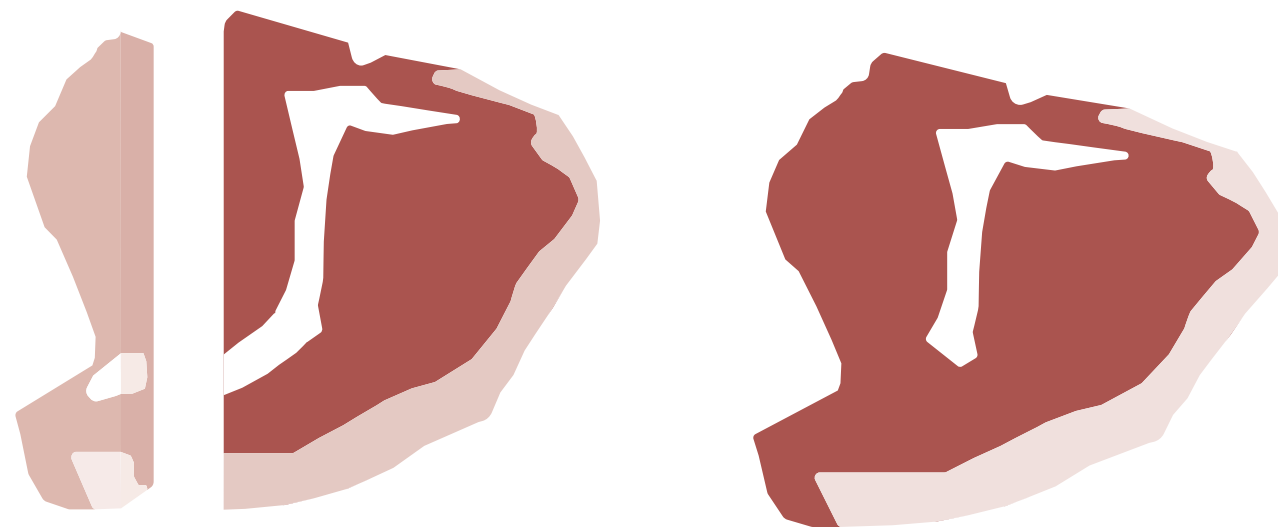
county is approximately 17. This means that a resident of Tioga County uses 4 more acres land than is available per person. Thus, the ecological footprint study is used to determine what practices can be used to lower the acres used so that it is below the 17 acres threshold. Many practices contribute to lowering ecological footprint such as fuel-efficient vehicles and purchasing local food. However, the three biggest factors contributing to a lower ecological footprint

are producing your own energy, lowering commuting time, and lowering calorie intake. By lowering those 3 main factors we are able to reduce the impact on the environment enough to allow each resident of Tioga County to affect at least 16 acres of land, in addition to lowering carbon emissions.

What Does Your Money Get You?

