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INTRODUCTION

Water is used globally for drinking, washing, cooking, irrigating crops, and other life-sustaining tasks. Many people also enjoy the opportunity for recreation that lakes and streams provide due to their beauty and for the prospects of boating, fishing and swimming. Watersheds are necessary to support habitat for plants and animals; they transport nutrients, filter waste naturally, regulate microclimates, as well as promote biodiversity. The quality of life as we know it depends on water. With so much dependence on water, it is crucial to understand how land use in the watershed impacts local bodies of water - and subsequently people's drinking water.

Awareness of the global importance of preserving water for ecosystem services has only recently emerged during the 20th century as more than half the world's wetlands have been lost along with their valuable environmental services. Biodiversity-rich freshwater ecosystems are currently declining faster than marine or land ecosystems (CCA 2010). With less than one percent of the world's freshwater readily accessible and located in the lakes, rivers and streams that cross

percent per one percent increase in pastureland (Hascic and Wu 2006). The quality of our water supplies in the future depends on conservation efforts and mindful management.

Humans and the organisms that they coexist with are the ones who ultimately suffer from excess pollution. The Environmental Working Group conducted an analysis of drinking water quality using over 20 million records, and their results are far from comforting. Since 2004, 316 water pollutants have been found in the tap water Americans drink (EWG 2009). More than half of these aren't subject to drinking water regulations. The government spends nearly nineteen times more money on chemically treating polluted water than they do on protecting our water bodies from contamination (EWG 2009). If more resources were spent in keeping surface and ground waters clean, then the government wouldn't have to invest nearly as much time and money in sanitizing it for use.

One way in which the government has sought to reduce pollution is the establishment of the Clean Water Act in 1972. The overall purpose of the act is to restore and maintain the physical, chemical, and biological integrity of the nation's waters by preventing pollution, assisting in wastewater treatment, and protecting wetlands. It sets standards of regulation for biochemical oxygen demand, suspended solids, fecal coliform, pH levels, as well as a wide range of toxic chemicals (EPA 2004). Recently, the New York Times conducted a survey of Clean Water Act violations in every state, and they found that more than 20% of regulated facilities violated CWA standards. Unfortunately, fewer than 6% of these violations resulted in fines or punishment (Duhigg 2009). The aim of the Clean Water Act is to protect our water sources for present and future use, but thus far has not proven to be entirely effective. At this point, it is becoming more necessary for local councils to assess the health of their drinking source, as well as the overall state of their watershed.

How we interact with our entire local ecosystem determines the health of the area's watershed, which is a land area that drains water into a creek, river, lake, wetland, bay, or groundwater aquifer. Watersheds are dynamic and are unique to their geographical area. Mountain ranges, microclimates, and the latitude in which an ecosystem is found all impact the natural cycles in an area and the functions that a watershed can perform. They are complex webs of natural resources - soil, water, air, plants and animals. Yet, everyday activities can impact these resources, ultimately impacting the well-being and economic livelihood of the humans that live in the area. Pollutants or runoff dumped on the ground will eventually find their way to a water route, carrying contamination throughout the larger environment and degrading water sources downstream. While watersheds in a particular region can be similar, individual drainage basins contain distinct geology and habitats. Conservation efforts need to be tailored to fit the requirements of each watershed in order to maximize their effectiveness in keeping the area pristine. Whether viewed as resource or commodity, water is the basis of our agricultural, municipal, industrial, environmental and aesthetic well-being.

