Marcellus Design

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

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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.

Timber:

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")

ExplorePAHistory.com "Penn's Woods"

Circa 1890.

ExplorePAHistory.com "Overview"

The "Pennsylvania Desert", Circa 1920.

Anthracite Coal:

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 deindus-trialization process that many Pennsylvania towns and cities continue to experience". (ExplorePAHistory.com "Mining Anthracite")

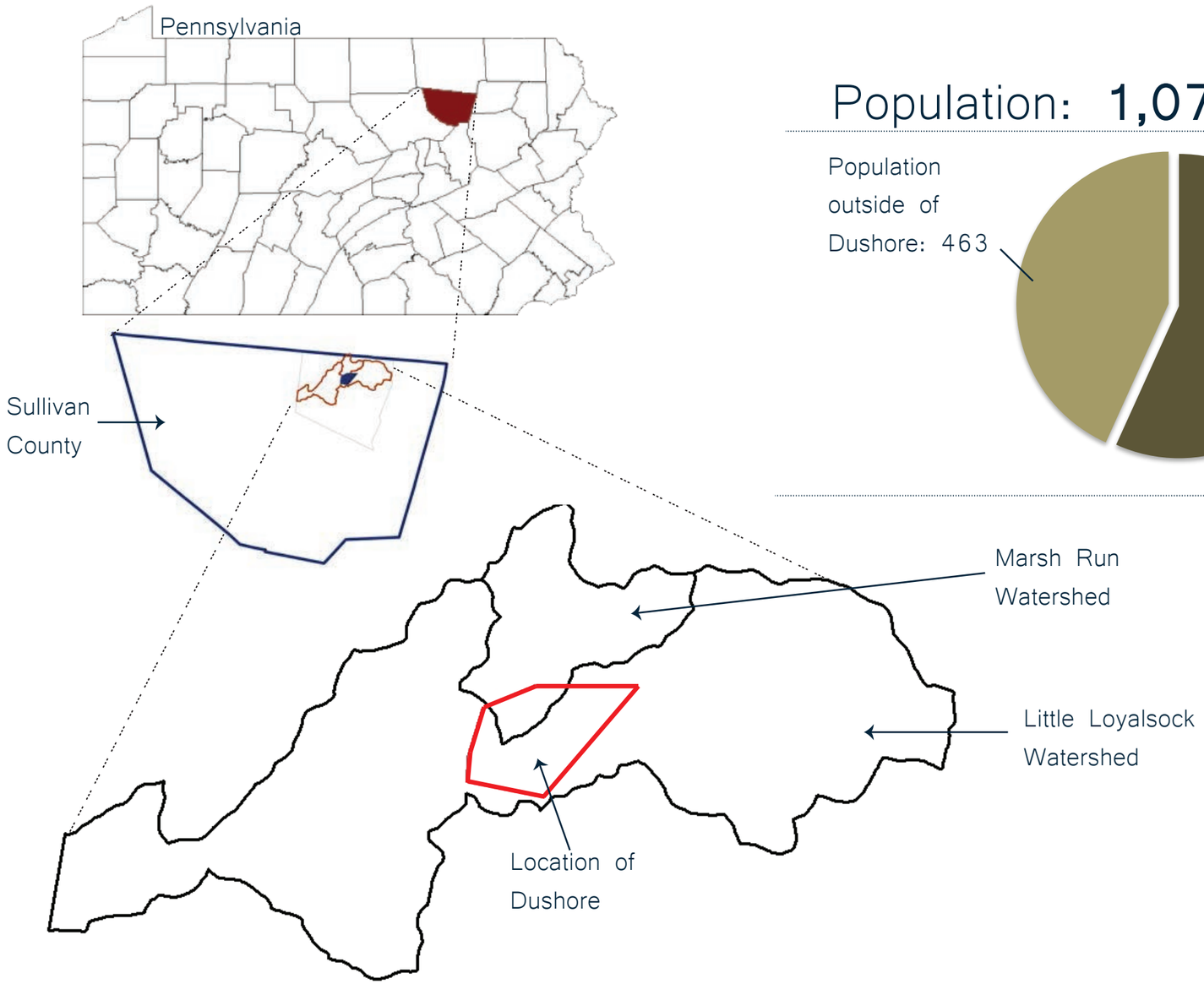
ExplorePAHistory.com "Mining Anthracite"

Young Mine Workers, Circa 1910.

ExplorePAHistory.com "Mining Anthracite"

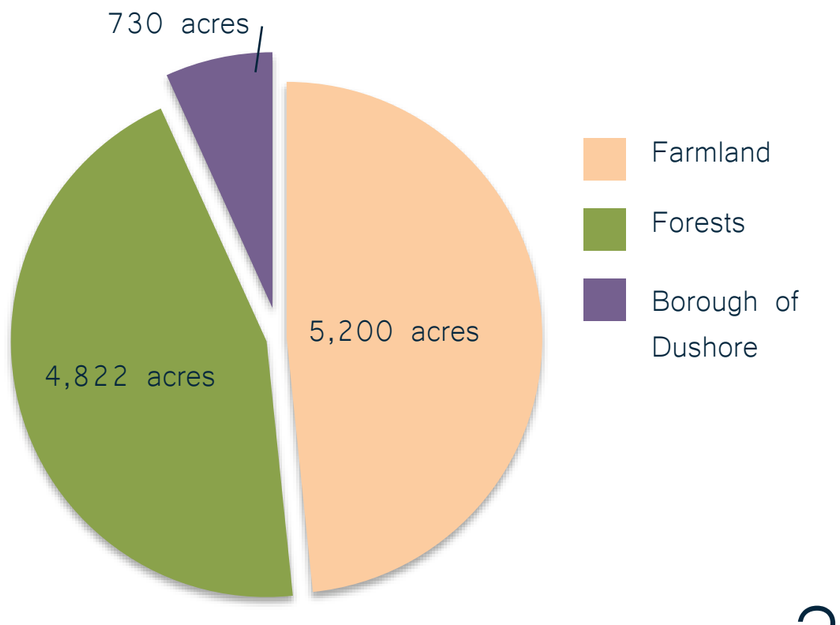
Workers in a "Patch Town", Circa 1900.