Save 27% by buying local beef

\$375/person per year

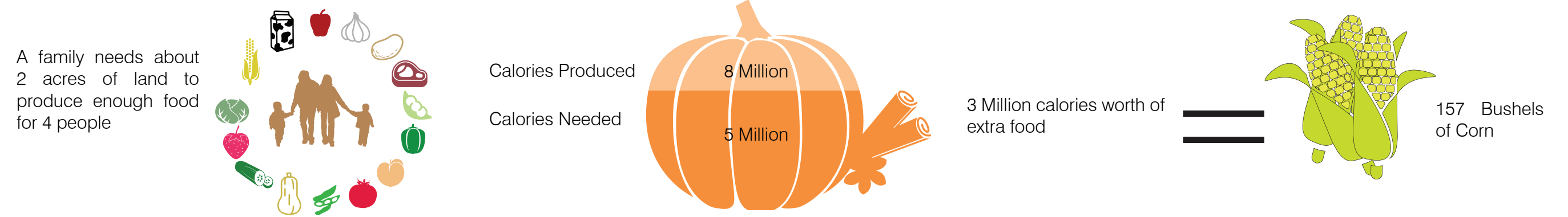


\$5.29/lb⁴⁴

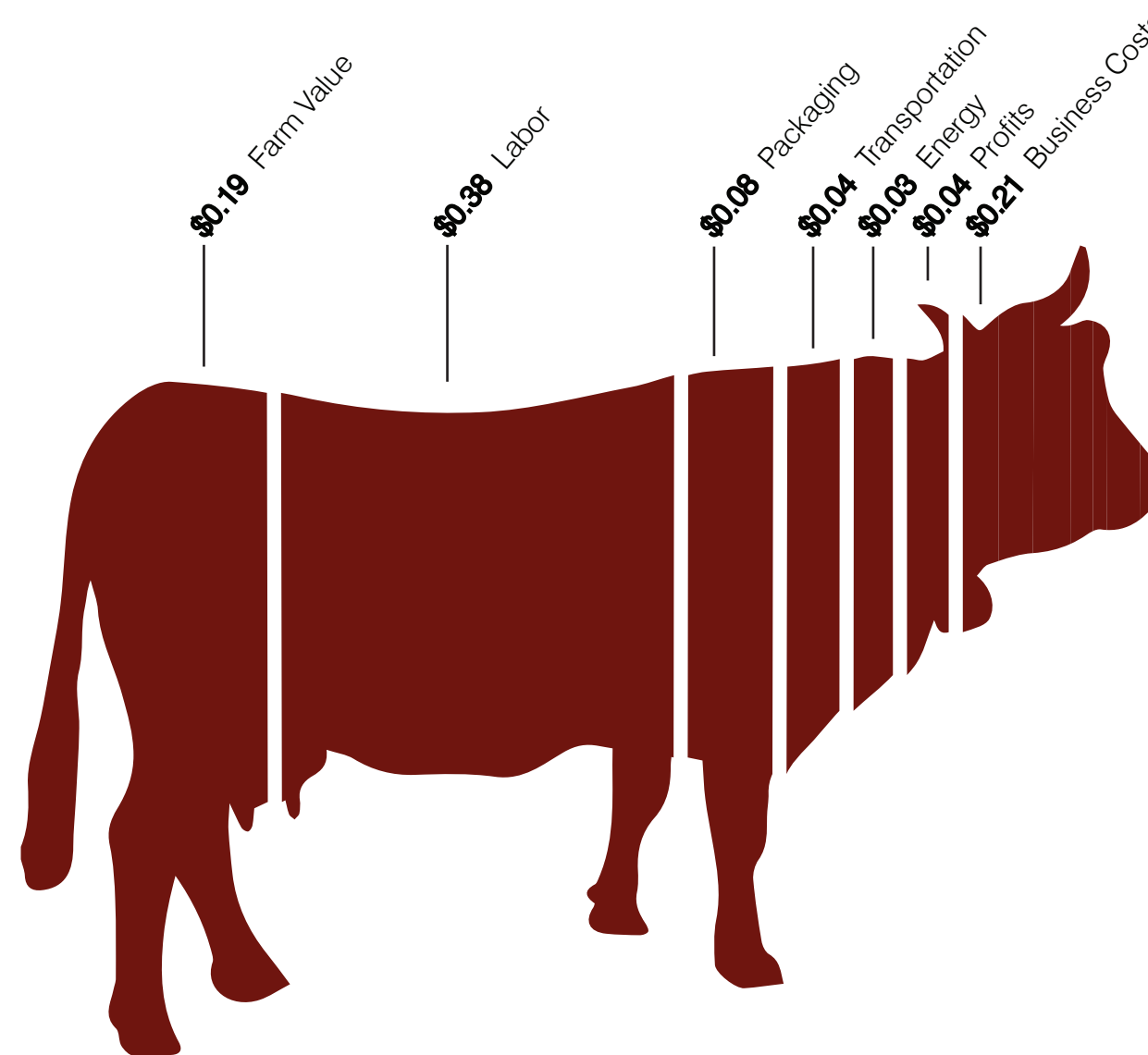
Average Retail Beef Price

\$3.90/lb⁴⁴

Price of Beef from Local Farm



Breakdown of Each Dollar Spent in Factory Farming⁴



1.3%

Feeds

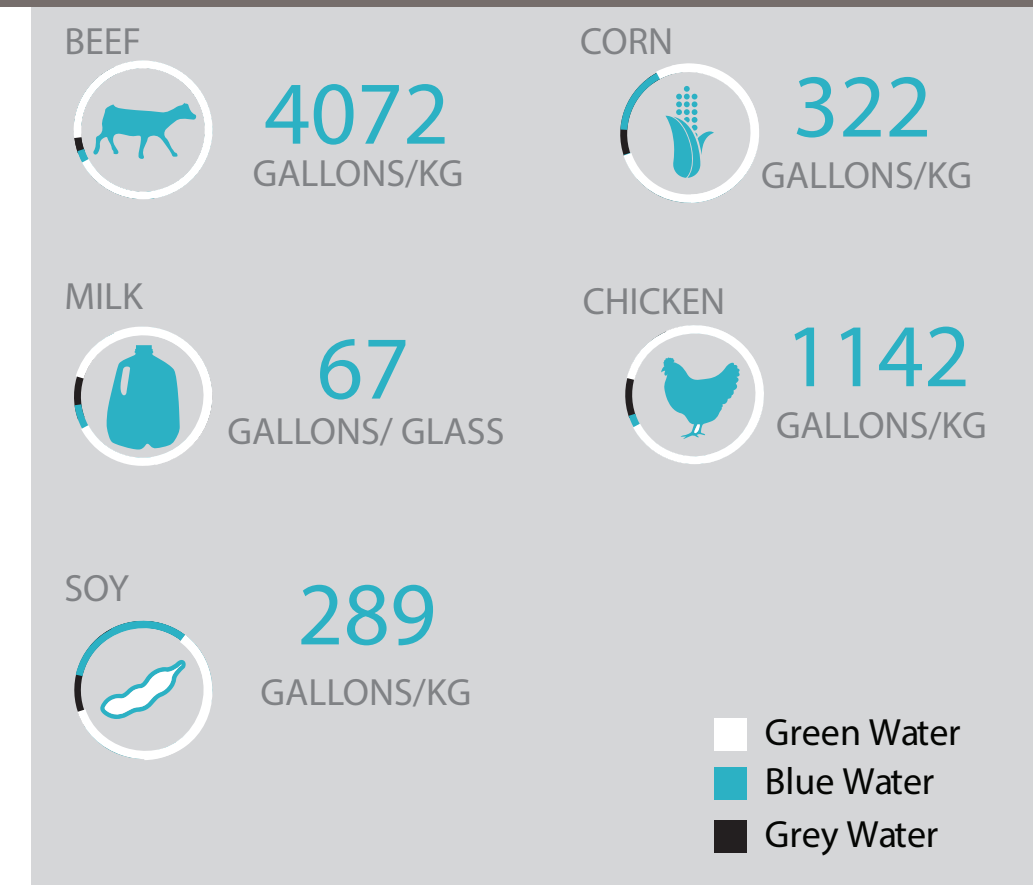
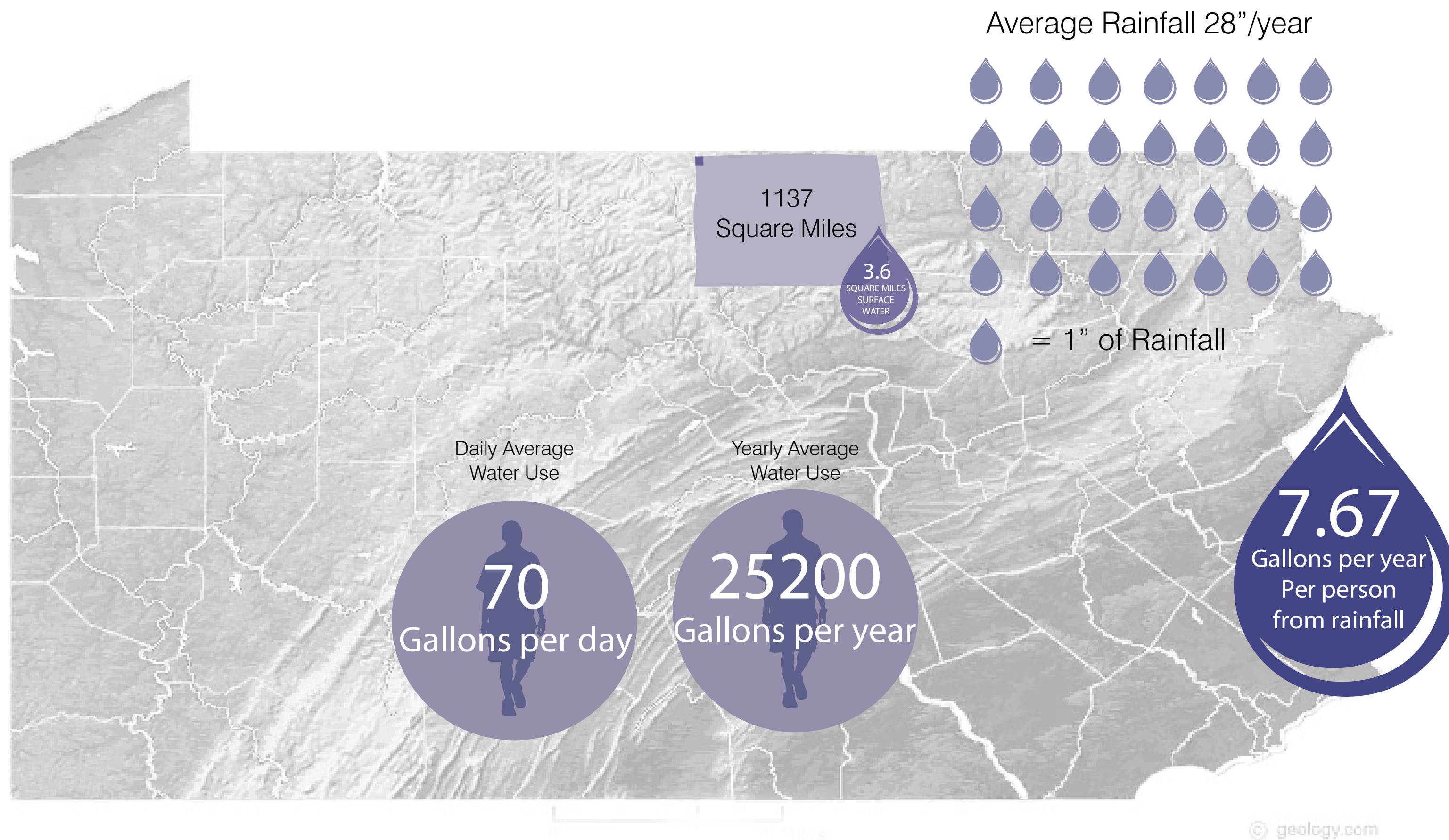


Food

A large benefit of local food is financial savings. Procuring food from local sellers is often not only tastier and better for you, but can be cheaper by about 27%. As an example, buying local beef in Tioga County at current prices can save 1 person \$375 a year! The money you spend also stays with your neighbors and community, instead of being sent off to a corporate headquarters somewhere else. Another option is to grow your own food.