The Chesapeake Bay Program has been working to protect their watershed for over 25 years. As of March 2009, their assessment of the area addresses the main threats to the bay and its river tributaries. They have determined pollutants, land use, natural factors, and other pressures such as climate change, invasive species, and fisheries harvests as the main threats to local water quality (Chesapea6T Q q 0.24 0 0 0.24 72.0 0.24 72.0 0.24 72.0 0 0.24 72er0 02 492 (dpoh)e62d

leaking septic systems. These are all areas of concern for the watershed with useful information described in previous capstones. Each capstone contains a fantastic amount of thorough research, tables, and figures. To keep the website succinct and user friendly we chose not to include every conclusion from the reports and only outline the most relevant facts to clarify important information. Supplement resources were used in cases when capstone research was insufficient to cover the breadth of material we wanted to cover. Information about the Saratoga Lake Watershed is scattered across multiple websites and publications. By condensing available information from these multiple resources in SWAN, we are creating a comprehensive

In the first focus page, *Development and Impervious Surfaces*, we included descriptions of the types of pollutants found in the water, while stressing the risks blacktop has on the watershed (Appendix C). The *Development and Impervious Surfaces Page* includes the

SWAN uses, please visit the *Works Cited Page* (Appendix G) provided in the

Stakeholders: Organizations within the Saratoga Lake Watershed that are active in preserving the natural ecosystem.

WRI [1]
Saratoga PLAN [2]
Saratoga Lake Association [3]
Friends of the Kayaderosseras [4]
The Saratoga Lake Protection and Improvement District, Land to Lake Perspectives [5]

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Appendix B

Watershed

Photo of Saratoga Lake. Courtesy of Jonathan Betz

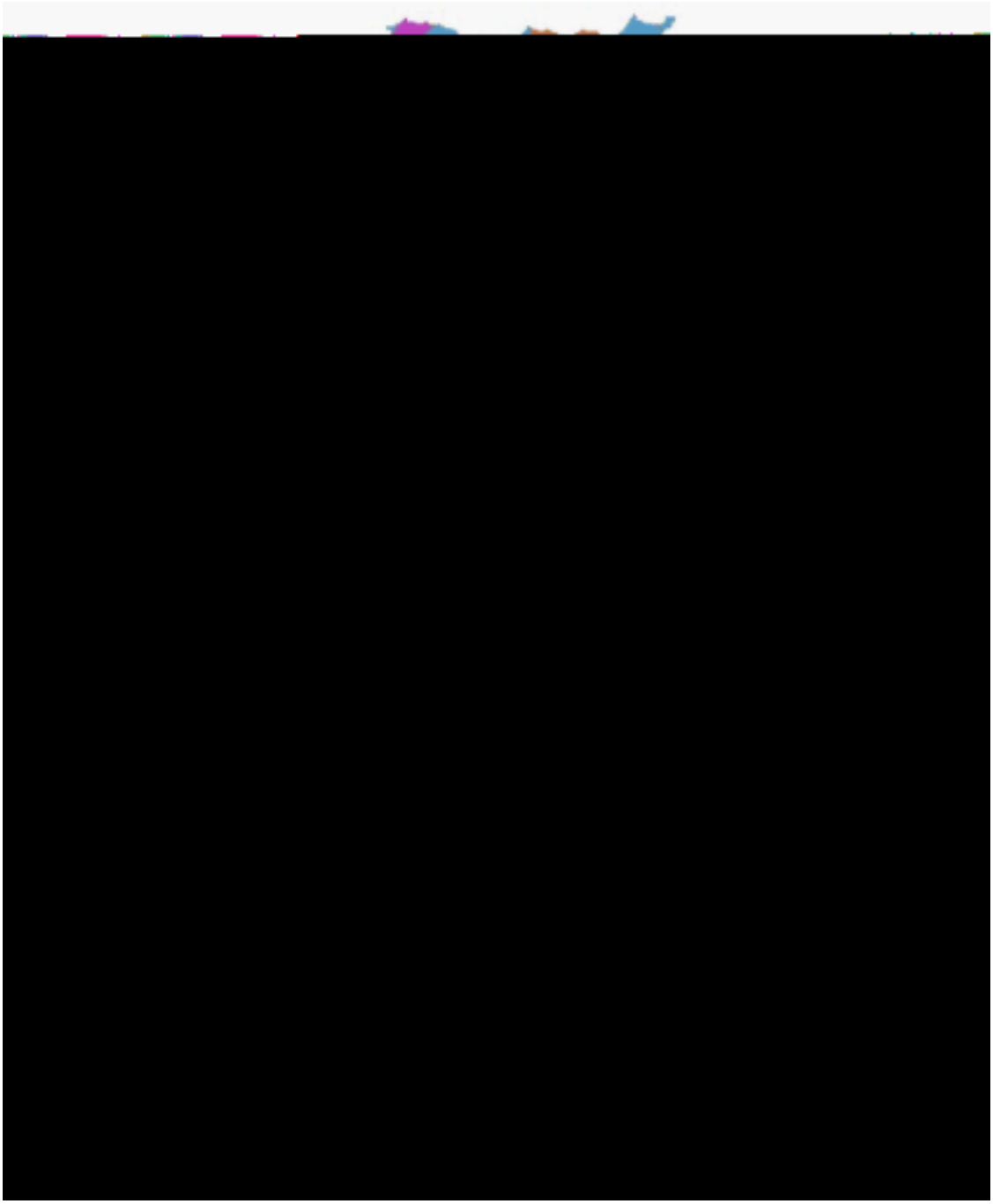
A watershed, also known as a drainage basin, is defined as an area of land that drains water into a particular body of water including a creek, river, lake, wetland, bay or groundwater aquifer.
Watersheds are dynamic and are unique to their geographical area. Mountain ranges, microclimates, and the latitude in which an ecosystem is found all impact the natural cycles in an area and the functions that a watershed can perform. They are complex webs of natural resources - soil, water, air, plants and animals. Watersheds are necessary to support habitat for plants and animals; they transport nutrients, filter waste naturally, provide drinking water as well as help regulate the local climate.
How we interact with our local ecosystem determines the health of the Saratoga watershed. Everyday activities can impact these resources, ultimately impacting the well-being and economic livelihood of the humans that live in the area, even if you do not live or work next to a body of water. Pollutants or runoff dumped on the ground will eventually find their way to a water route, carrying contamination throughout the larger environment and degrading ecosystems downstream.