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

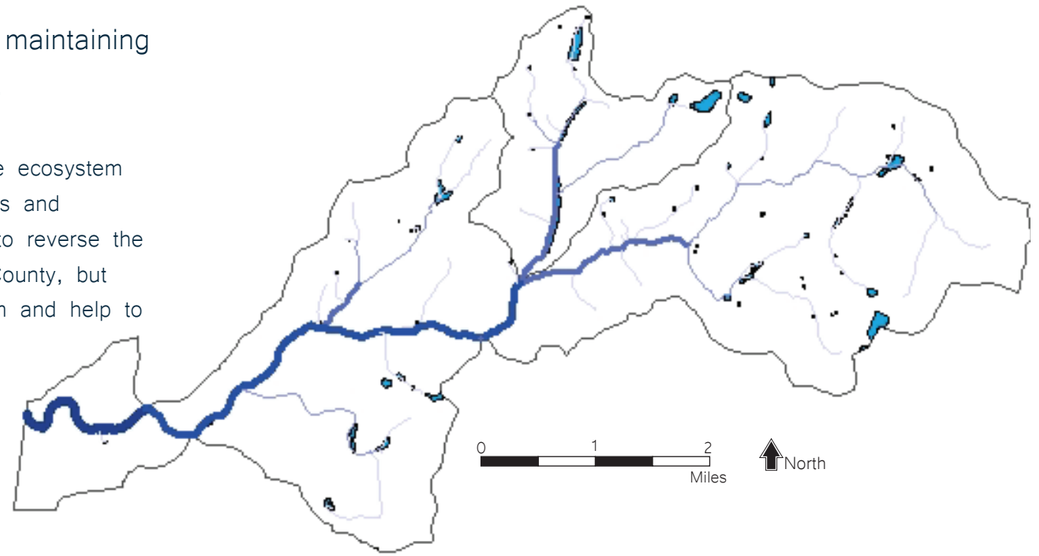


Stream Buffers

Streams and water are an essential part to maintaining the sustainability and quality of a watershed.

Without clean streams and a clean water table the entire ecosystem starts to be affected by the negative impacts of pollutants and contaminants flowing downstream. Nothing can be done to reverse the development that has already happened within Sullivan County, but there are things that can be done to prevent future harm and help to correct already disturbed areas.

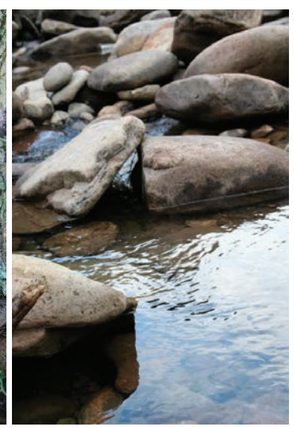
One of many ways to help the streams within the area is create riparian buffer strips along either side of streams to filter and remediate negative impacts on water and streams themselves. This idea is suggested as a “cookie cutter” that can be applied to different types of streams given their quality and outlying context.



Map depicting where streams and wetlands are located.

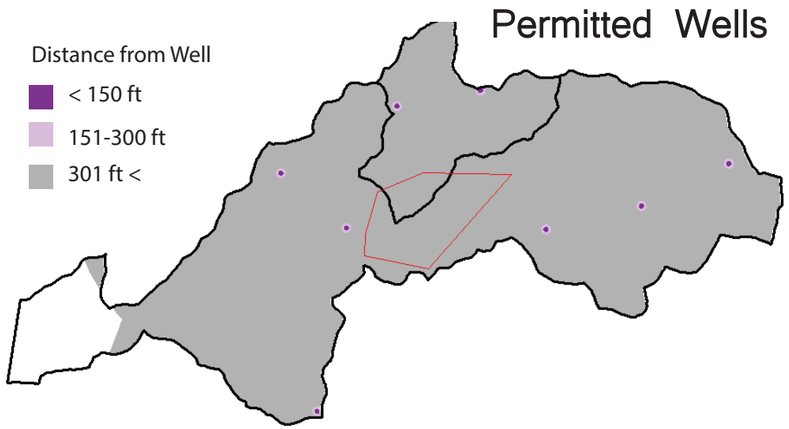
Above is a map depicting where roadways are that create polluted runoff from vehicles and anything else that comes along. The map also shows where all of the farm land lies that can have a negative impact depending on what that land are being used for.

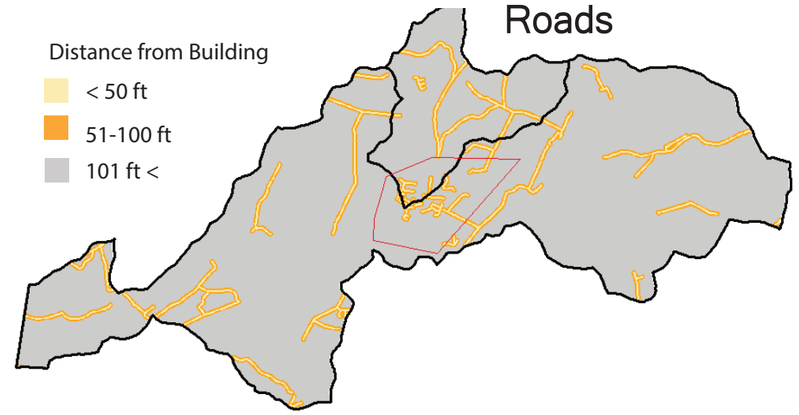
Below are images that show the natural, beautiful “endless mountains” and to the bottom right is paved area on at a gas compression station that adds to contamination.

