Northwest Conservation District

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Photo 1 – view towards the south property line

SUSTAINABLE, PERMACULTURE FARM PLAN FOR SULLIVAN FARM TOWN OF NEW MILFORD, CT

Prepared for:

NEW MILFORD YOUTH AGENCY AND TOWN OF NEW MILFORD

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TABLE OF CONTENTS

PART 1 – EXISTING CONDITIONS.....3

- **A. Historical Overview of Sullivan Farm.....3**
- **B. Existing Physical Conditions.....3**
  - **1. Geographical Location.....3**
  - **2. Climate.....4**
  - **3. Soils and Drainage.....5**
  - **4. Slopes.....10**
  - **5. Buildings and Infrastructure.....10**
  - **6. Vegetative Communities.....14**
- **C. Existing Crops.....16**
- **D. Current Farm Operations/Business Structure.....16**

PART 2 – POSSIBLE FUTURE PROJECTS/ENTERPRISES.....18

- **A. Additional Sources of Water.....18**
- **B. Soil Health.....24**
- **C. Microclimates and Habitat.....26**
- **D. Agroforestry.....27**
- **E. Edible Forest Gardening.....28**
- **F. Woodlot Management.....28**
- **G. Perennial Crops.....30**
- **H. Educational Programming.....31**
- **I. Untapped Market Opportunities.....32**
- **J. Planning for the Future.....32**

APPENDIX A – Location Map.....35
APPENDIX B – Regional Watershed.....36
APPENDIX C – Topography.....37
APPENDIX D – Soil Map.....38
APPENDIX E – Soil Test Results.....39
APPENDIX F – Vegetation.....46
APPENDIX G - References.....47

PART 1 – EXISTING CONDITIONS

A. HISTORICAL OVERVIEW OF SULLIVAN FARM

Sullivan Farm was acquired by the Town of New Milford in 1997 as agricultural open space, and there are no deed restrictions on the property. The farm is operated by the New Milford Youth Agency, under the direction of Mr. Mark Mankin, Director. The farm program is one of 23 programs run by the Youth Agency which provide students with work experience.

The Town's initial interest in the property was to create a recreational facility, but after a study it became apparent that due to the extensive wetland areas on the property, it could not sustain recreational fields. In 1998 the Youth Agency re-established the farming operation and for 13 years ran agricultural education programs from Sullivan Farm. Subsequently, the farm became a burden to the Agency which then gave up the farm youth program and turned it over to Friends of Sullivan Farm, a non-profit organization, and it was operated as an agricultural education program for two years. The Friends of Sullivan Farm's operational model was not sustainable, and so the farm was then leased to two young farmers for two years. In 2016, the Youth Agency, because of dramatic interest on the part of its participants, re-established the agricultural education program. Currently, approximately 25 high school and college students work at the farm. These workers are committed to the farm operation and are the primary stakeholders. Currently, the farm pays for itself, with the exception of insurance and utilities, covering wages, and other employment overhead costs, and equipment.

The Agency has received a grant from the CT Department of Agriculture for $7,000.00 to develop a long term plan for the farm. The plan uses a permaculture approach to envision the sustainable development of farm enterprises in conjunction with building educational opportunities for the stakeholders and the wider community.

B. EXISTING PHYSICAL CONDITIONS:

Location Map – See Appendix A
Watershed Map – See Appendix B
Topographical Map – See Appendix C
Soils Map – See Appendix D

1. Geographic location:

The 104 acres of Sullivan Farm are located in the Town of New Milford, in Litchfield County, Connecticut. Litchfield County is in the northwestern part of Connecticut and adjoins Massachusetts in the north and New York in the west. The County is entirely within the New England physiographic province and occupies parts of two sections – the

New England Upland section and the Taconic section with its adjoining limestone valley. The County is generally referred to as the Western Highlands of Connecticut. The Highlands give the region a distinctive character with a landscape that is varying in elevation and undulating both with rolling hills and sharp, steep inclines rising to 1100 feet and more. The land of the Sullivan Farm is undulating but not overly steep and descends from Park Lane (RT 202) to a low area extending from north to south through the (almost) center of the site. The land rises to the west of the center. The elevations are not extreme, however, ranging from 350 feet to 600 feet (approximately).