The majority of information on this page is provided by Conor Taff's 2005 capstone[1].

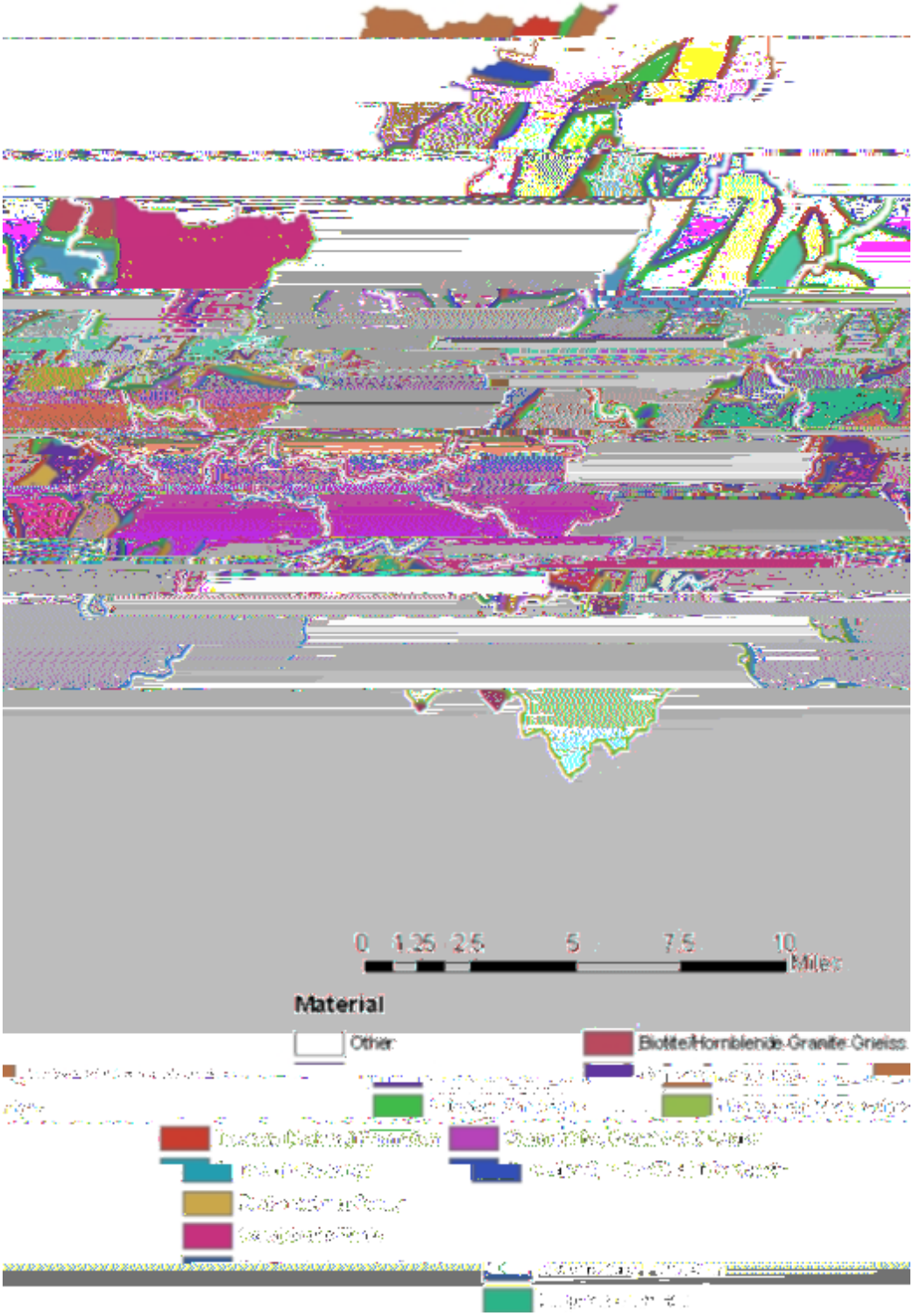
The Saratoga Lake Watershed

Location

The Saratoga Lake Watershed straddles an interesting geological location. The north and west regions of the basin reach into the lower Adirondacks and are characterized by the bedrock geology of that region. The watershed is also characterized by a distinct north east trending fault which divides it. The eastern side is composed almost entirely of shale.
These characteristics of be



Surficial geology of the Saratoga Watershed. Courtesy of Conor Taff



Bedrock geology of the Saratoga Lake Watershed. Courtesy of Conor Taff

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Appendix C

Development and Impermeable Surfaces

Urbanization and development in an area such as the Saratoga Watershed can cause extensive harm to the health of

hurricane Katrina admit that had Louisiana been less over-developed, the impact of the flood would have been much milder.

2. *Types of Pollutants in the Watershed:* Construction site sediments, nutrients from fertilizers, and bacteria from animal waste, road salts, floating aquatic litter. Also metals like lead, zinc, copper, and calcium may be present in runoff making degradation even worse.

The dangers are not specific to just the stream, however. The Kayaderosseras creek feeds directly into Saratoga Lake, a possible drinking source for Saratoga Springs.

Point Source Pollution: Point source pollution is defined as a localized source of pollution. Despite existing environmental controls, three out of the four point source pollutants in the creek measured in 1983, still exist today. There are currently eight facilities that handle, use, or transport at least one toxic chemical in the water. Data from this particular capstone suggests that many of the industrial facilities in the Saratoga region handling hazardous materials increase proportionately with development.

Nonpoint Source Pollution: The New York ECL defines Nonpoint pollution as, "any source of water pollution or pollutants which is not a discreet conveyance or point source" (ECL 1972 Appendix B) The Kayaderrossera Creek is of interest because of the

The most common threats to the Saratoga Lake from the perspective of businesses in order from most to least are development, overuse, seasonal property owners, drinking water source, public access, governmental jurisdictions, reckless boat users, and water pollution. A whopping 100% of recreation-based businesses cite overdevelopment of Saratoga Lake as a major concern. However, only 38% of respondents believed that an up and coming drinking water plan was a problem. Regardless, most recreationally oriented businesses assert that a micro-chip plant will be built and that the Hudson River will have to be Saratoga's future water source.