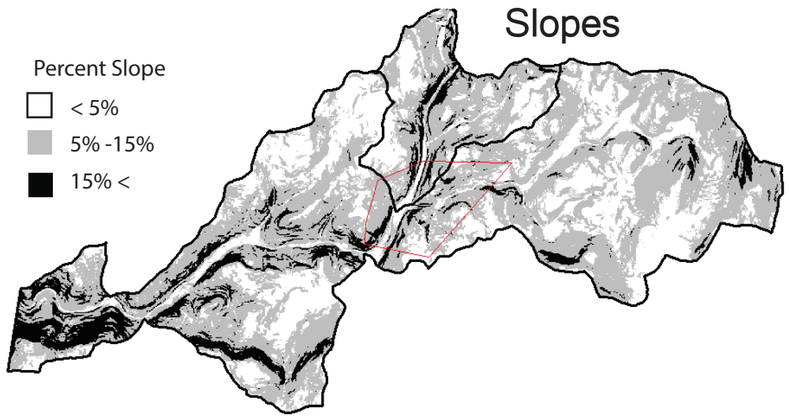


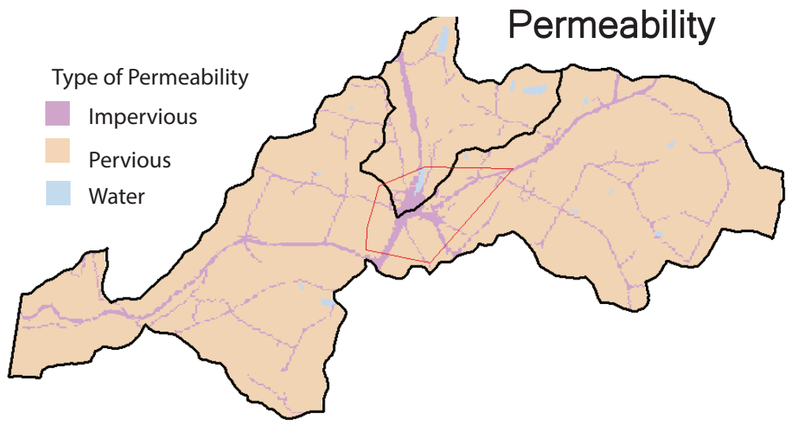
Key Components of the Watershed

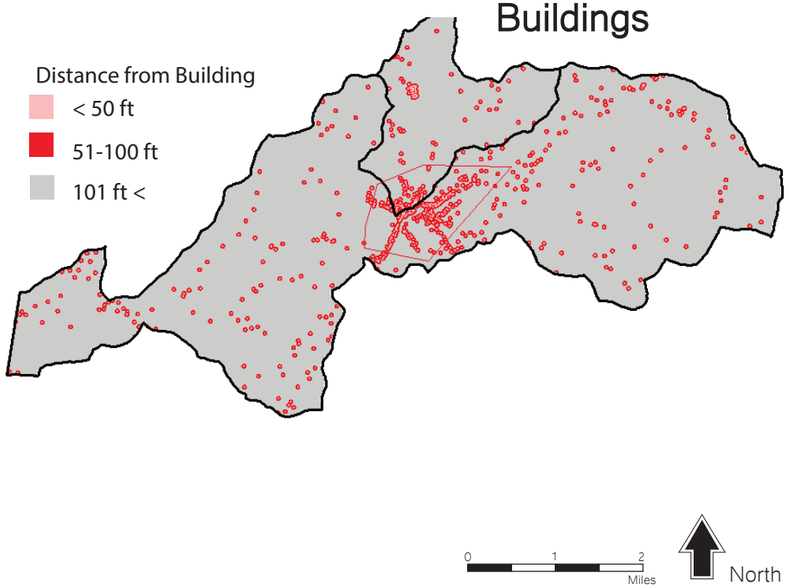
These seven maps contain key components in identifying areas of concern for creating buffer strips along streams. These maps highlight both negative and positive aspects that need to be addressed from proximity to roads, wells, and streams to slopes and impervious surfaces.