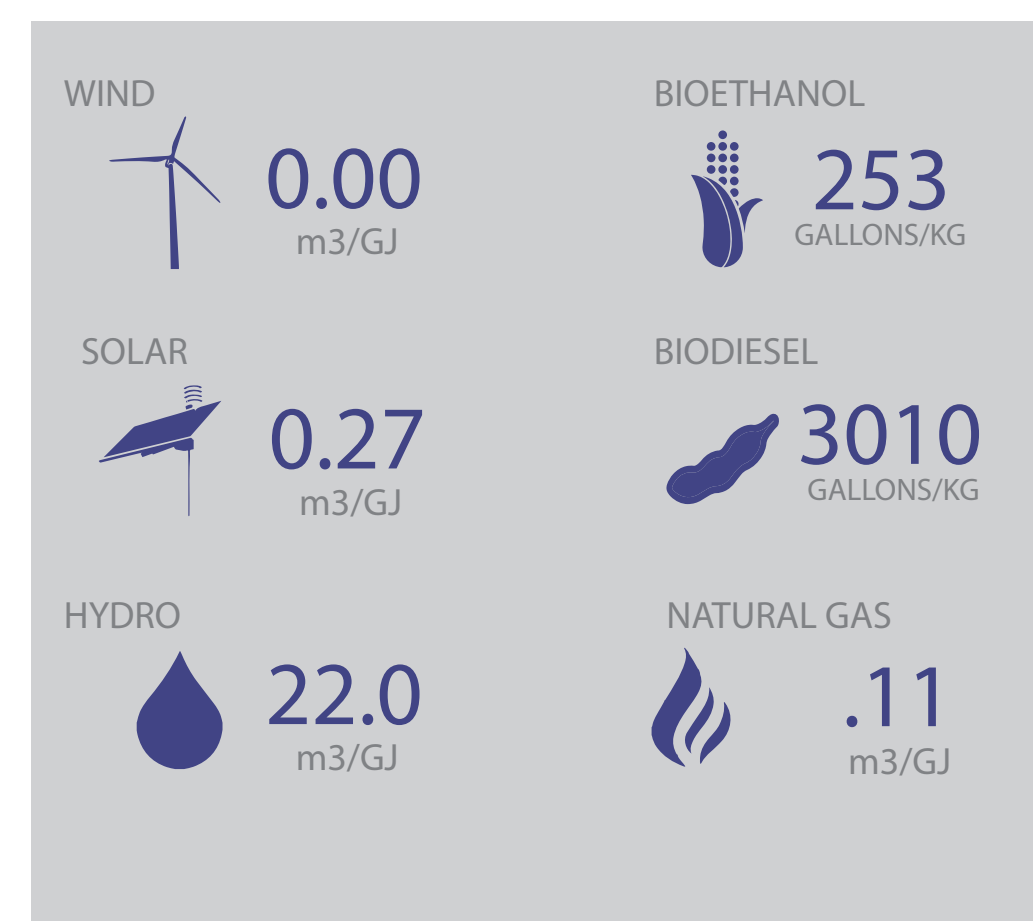
A family of four needs around 5 million calories a year. On 2 acres of land, a family can produce, including meat, over 8 million calories in a year. This extra can be stored, donated, or sold in the community. In the 3 researched sub-basins, the total existing agricultural land can feed 92% of the ENTIRE County, while only taking up 1.3% of the total land in the county. The ability for the entire county to be fed from such a small percentage of the land underscores how easy it is to

provide enough food for a family. While not every family needs to do this, purchasing food as close to you as possible removes many of the business and labor costs normally associated with buying food. The savings from customers also becomes a larger profit for growers, allowing both parties to benefit from their relationship.