2. Climate:

The climate in the County is defined as a snow-forest type with warm summers and a general humid continental climate. The County climate is reliant on the prevailing westerly winds that flow from the northwest, except in the summer where they flow from the southwest. These winds act as the dominant continental character; however, air from the Atlantic may disrupt these winds, causing some day to day weather alterations.

The monthly mean average temperature of the County is above 50^0F from May to October. The highest monthly mean temperature is 70^0F in July, while the lowest is 24^0F in January. Microclimates exist throughout the County due to differences in topography, variations in wind patterns and the direction of a slope. For example, on northern facing slopes throughout the County, there is a 4^0F lower average temperature throughout the year due to decreased sun exposure. In general, the weather of an area will not be prolonged hot or cold. On average throughout the county, there are 30-50 days where the maximum temperature is below 32^0F. For north facing slopes, however, that average rises to 65 days. On south facing slopes, the temperature will not exceed 90^0F for on average 6-12 days in the year, while northern facing slopes the average is only 1-5 days.

The last day of frost can range, but typically occurs between May 21st and May 31st; however, the last frost free day has been as early as May 7. (http://www.plantmaps.com/interactive-connecticut-last-frost-date-map.php) Still, the start of an average growing season in the County can vary depending on the crop type. For example, the season for grasses and hardy crops begins in April, while the season for more tender crops begins in May. The growing season ends for most crops in October, with the first day of frost typically occurring between October 1st and October 10th. (http://www.plantmaps.com/interactive-connecticut-first-frost-date-map.php) This results in an average growing season between 160-180 days. There is the possibility for some freezing temperatures in the summer, though these are rare and in isolated pockets. One year in fifteen will have a freezing temperature in June, and one year in thirty will have a freezing temperature in August.

Storms are a major consideration of the climate in the County. The area is 25-50 miles inland from the ocean, making it less vulnerable to damage from intense coastal storms and hurricanes compared to other areas in the state. For every one in six years there is major damage from intense coastal storms. On average, throughout the County, there are thunderstorms on 17-35 days of the year, with varying severity. Thunderstorms also occur

more typically in July and August. Lightning damage is important to consider and the rain from these intense storms can cause soil erosion. Hail also occurs during one or two of these thunderstorms every year.

More than 85 percent of winters in the County span mid-November to mid-April, and the yearly snowfall amounts can vary extremely throughout the county. In the southwestern portion of the County, the variation can be between 15 and 65 inches from year to year. In comparison, the northwestern hills can exceed 125 inches in a year. The intensity of the storms also fluctuates. In the southwestern region of the County, there is a storm exceeding 12 inches in a 24 hour span every 1 in 4 years, and every 1 in 100 years there is a maximum 24-hour snowfall above 22 inches.

While ice storms are typically infrequent, there is at least one significant ice storm each season. The average number of days in which glaze ice occurs can also range from 6-24 days.

3. Soils and Drainage:

a. Soil Series Descriptions

WETLAND SOILS

SOIL TYPE:	SCARBORO SERIES
DEPTH TO REDOXIMORPHIC FEATURES:	NONE
DEPTH TO BEDROCK:	>60 INCHES
DEPTH TO SEASONAL HIGH WATER TABLE:	0 – 1 FOOT

The Scarboro series consists of very poorly-drained soils that formed in shallow organic material over sandy glacial outwash derived mainly from gneiss and schist. Scarboro soils are in depressions on glacial outwash terraces and outwash plains. Slopes are less than one percent.

Because of the very poorly-drained nature of this soil, most areas of this soil, statewide, are not cultivated and most are in woodland or shrub and brush land. Common shrubs are speckled alder, smooth alder, rhododendron, azalea, steeplebush spirea, leatherleaf, labrador-tea, winterberry, highbush blueberry, large cranberry, black huckleberry, poison sumac, and sheep laurel. Common trees are red maple, slippery elm, Atlantic white cedar, tamarack, eastern white pine, willow, and gray birch.