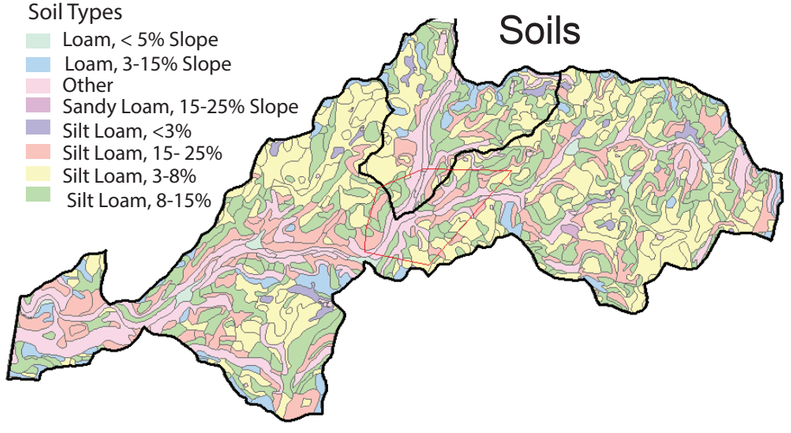


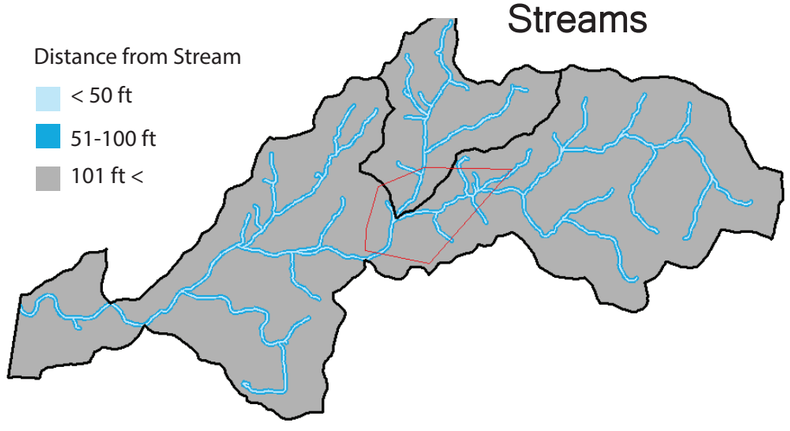






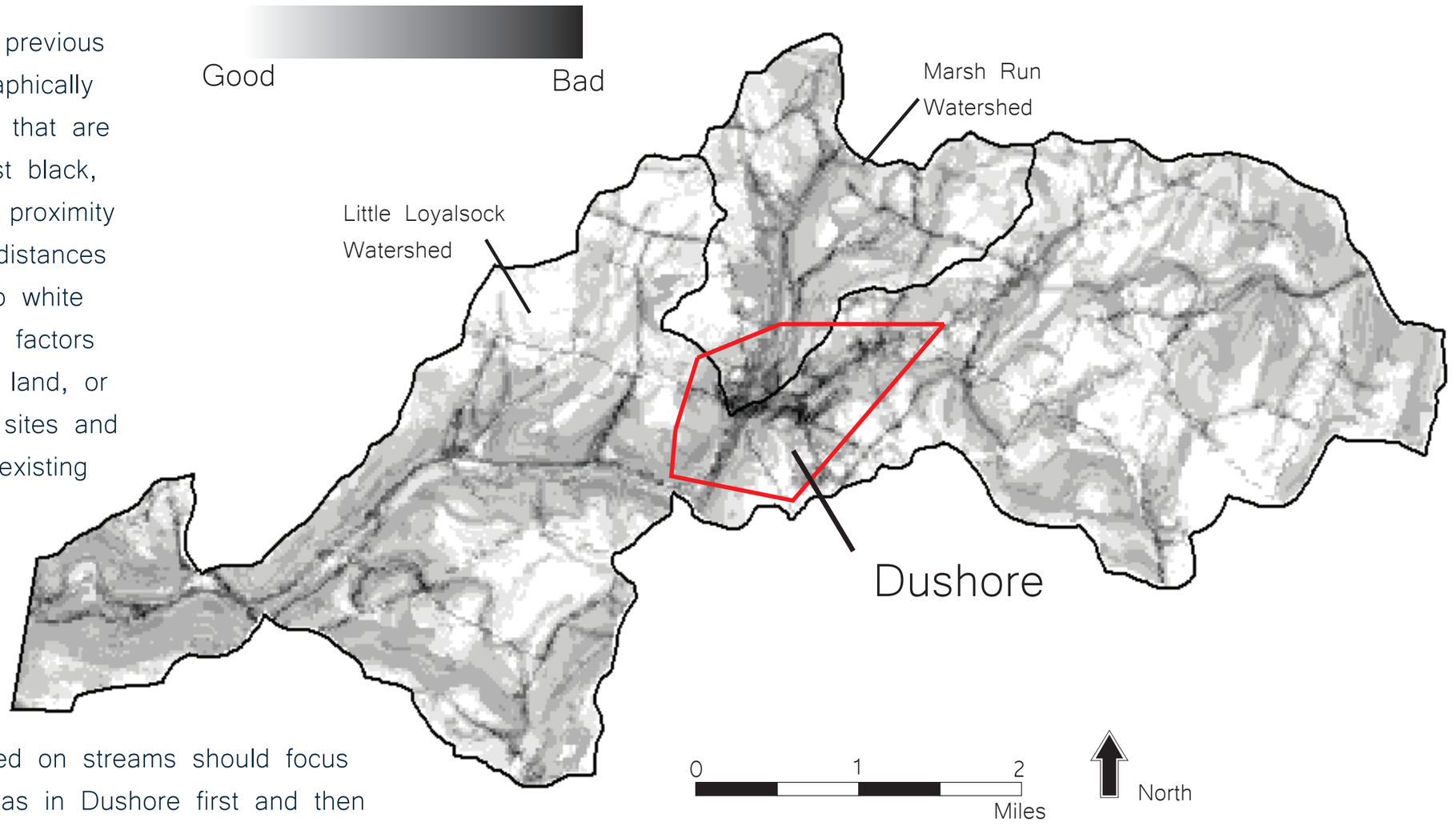






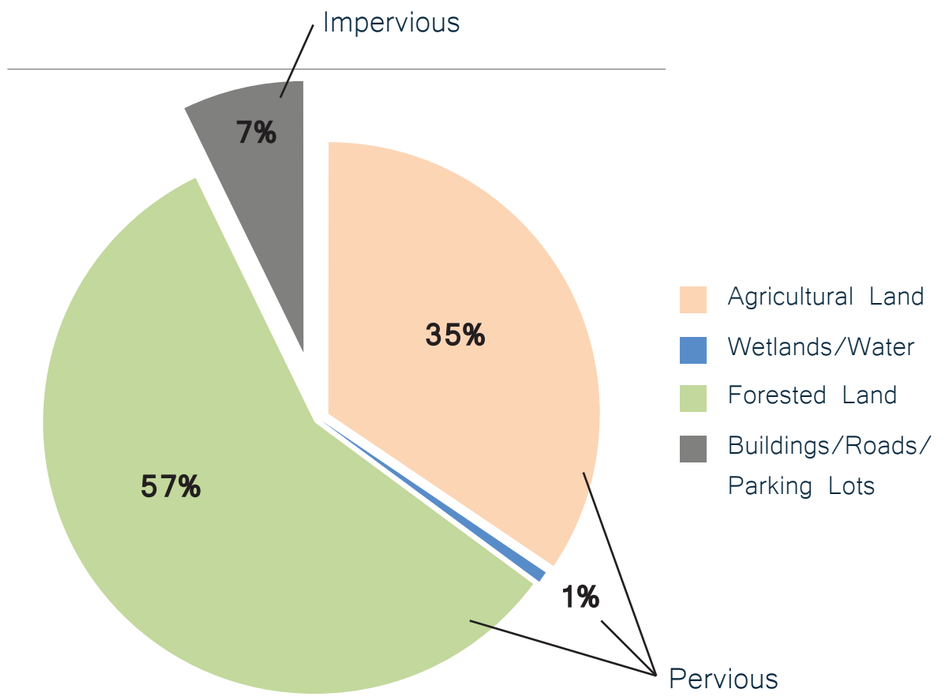
Suitability Map :

By combining the maps from the previous page, a suitability map evolves to graphically show the positive and negative spaces that are within the watershed. The dark, almost black, areas are most affected by factors like proximity to Dushore, impervious surfaces, and distances from roadways. Whereas, the gray to white spaces are less impacted by negative factors and become areas of open land, farm land, or near streams. The further away drilling sites and its access roads are away from the existing streams, the better.