Food Water Footprints²⁹

Energy Water Footprints



Water

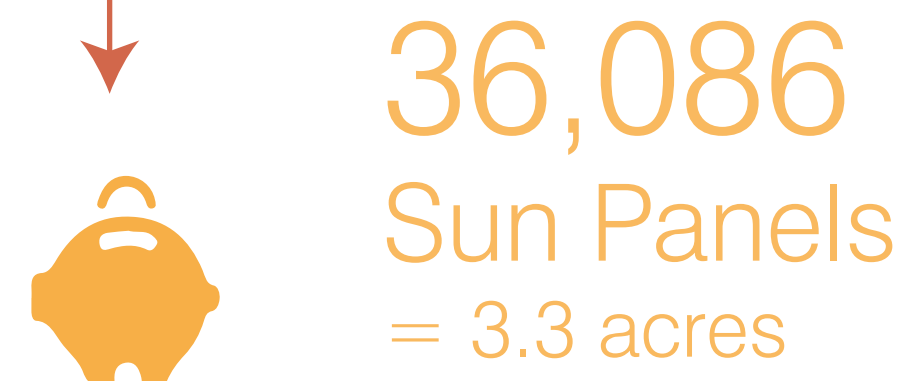
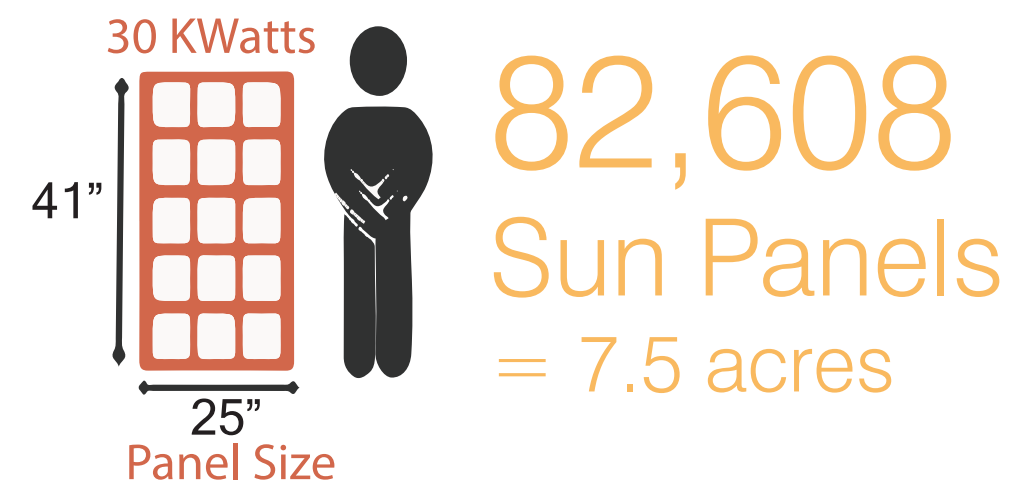
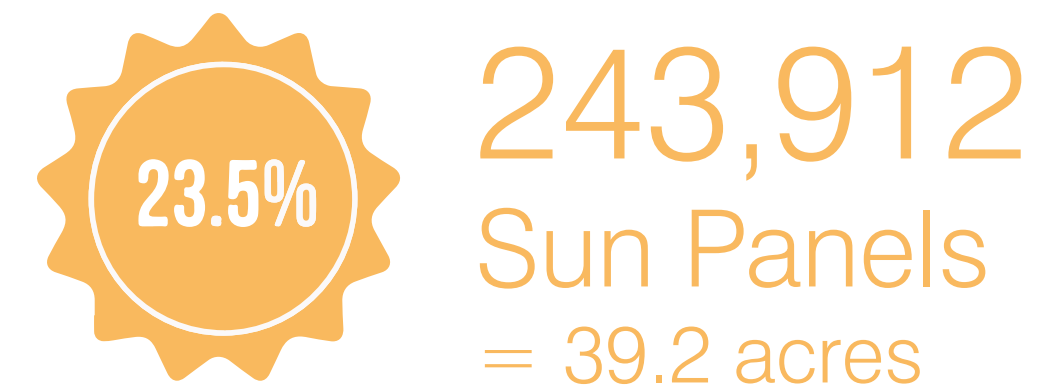
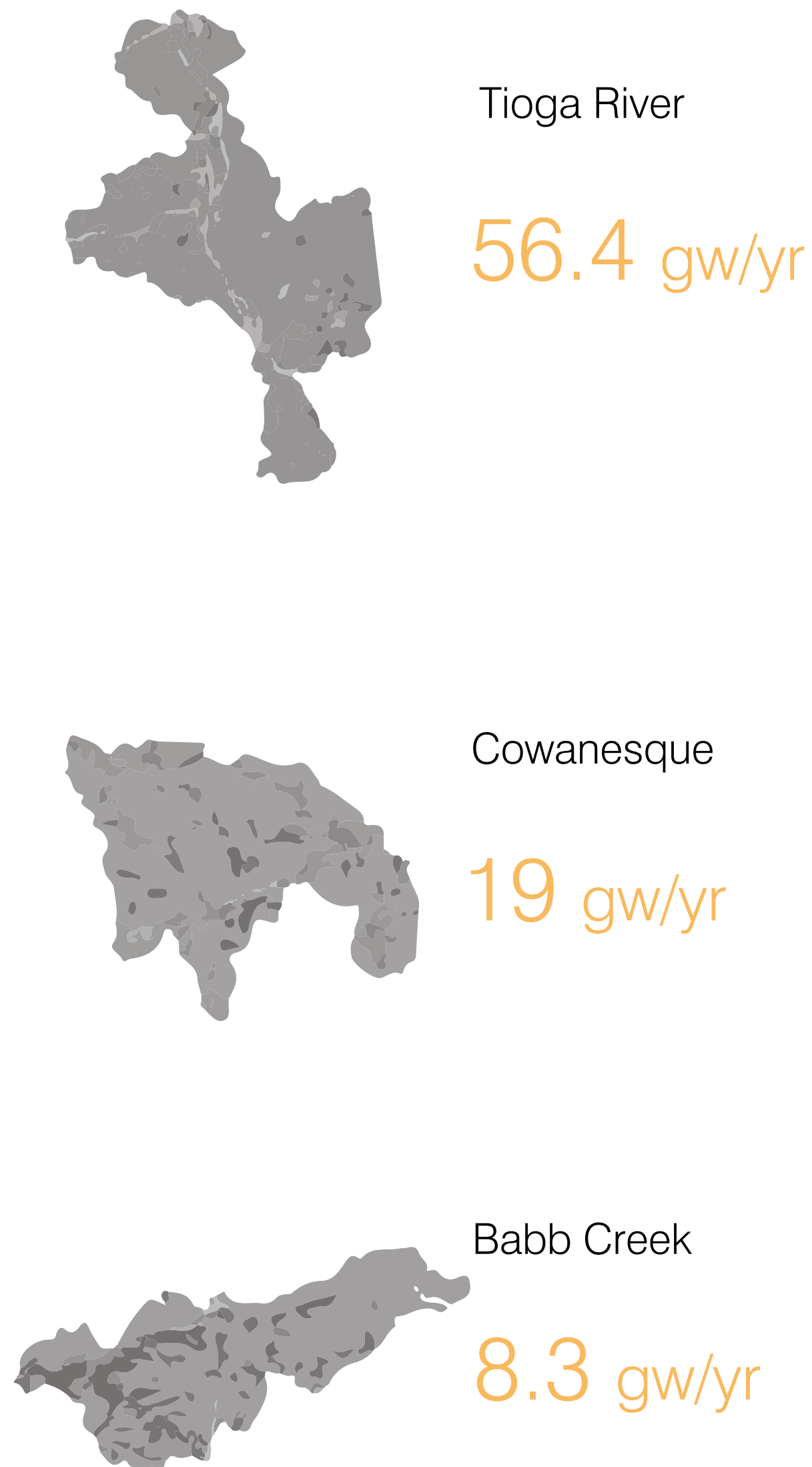
Pennsylvania, and Tioga County specifically, have an abundance of water that comes from rain, and relatively easy access to water from surface water and wells. The danger of drought is very low, and therefore using water wisely generally saves time, energy, and money. An average person in the US uses about 70 gallons of water per day to support their lifestyle. This water includes not only toilet, showering, and dish-washing, but also the water used to grow food,

water needed in transportation or creation of materials that support a particular lifestyle. Outside of day to day uses, a lot of water is used for agriculture and food related endeavors. The required water for food results in a large water footprint, with beef consuming the most. When these footprints are compared to energies, alternative energies such as ethanol and bio-diesel require significant water. Renewable energies of wind and solar require minimum water, supporting the

transition from non-renewable energies. Thus, the available water throughout Pennsylvania is enough to sustain the lifestyles of the residents, but it will further enhance their lifestyle by transitioning to renewable energies.

Solar

Wind



4 Siemens
3.3 mw

or



8 Nordex
2.5 mw

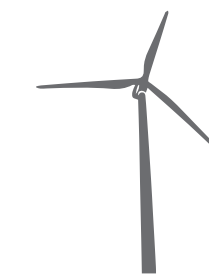


2 Siemens
3.3 mw

or



3 Nordex
2.5 mw



2 Siemens
3.3 mw

or



3 Nordex
2.5 mw



1 Siemens = 16 gw
\$900,000
*according to NREL¹³



1 Nordex = 7.5 gw
\$600,000
*according to NREL¹³

Energy

We looked at the individual sub-basins, and their estimated energy requirements for a year. Comparing that to the production capacity of renewable energy sources we determined that the adoption of solar panels and wind turbines for local use can easily meet and exceed the energy demands of each sub-basin. Complete energy generation from just one form of energy is not a feasible with current technologies, so it is important that generation comes from multiple

sources in order to make it reliable. Using natural gas as a backup is also a good idea in cases where the renewable source would fall short of energy needs.

The placement of renewable energy sources can also work to the benefit of residents. Working with energy companies, residents can lease portions of their land for personal profit, gaining money from the land and the energy generation that occurs on the site. Smaller

scale turbines and solar panels are a more realistic and convenient way for smaller properties to still generate energy, and sell excess back to the grid. These small scale generators help reduce reliance on the grid for power.