Land Conservation and Quality in the Saratoga Lake Watershed

Land conservation has a potential impact on water quality within the Saratoga Lake Watershed. In a 2007 capstone by Doug Morin entitled, "Land Conservation and Quality in the Saratoga Lake Watershed," he comes to the conclusion that Saratoga water is unlikely to be in danger of degradation currently, but will require more extensive forest conservation to ensure it's quality in the wake of rapid development.

1. *Land Disturbing Activities:* such as agriculture and construction causes the addition of sediment to bodies of water. Runoff from agricultural lands can add nutrients, sediments, and toxic chemicals to water, and thereby reduce its quality.
2. *Urban Development:* runoff from urban development can cause runoff of nutrients and toxic chemicals to the water body. Increasing urbanization also leads to an increase of impervious surfaces like pavement and buildings. Impervious surfaces speed up runoff and causes more sediments, pollutants, and nutrients to be added to the water while increasing erosion and stream channel changes.

Source: cityofmenesha-wi.gov

Appendix D

Water Resources

From Saratoga Water Awareness Network

Jump to: navigation, search

The amount of water available to any given community is of vital importance. Not enough rain can lead to drought, whereas too much can lead to flooding. The abundance of rainfall a region receives is determined by the climate in the area. The Saratoga Watershed usually gets a healthy amount of rain per year, yet the threat of both drought and flooding is always a potential danger. As the climate changes worldwide, it is important to understand the implications either event would have on this region.

Drought in the Saratoga Watershed

Source: Skidmore College Water Resources Initiative

Saratoga Springs is a region with an abundant rainfall average per year. New York State generally averages forty-two inches of rain per year, and Saratoga Springs usually gets an inch more than that annually. Yet, in Saratoga there

Since Saratoga has a high amount of annual rainfall, it is important to understand what the risks are for floods in this region.

According to the DMA 2000 Hazard Mitigat

Appendix E

Septic Tanks

Septic tanks, also known as onsite wastewater treatment systems, onsite sewage disposal systems, or wastewater infiltration systems, are an effective means of treating wastewater of a household or development in an unsewered area (U.S. Environmental Protection Agency Office of Water Office of Research and Development 2003: 7). While septic systems are a safe alternative t

Proper Maintenance

Maintenance of a septic tank. Courtesy of Dante Petri

Once constructed, the long term effectiveness of the system is dependent on the homeowner. It requires proper maintenance to prevent leakage and pollute the landscape.

To keep a septic system functioning properly, the tank must be pumped out every two to five years, or more frequently if necessary. Failure to do so will cause sludge and scum to escape the tank and enter the leachfield and form a thick biomat over the visible area. An excess of amount of biomat causes the system to “back-up” or “blow out.". A backup results in wastewater backing up into the home via the drain pipes. Blowouts occur when wastewater forces its way out of the tank and into the soil and is sometimes visible in surface pooling.

Most homeowners go 5-20 years between checkups even though the average lifespan of a tank is 15-25 years. If properly maintained, contractors say that the lifespan of a tank could double to around 40 years.