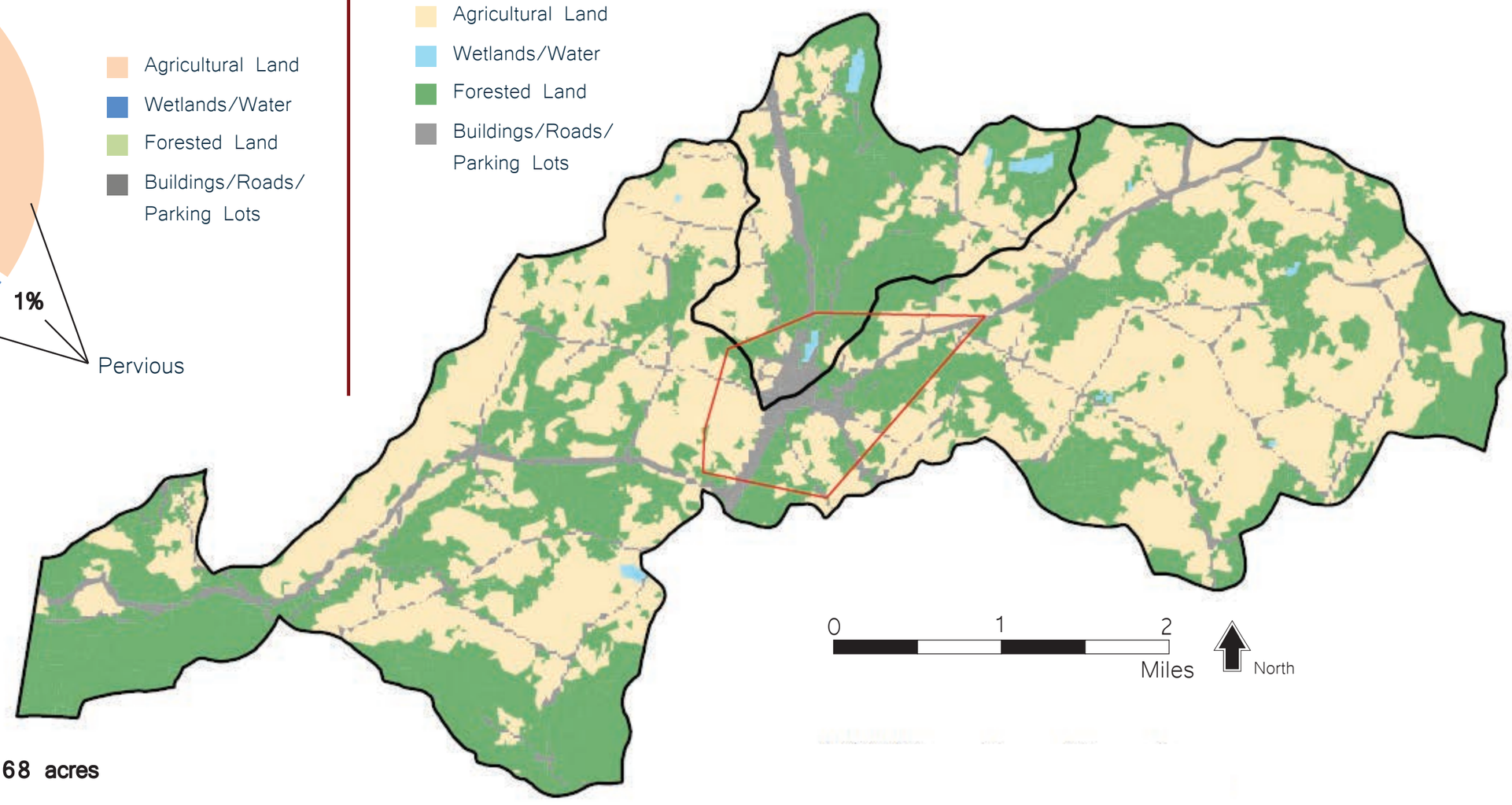
Buffers to be placed on streams should focus around the dark areas in Dushore first and then expand to the roadways and farmlands nearest streams.

Permeability



The permeability of a site affects what toxins are running off the impervious surfaces with water that percolates back into the ground. Pollutants from roads, vehicles, and parking lots all find their way back into the water table and streams, which then affects the entire ecosystem.

Current Surfaces



Pervious Surfaces:

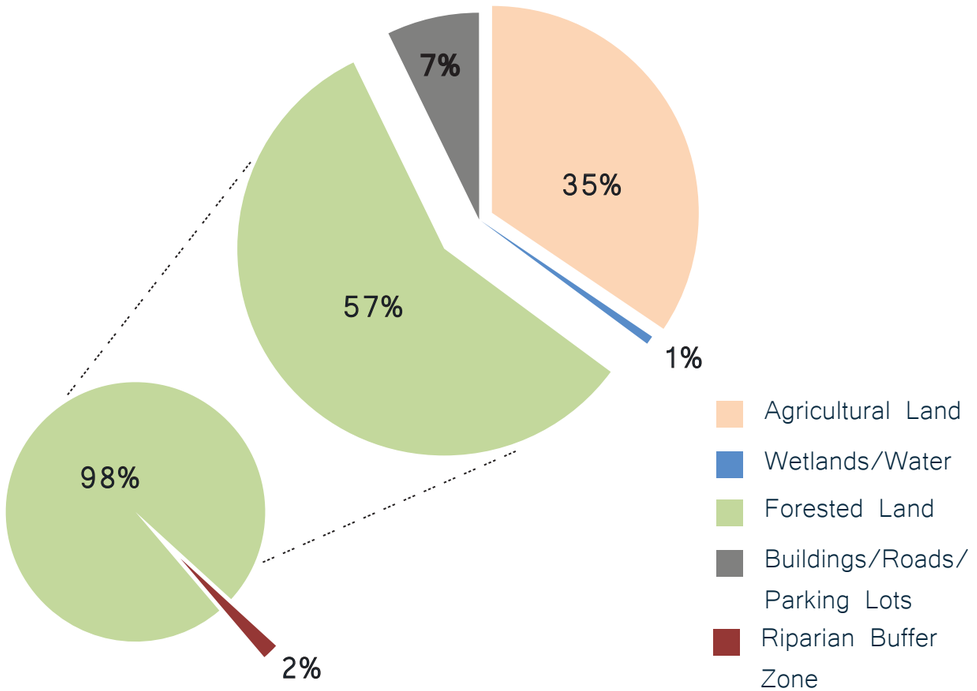
- Farmland: **3,669.2 acres**
- Wetlands/Water: **70.4 acres**
- Forests: **6,137.6 acres**

Impervious Surfaces:

- Roads/Buildings/Parking Lots: **768 acres**

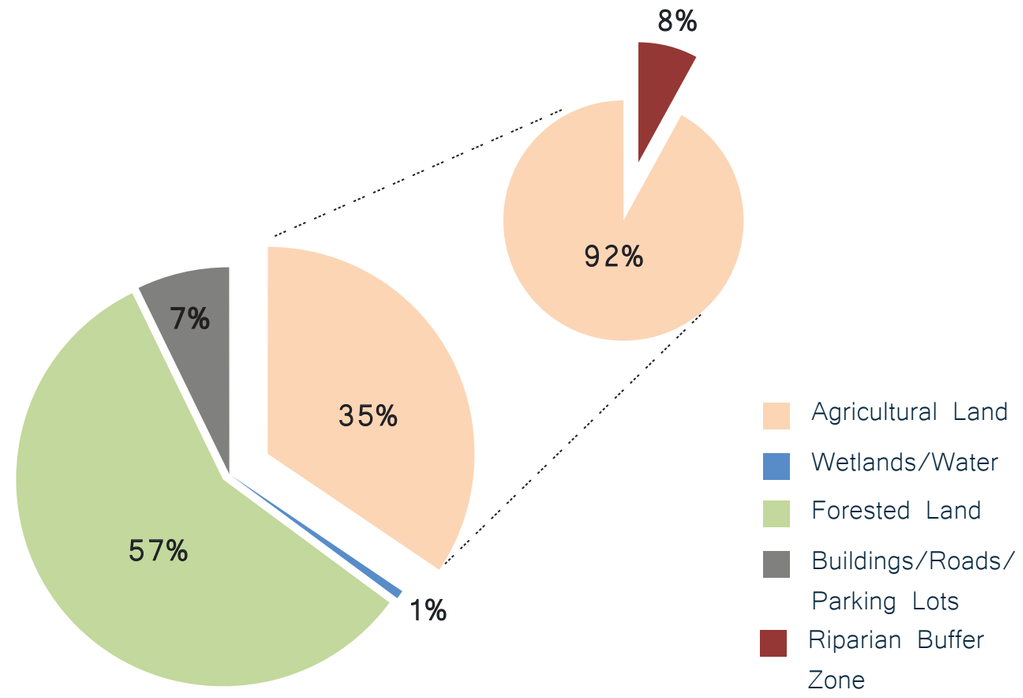
By creating buffers on the streams that are throughout the watershed, not only is there an impact on the stream, but also there is an impact on other components of the watershed like food resources and biomass production for renewable energy.