Wildpoldsried Innovativ Richtungsweisend⁵

Established by the community in 1999

Strived to become 100% Energy Self-Sustaining by 2020

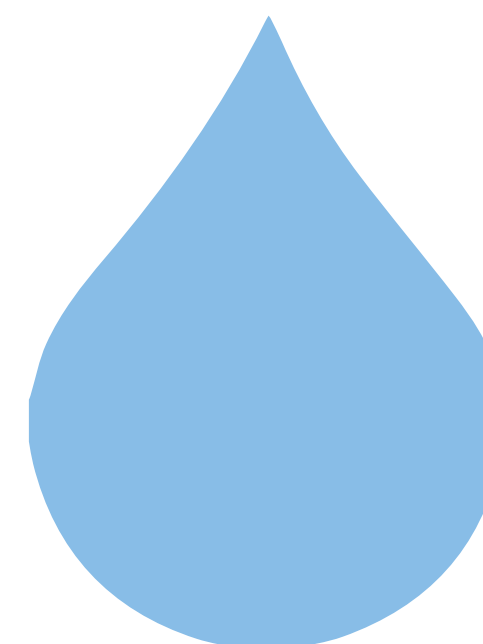
Wildpoldsried has:

- 2/3 fewer people
- ~1,000 more people

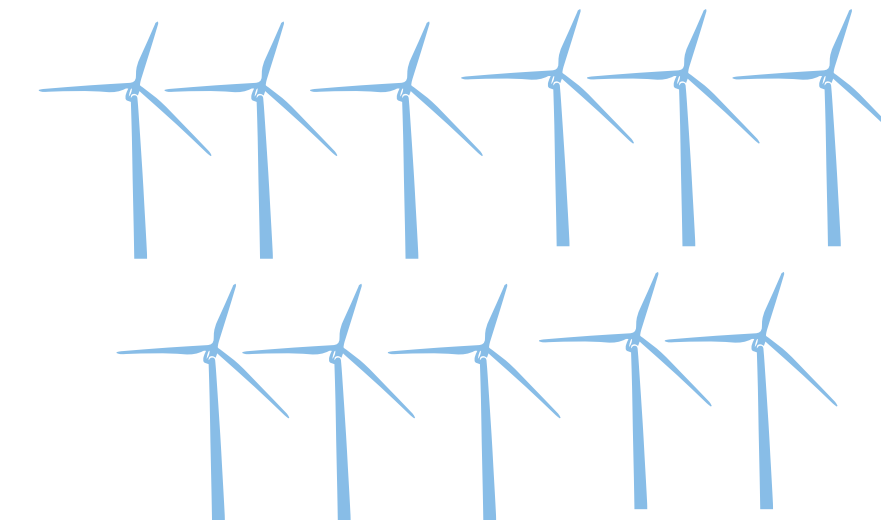
Wildpoldsried Production:

- 321% more energy than they needed by 2011
- 500% more energy than they need today

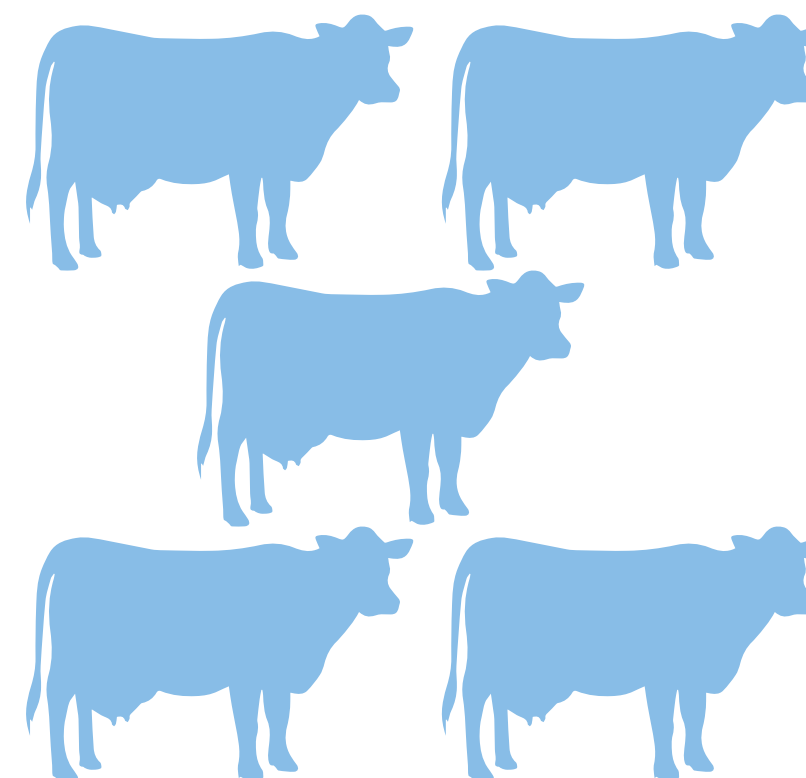
Types of Energy Generation



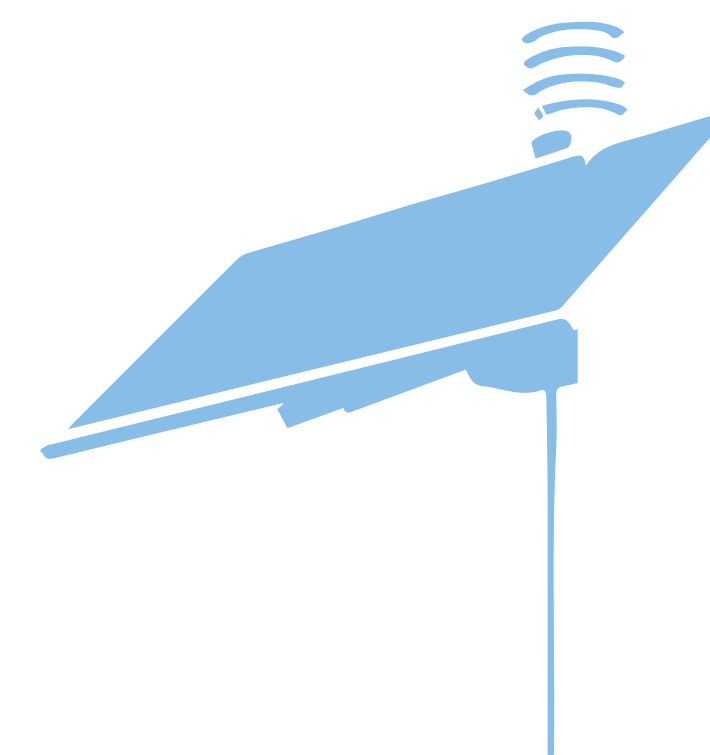
1 Hydro



11 Wind Turbines



5 Biogas



4,983 kWp of Photovoltaic Solar Power

It's Been Done Before

Specifically in regards to energy, a community becoming self-sustaining in energy has been done before. In the German village of Wildpoldsried, the community in 1999 decided, invested, and committed to becoming self-sustaining in energy by 2020. The community implemented hydroelectric energy, biogas, solar panels, and wind turbines. Moreover, with 2/3rds less land and 1,000 more people in comparison to the Cowanesque sub basin, they were able