SOIL TYPE:	WALPOLE SERIES
DEPTH TO REDOXIMORPHIC FEATURES:	14 INCHES
DEPTH TO BEDROCK:	>60 INCHES
DEPTH TO SEASONAL HIGH WATER TABLE:	0 – 0.5 INCHES

This poorly drained and somewhat poorly drained soil is found in nearly level areas in depressions on broad outwash terraces and narrow stream valleys. Permeability is moderately rapid in the surface layer and subsoil and is very rapid in the substratum. The water table is near the surface in winter and early spring.

Thickness of the soil profile and depth to sand or loamy sand substratum layers range from 46 to 71 cm. Rock fragments range from 0 to 25 percent by volume in the profile and from 0 to 50 percent in individual layers of the substratum. Typically, 70 percent or more of the rock fragments are rounded gravel. Reaction ranges from very strongly acid to neutral throughout.

Statewide, most areas of this soil are wooded. Drained and cleared areas are used for hay and pasture or silage corn. The typical woodland vegetation consists of a forested community with canopy trees of red maple, American elm, scattered black gum, swamp white oak and yellow birch eastern hemlock; with a shrub understory of spicebush, silky dogwood, northern arrow-wood with sweet pepperbush, and winterberry in slightly wetter situations, and a herb layer of cinnamon fern, royal fern, false hellebore, violets, wood-reed grass, with skunk cabbage and sedges.

NON-WETLAND SOILS

SOIL SERIES:	FARMINGTON
DEPTH TO REDOXIMORPHIC FEATURES:	NONE
DEPTH TO SEASONAL HIGH WATER TABLE:	>48 inches
DEPTH TO BEDROCK:	10 – 20 inches

This series consists of shallow, well-drained and somewhat excessively drained soils formed in till. The soils range from nearly level to very steep soils on glaciated uplands. Bedrock is shallow contributing to the rapid drainage of the series. Rock fragments range from 5 to 35 percent by volume in the soil profile. The soil reaction (pH) ranges from strongly acid to neutral in the A horizon, and from moderately acid to slightly alkaline in the B horizon. Farmington soils are located on slopes of varying steepness on glaciated uplands. Limestone may be present in some areas. The soils formed in wind and water deposits usually mixed with till or unconsolidated parent material that has been exposed to freezing and thawing (congeliturbate). The potential for surface runoff is high, depending on degree of slope. Joints and cracks in the underlying rock affect the rapidity of internal drainage.

Statewide, about two-thirds of the areas of this soil series have been cleared and, where deepest, are often used for corn and small grain production, or hay and pasture. Woodlands contain northern hardwood trees with sugar maple as the dominant species.

SOIL TYPE:	HINCKLEY SERIES
DEPTH TO REDOXIMORPHIC FEATURES:	NO MOTTLING
DEPTH TO BEDROCK:	>60 INCHES
DEPTH TO SEASONAL HIGH WATER TABLE:	>6 FEET

The Hinckley series consists of excessively drained soils located on outwash terraces, plains, kames and eskers in stream valleys. Slopes range from 3 to 35 percent but are dominantly 3 to 15 percent. Permeability of the soil is rapid in the surface layer and very rapid in the substratum. Runoff is medium to rapid. The hazard of erosion in steep areas is severe.

Rock fragment content of the solum ranges from 5 through 50 percent gravel, 0 through 30 percent cobbles, and 0 through 3 percent stones. Rock fragment content of individual horizons of the substratum ranges from 10 through 55 percent gravel, 5 through 25 percent cobbles, and 0 through 5 percent stones. In some places, gravel content throughout the soil ranges up through 75 percent. The soil ranges from extremely acid through moderately acid, except where limed.

Cleared areas are used for hay, pasture and silage corn. Statewide, most areas of this soil series are forested, brush land or used as urban land. Northern red, black, white, scarlet and scrub oak, eastern white and pitch pine, eastern hemlock, and gray birch are the common trees. Unimproved pasture and idle land support hardhack, little bluestem, bracken fern, sweet fern, and lowbush blueberry.