Biomass Production Land

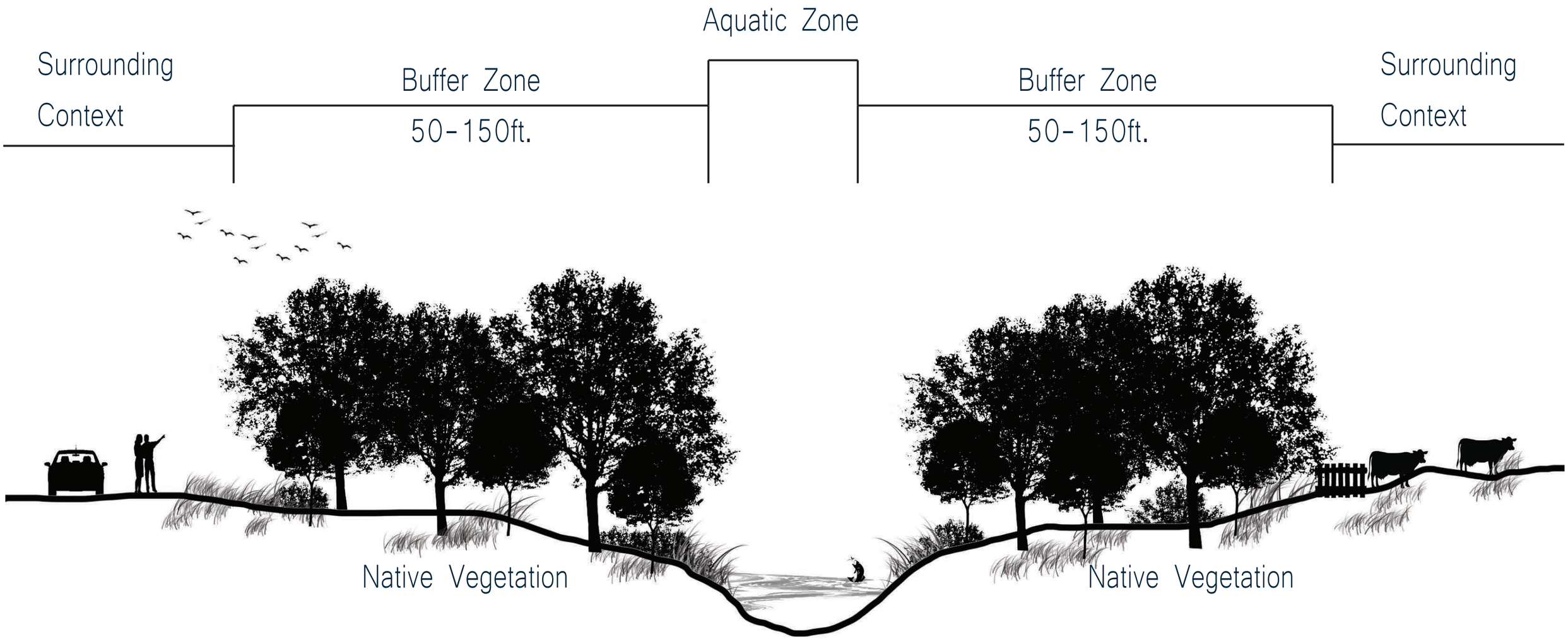


In the never-ending search for renewable energy, vegetative buffers can be used to grow the vegetation needed for biomass production. Within these watersheds only 110 acres of the overall acreage is needed to create enough biomass for Marsh Run and Little Loyalsock watersheds. Therefore, only 2% of the forested area is needed along streams to create biomass. This can also be dispersed throughout other areas, for more see Devon Beekler's project on energy.

Food Resources Land



To create a fully sustainable watershed, the watershed must grow its own crops on the farmland and areas that it contains. By creating buffers within the watershed, they help to filter out any toxins that run off of these lands from pesticides, farm animals, and other pollutants, Only 8% of the farmlands would need to be converted to stream buffers and would still allow or maximum agricultural practices. For more on the watersheds foodshed see Kyrie Yaccarino's project on food.



Buffers on streams range in length depending on the context of the surrounding area. The width of a buffer can be anywhere from 50ft. to 150ft of native vegetative covering. There are many beneficiaries to the correct buffer widths not only for the stream but also for the water flowing down the stream. Thus, is order for a sustainable watershed the water must behave a naturally and pristinely as possible as it travels through its natural paths.

20 Benefits of Urban Stream Buffers:

1. Reduces watershed imperviousness by 5%.
2. The amount of imperviousness they cover from the stream.
3. Reduces problems and complaints due to drainage.
4. Allows for lateral movemen for stream “right of way”.
5. Essential for greater flood control.
6. Protects the streambank from eroding.
7. Increases property values without making it neccessary for them to be public land.
8. Increase in pollutant removal.
9. Gives way for the ability of future geenways.
10. Provides a lot of food and habitat for land and aquatic wildlife.
11. Slows down sream warming by a significant amount.
12. Protects any surounding wetlands.
13. Prevents steep slopes from eroding away.
14. Provides important transitional habitats for wildlife.
15. Provides corridors for conservation.
16. Creates essential habitats for amphibians.
17. Creates fewer barriers for many different types of fish migrations and mating.
18. Discourages excessive storm drainage.
19. Provides space for sormwater management.
20. Room for fuure restoration.