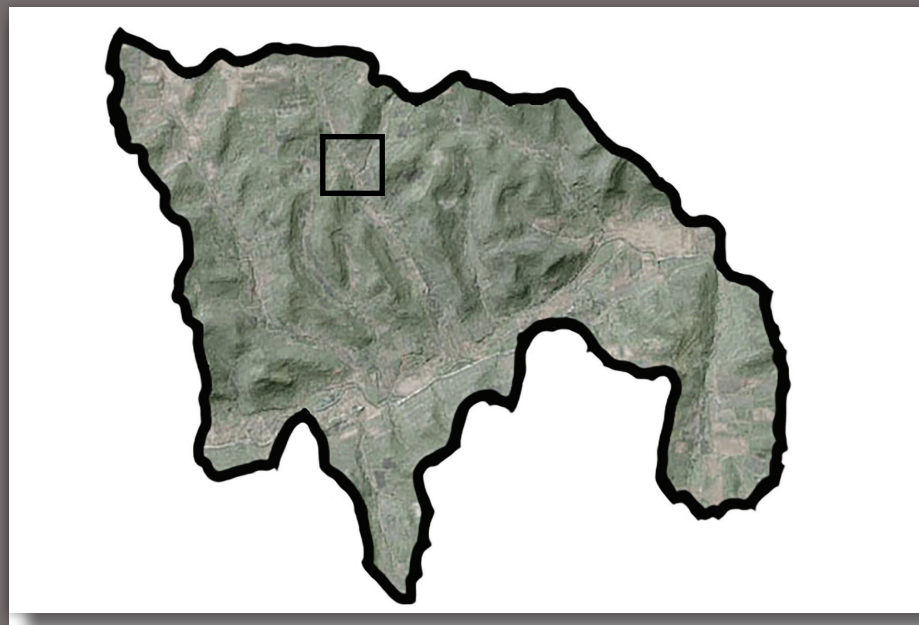
to produce 321% more energy than they needed in 2011. Then in 2014, they were producing over 500% more energy than they needed. Within 15 years of their initial commitment, Wildpoldsried was able to produce 600% energy and meet their energy demand. This excess energy was then exported for revenue that is reinvested into improving the community. Thus, becoming self-sustaining in energy is feasible, but it is done through the investment and commitment

of the community. Other examples like Wildpoldsried can be found across Europe, but few examples are found within the United States.

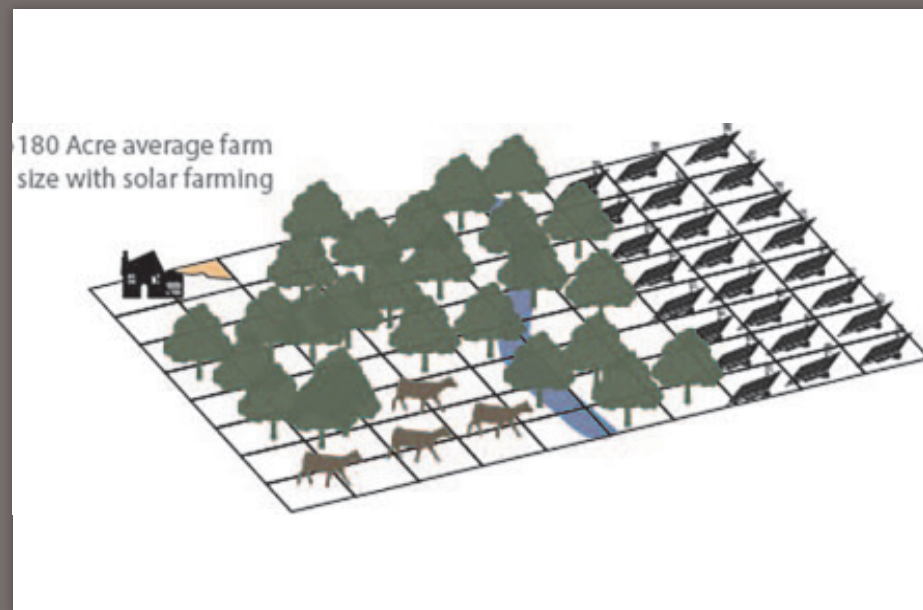
Food Water Energy Futures

Design Proposal

With the Carter retired lifestyle and main intention to give back to the community, their landscape, framework, and design service their ideas in a practical and sustainable method.

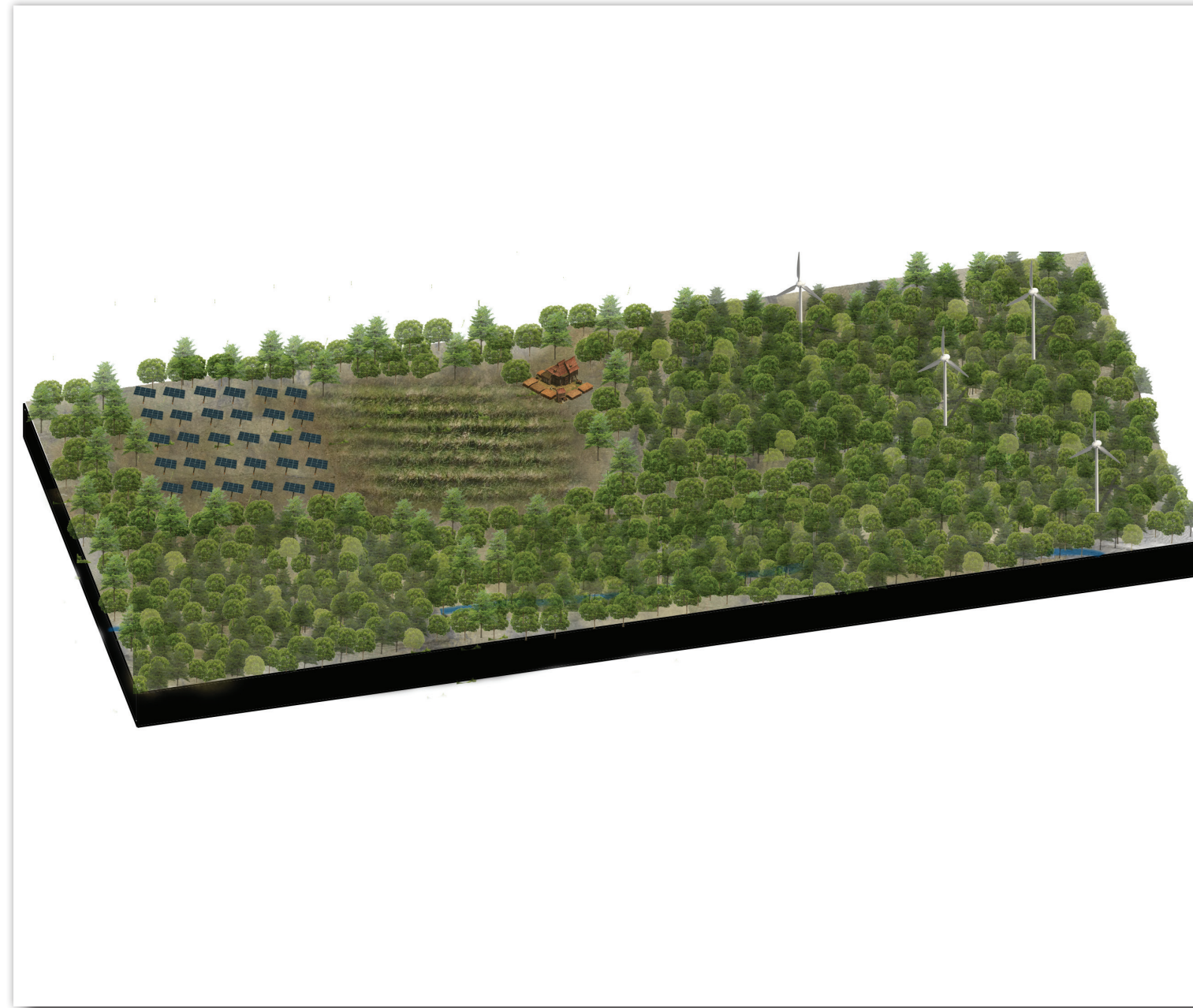


The site of the Carter farm is mainly gentle slopes but obtains a landscape accommodating wind and solar.