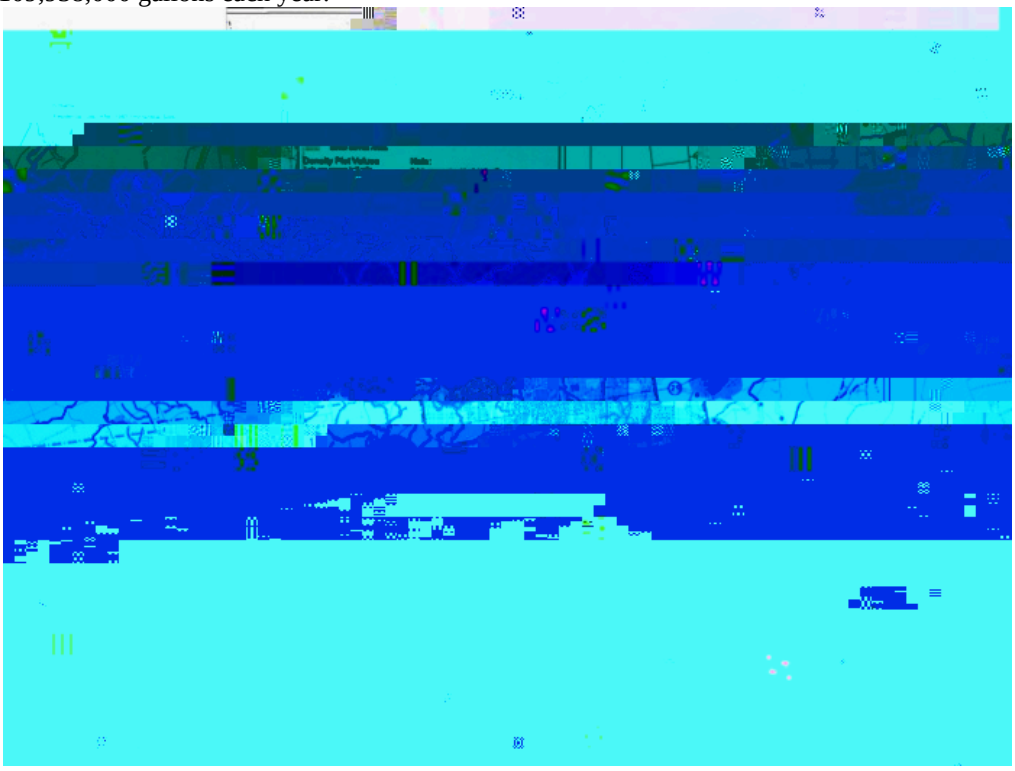
The cost of replacing a system costs around $5,000, however, that price may increase to as much as $50,000 depending on if the area is suited for one. Maintenance costs approximately $100-

Current Locations of Septic System Map for the Saratoga Lake Watershed. Green indicates sewered areas. Light Pink indicates areas slotted for septic systems. Orange indicates mobile parks. Courtesy of Dante Petri

Approximately 500-1,000 sep

Septic System Practicality Map for the Saratoga Lake Watershed. Yellow indicates suitable geology for septic tank installation. Grey indicates impractical locations. Taken from land to lake perspectives [www.sara-lake.org]

Of the approximately 10,000 septic tanks in the watershed, and estimated 1,500 are currently visible failing. That correlates to 301,200 gallons of raw sewage being released into the Saratoga Lake Watershed every day or 109,938,000 gallons each year.



Areas of Potential Septic System Failure Map. This map illustrates what systems may have the greatest impact on watershed health. The blue hot spots show high concentrations of septic systems located in unpractical soils within 200 feet of a stream. The red dots you see are developments constructed prior to 1980, the pink afterwards. Older systems, or systems in unpractical soils are the most likely to cause negative impacts. Created by the LA group as part of the Lands to Lakes Perspective in 2002. Courtesy of Dante Petri

Tips for Maintaining a Septic System

- Schedule regular check ups every two to five years with a qualified technician to minimize treatment failure
- Be careful whom you hire to clean or install a system - New York state does not require contractors and installers to have a license to maintain tanks
- Do not park cars or any heavy machinery over pipes or system
- Only plant vegetation with shallow root systems over the leach field and pipes
- Keep an eye out for dieing grass or vegetation above the leach field - this may be a sign of treatment failure
- If available, connect to a public or private sewer line

This page was last modified on 7 May 2010, at 13:34.

Appendix G

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Appendix H

Contact Information

For questions about content please email **Mel Ausanka-Crues** at mel.ausanka.crues@gmail.com or **Stephanie McGurk** at smcgurk@skidmore.edu
For rights to modify SWAN please email **Josh Ness** at jness@skidmore.edu or **Karen Kellogg** at kkellogg@skidmore.edu

This page was last modified on 7 May 2010, at 13:59.