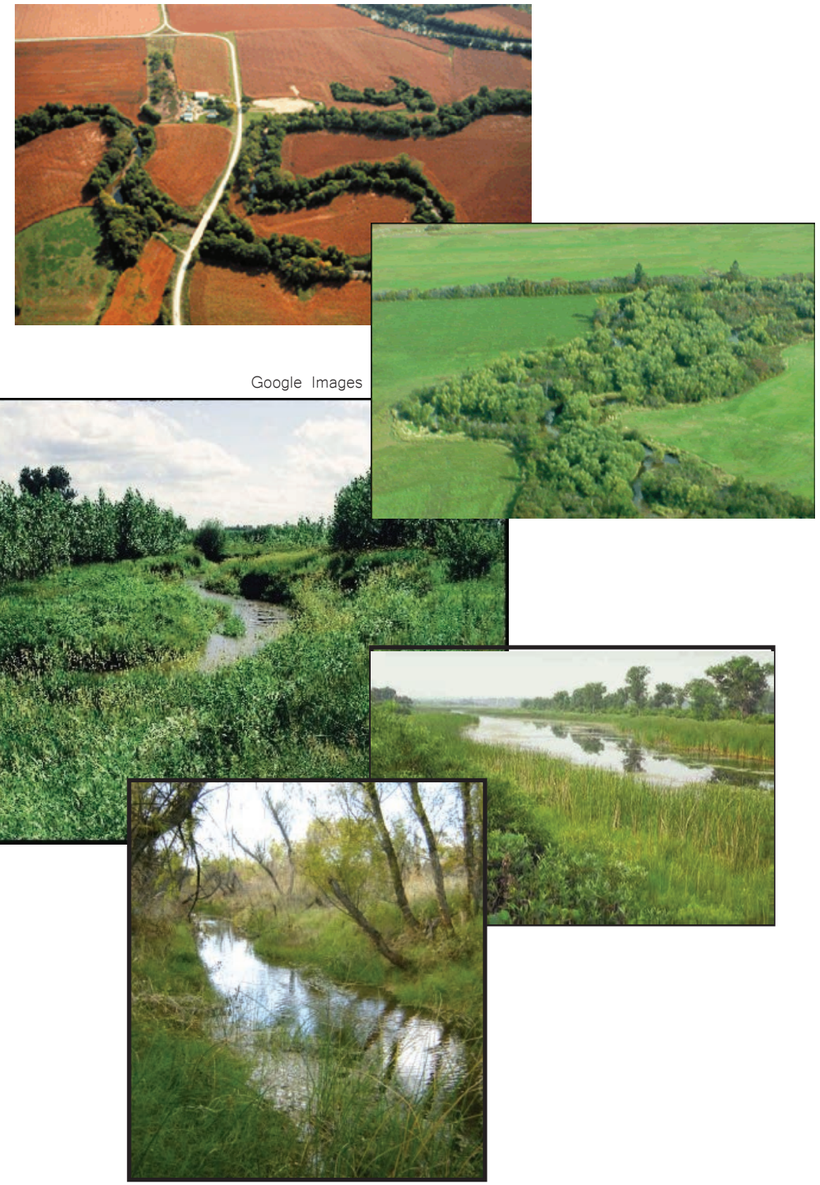
Hosley Witten Group

Personal Image

Benefits and Opportunities

- Trapping and removing pollutants that lead to eutrophocation of aquatic systems.
- Trapping and removing pesticides and pollutants that may come from agriculture or urban development.
- Providing a continuous corridor and habitat for animals
- Stabilizing banks and reducing channel erosion.
- Monitoring water temperatures and woody debris in water for fish habitats and other aquatic organisms.
- Improving the overall look of streams which increases property values without having to make the land public.
- Offering spaces for recreation such as paths or parks, and giving way for educational opportunities.

Actual Riparian Buffer Images



Google Images

Vegetative Suggestions for Buffer Areas

Canopy & Understory Trees :


Hemlock


Black Gum


Yellow Birch


Black Willow


Various Dogwoods


Red Maple


Basswood


Honey-Locust


Hornbeam


Redbud


Black Locust


Hawhorn

Small Shrubs, Plants, & Wildflowers:


Common Elderberry


Red-Berried Elder


Common Ninebark


Bladdernut


Spicebush


Winterberry


Rhododendron


Ameican Blackcurrant

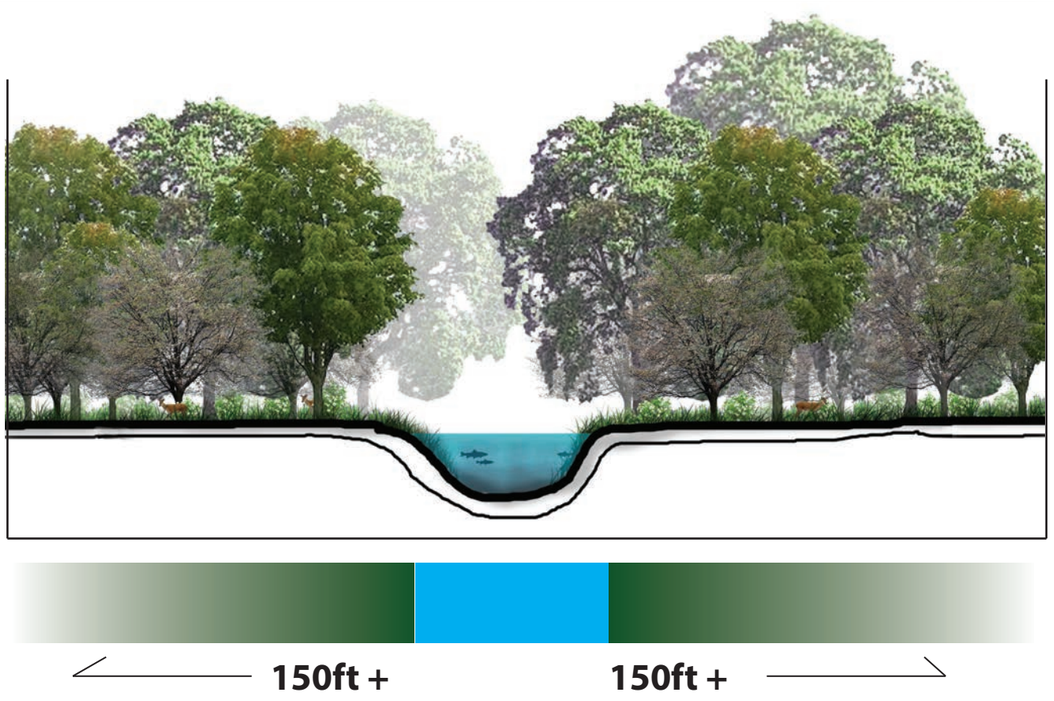

Golden Rod


Oxeye Sunflower


Wild Geranium

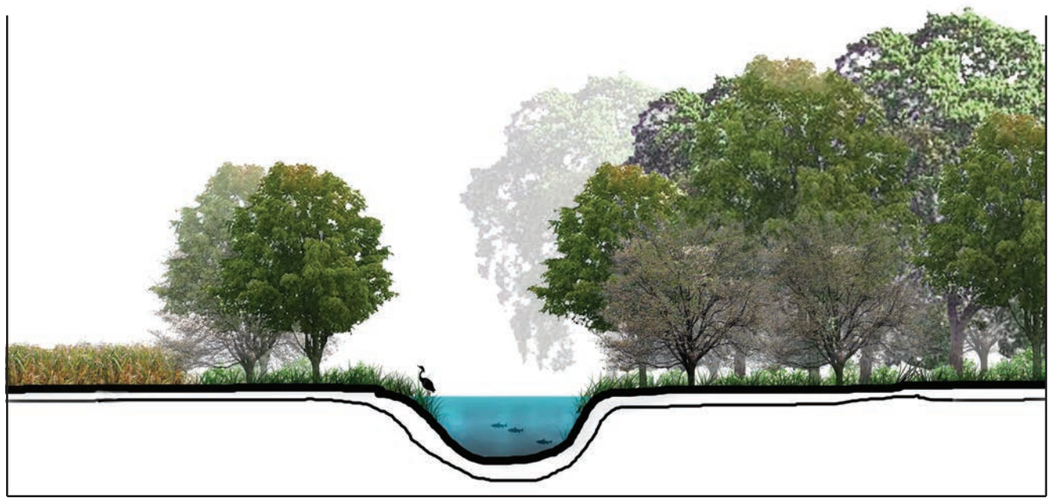
*All images from Google Images

Untouched Landscapes



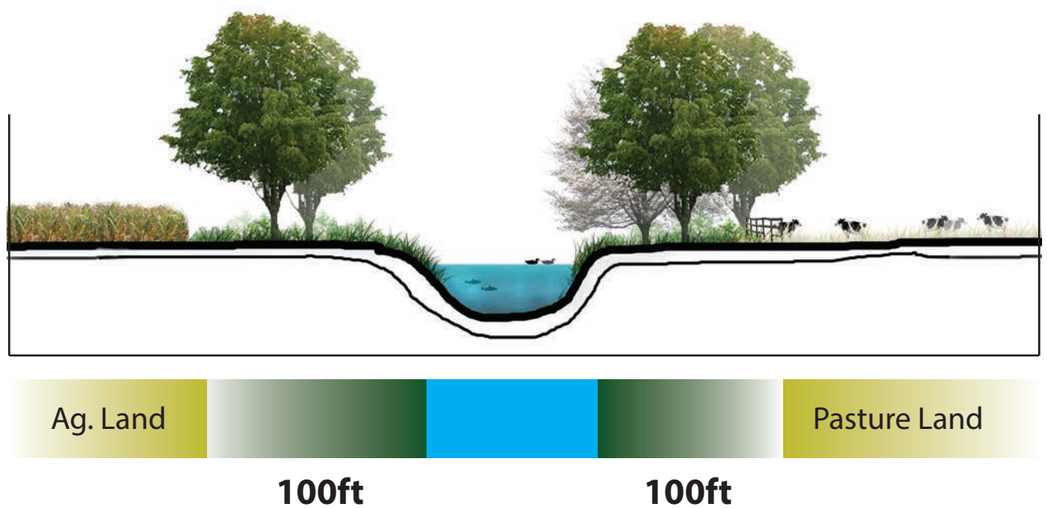
Sullivan County is known for its “endless mountains” and pristine beauty. These images only emphasize that factor and show that by adding buffers to the stream ways the natural landscape will only thrive more as a successful habitat and overall ecosystem. By showing an untouched scene first, the relationship to altered landscapes can be easily compared and understood how adding buffers will help to keep this image and not become industrialized.

Agricultural Land & Forests

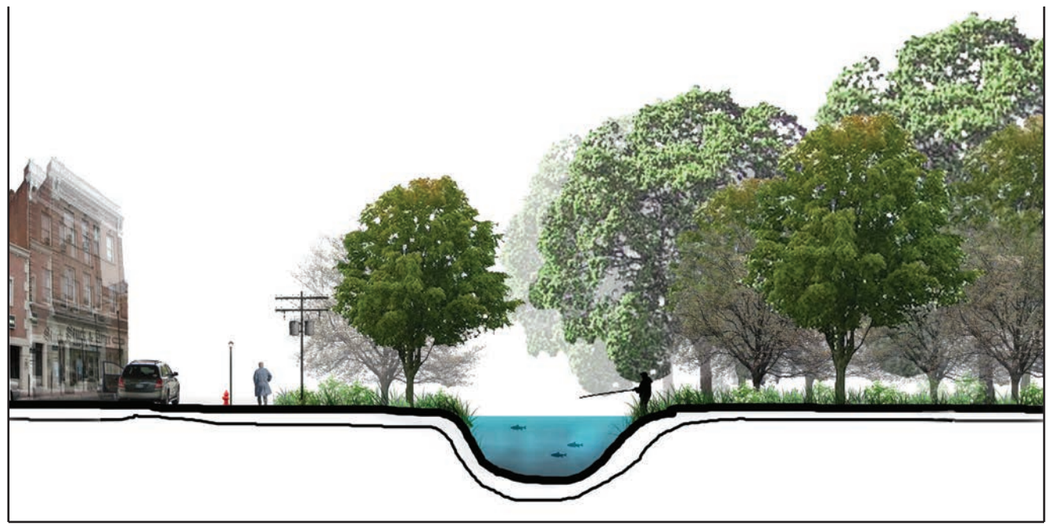


In this scenario, there is agriculture to the left and forested area to the right. In order to protect the streams natural state the buffer between the agricultural land and the stream should be between 100ft and 150ft in order to filter any unnecessary contaminants within the water. This also allows for animals to thrive in their natural habitat along the stream corridor and not be disrupted by the agricultural practices.

Agricultural Land & Agricultural Land



In some cases, there is agricultural and/or pastoral land on either side of the stream, which still uses a 100ft to 150ft buffer strip. It is important not to let animals from pastoral lands utilize the stream as drinking water because of the fecal matter and other negative contact with the stream that the animals have. Keeping a buffer allows the animals to stay back and the natural habit do its natural job.



Not all scenarios will be used for agricultural purposes or untouched, natural land, but rather there may be urban development that pops up near a stream. Buffers are extremely important in these areas because of the amount of runoff from nearby impervious surfaces. It is necessary to have a 50ft to 100ft buffer in these areas. However, buffers near urban development, or anywhere, can we used as a nice nature trail when done in a correct matter. Therefore, providing beautiful spaces for humans as well as common wildlife.