The framework of the Carter landscape portrays ample acres for agricultural and renewable farms.

The Carter's of Cowanesque



The Carter's new lifestyle...

Since the Carters have invested in a dual agricultural and renewable energy lifestyle, they have become closer to the community. They produce more food and energy than they need and sell the excess to the community. This provides the additional income they need to sustain their retired lifestyle and contribute to the lives of their friends, family, and neighbors. Plus, since the farms need tended to, Ben has been able to get back into shape, Abby has gotten involved with neighborhood planning after meeting everyone through their contributions to the community.



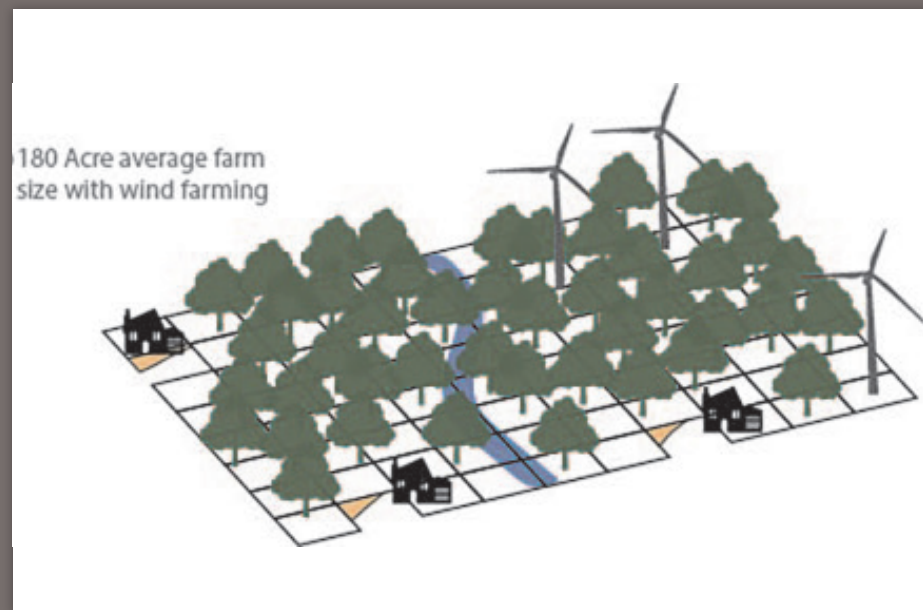
Food Water Energy Futures

Design Proposal

The Timmons and their four young children seek to support the community in energy and agriculture, but pioneer a new generation of sustainable individuals by teaching their kids responsible practices.

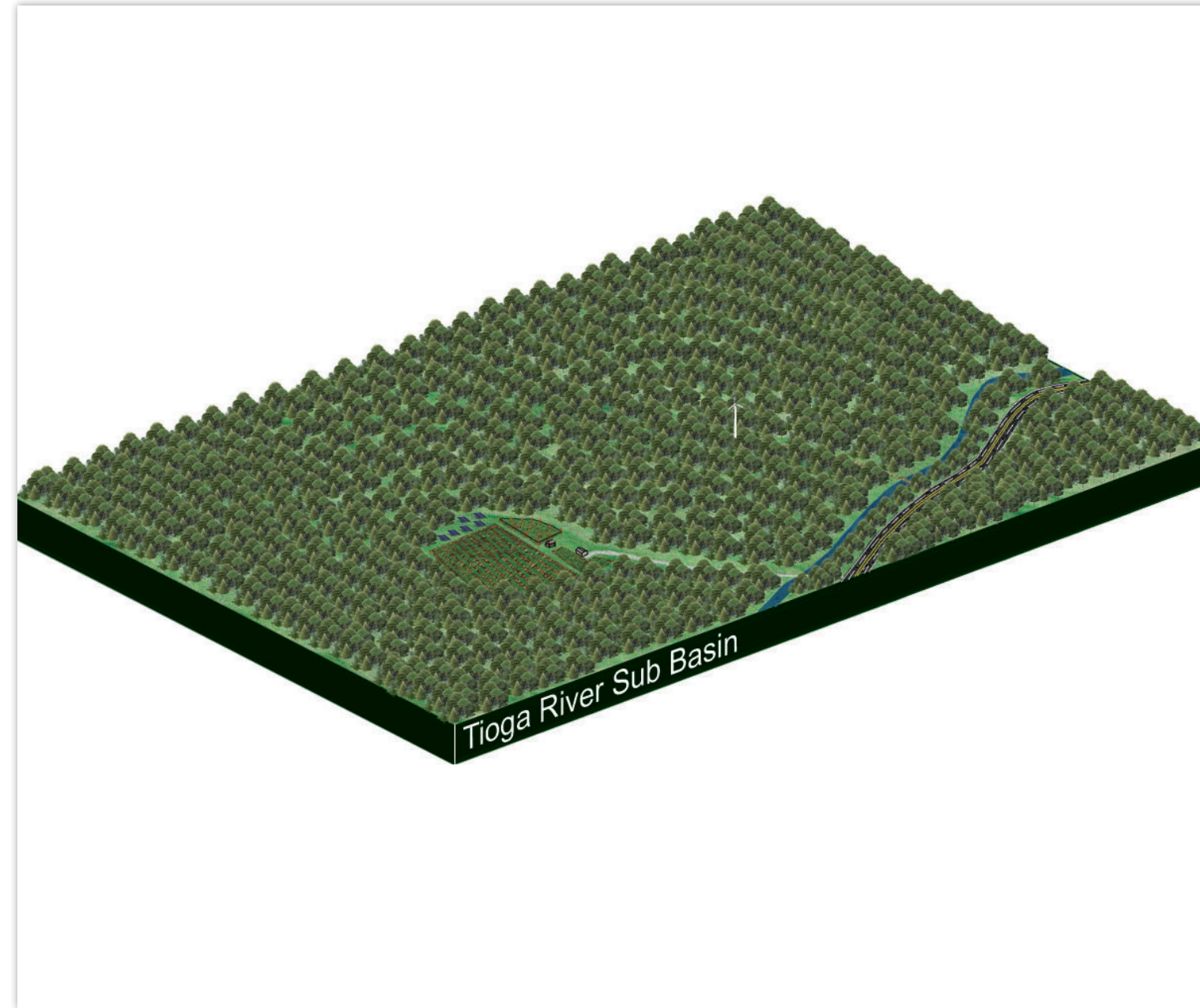


Adjacent to the Tioga River, the Timmons steep terrain supports reforestation and teaching agriculture.



The Timmons' framework encourages ecological priorities like reforestation, but adds food and energy.

The Timmons' of Tioga River



The Timmons' new lifestyle...

The Timmons family love feeling independent and teaching their children responsible practices. The kids are proud to grow the food they eat and explore their reforested backyard. The excess food the family grows creates opportunities for them to meet more of their community by selling at the local farmer's market. The children are learning valuable lessons about community and the importance of growing and purchasing food locally in the community.



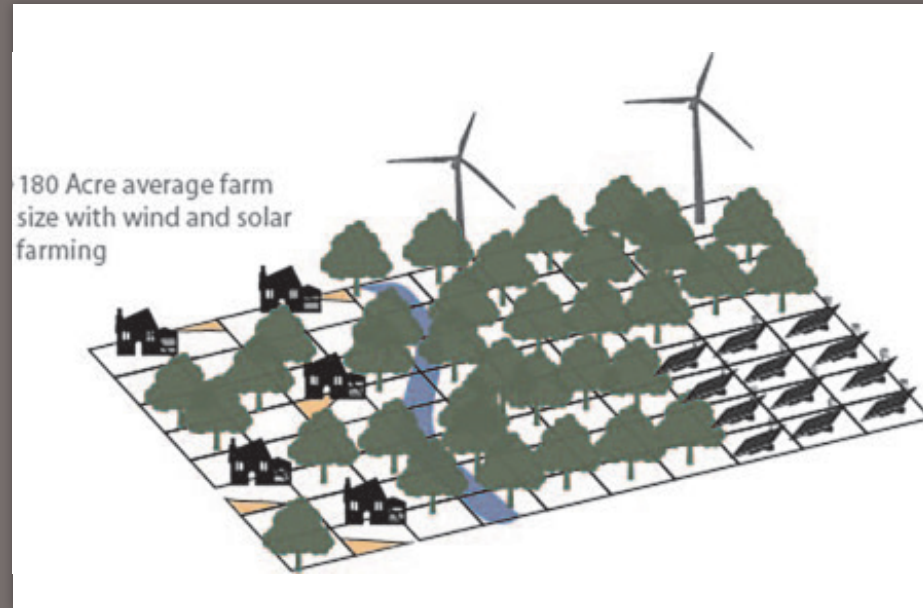
Food Water Energy Futures

Design Proposal

The Bryant family is transitioning from agriculture to renewable energies and is dependent on them for income. The expansion of the resources with an assisting landscape allows for the Bryant's to have a successful future.



The Bryant landscape has steep slopes and heavily supports many renewable energy resources.



The Bryant family framework balances all the aspects, but mainly focuses on energy.

The Bryant's of Babb Creek



The Bryant's new lifestyles...

The Bryant's are taking advantage of subsidies and other government programs to build renewable generation facilities on their property. They have also been in contact with their utility company and have agreed to lease some of their less productive agricultural land for large-scale wind generation. While slow to start, the Bryant's are gradually increasing their income through selling excess power to the grid that not only supports them financially, but provides greater energy security through distributed power generation.





Chris Frey

Born in Virginia, Chris is a former Marine and has traveled to over a dozen different countries inside and out of service. He is currently a fourth year student at Penn State and has done work in the US and abroad. In the fall of 2015 he hopes to graduate early and pursue work in community design, and planning the human habitat.

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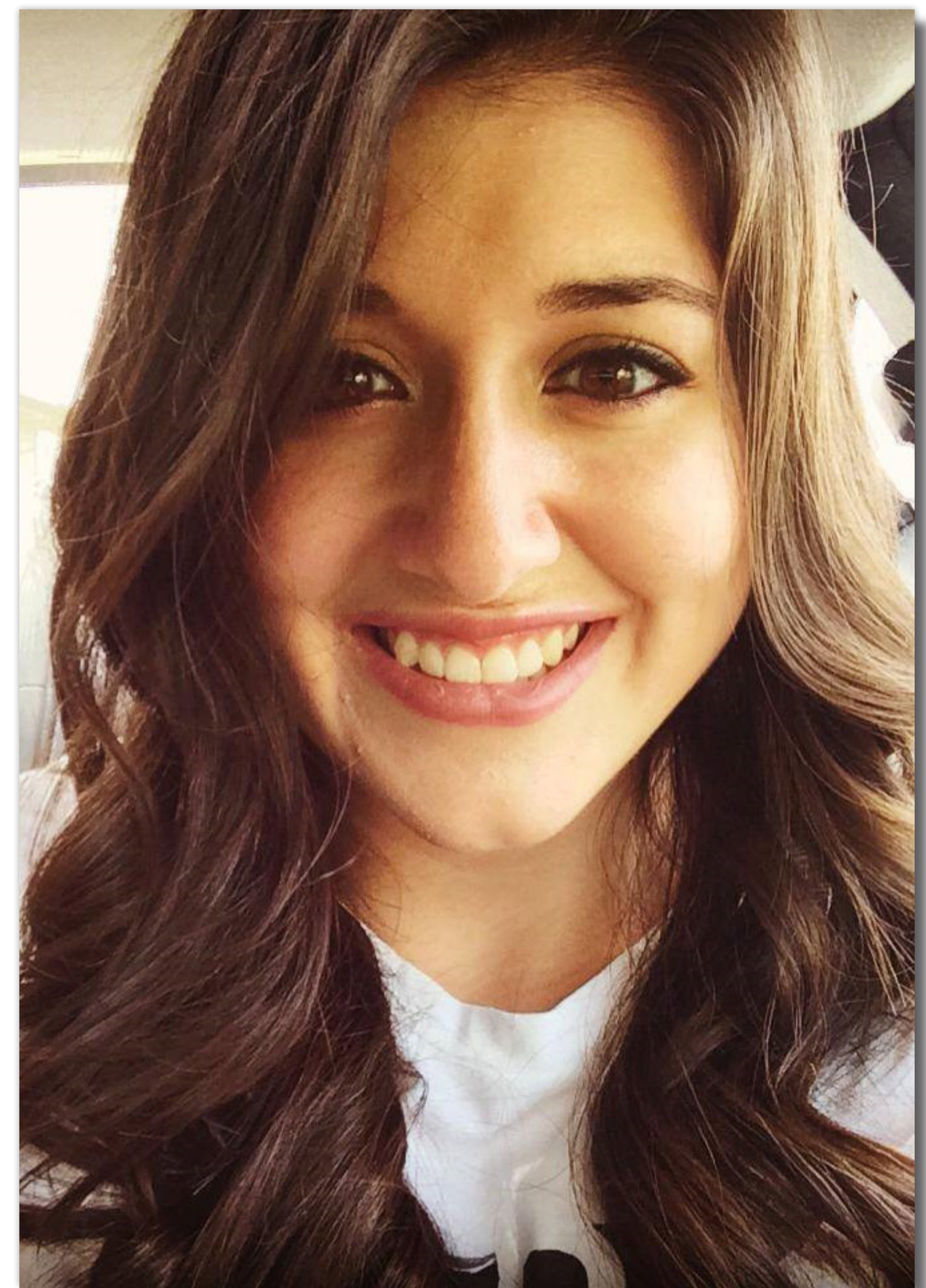


Jeffrey Holzer

Originally from Hollidaysburg, Pennsylvania, Jeff is a 4th year landscape architect student at Penn State University. Through his academic career he has experience in athletic facility design, horticulture, and has done work in Philadelphia, Russia, and Istanbul. Upon graduate in May 2016, he hopes to pursue a career in the urban and community fields of landscape architecture.

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Allyson Caruso

Born in Pittsburgh, Pennsylvania, Allyson is currently in her fourth year of study at Penn State University where she is acquiring a bachelor's degree in Landscape Architecture. She also has a strong interest in dance and acquired a minor in the spring of 2014. Allyson has done studio work within the U.S. and in Africa. She plans on graduating early in the fall of 2015 where she hopes to pursue work with community design in accordance with habitat restoration.

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