SOIL TYPE:	MERRIMAC SERIES
DEPTH TO REDOXIMORPHIC FEATURES:	NO MOTTLING
DEPTH TO BEDROCK:	>10 FEET
DEPTH TO SEASONAL HIGH WATER TABLE:	>48 INCHES

The Merrimac series consists of very deep, somewhat excessively drained soils formed in outwash. They are nearly level through very steep soils on outwash terraces and plains and other glaciofluvial landforms. Slope ranges from 0 through 35 percent. They are sometimes underlain by stratified sand and gravel at a depth of about 2 feet. These soils occupy scattered areas on terraces throughout stream and river valleys. Their permeability is moderately rapid in the surface layer and rapid in the substratum.

Soil profile thickness ranges from 18 through 36 inches. Rock fragments are commonly granite, gneiss or schist but up to 25 percent are flat, fine-grained slate, shale, or phyllite fragments. The upper part of the solum commonly has 2 through 20 percent gravel, but includes cobbles in some pedons, and the lower part 5 through 30 percent. The substratum contains 2 through 55 percent gravel and 5 through 15 percent cobbles. Total volume of rock fragments may be less than 35 percent. Clay content is less than 18 percent. Reaction ranges from extremely acid through moderately acid, unless limed.

Statewide, most areas of this soil series are cultivated and used for growing hay, pasture, silage, corn, or truck crops. Some areas are forested with mostly white pine, gray birch, hemlock, red maple, and red, black, white, and scarlet oaks.

SOIL SERIES:	NELLIS
DEPTH TO REDOXIMORPHIC FEATURES:	NONE
DEPTH TO SEASONAL HIGH WATER TABLE:	>48 INCHES
DEPTH TO BEDROCK:	60 INCHES

The Nellis series consists of very deep, well-drained soils formed in calcareous till. They are nearly level to very steep soils on upland ridges, knolls and hillsides. Rock fragments range from 3 to 35 percent by volume in the A horizon, 5 to 35 percent in the B horizon, and 5 to 50 percent in the C horizon. Reaction ranges from moderately acid to neutral in the upper part of the mineral soil profile, moderately acid to slightly alkaline in the lower part of the soil profile, and neutral to moderately alkaline in the substratum.

Nellis soils are nearly level to steep soils on till plains. Slope ranges 0 and 60 percent. These soils formed in till high in calcic limestone, with or without a mantle high in silt and very fine sand up to 18 inches thick.

The potential for surface runoff ranges from very low to very high.

Statewide, most areas of this soil series have been cleared and are used for growing hay, corn, small grains, some vegetables, and locally, fruit. Other areas are pastured. Wood lots contain basswood, sugar maple, white ash and other hardwoods.

SOIL SERIES:	NINIGRET
DEPTH TO REDOXIMORPHIC FEATURES:	16-26 INCHES
DEPTH TO BEDROCK:	>65 INCHES
DEPTH TO SEASONAL HIGH WATER TABLE:	1.5 – 3.5 FEET

The Ninigret series consists of very deep, moderately well-drained soils formed in loamy over sandy and gravelly glacial outwash. They are nearly level to strongly sloping soils on glaciofluval landforms, typically in slight depressions and broad drainage ways. Slope ranges from 0 to 15 percent.

Thickness of the soil profile ranges from 18 through 38 inches and typically corresponds to the depth of sand, or sand and gravel. Rock fragments, mainly rounded pebbles, range from 0 to 15 percent by volume in the profile, from 0 to 30 percent in the substratum above a depth of 40 inches, and from 0 to 60 percent below. Unless limed, the soil is very strongly acid through moderately acid to a depth of 30 inches and very strongly acid through slightly acid below 30 inches.

Statewide, much of the acreage is used for cultivated crops, hay or pasture. Common crops are silage corn, vegetables, tobacco, and nursery stock. Some areas are idle, wooded, or used for community development. Common trees are red, white and black oak, red maple, sugar maple, white pine, gray birch, white ash, and hemlock.

SOIL SERIES:	TISBURY
DEPTH TO REDOXIMORPHIC FEATURES:	NONE
DEPTH TO SEASONAL HIGH WATER TABLE:	>48 inches
DEPTH TO BEDROCK:	10 – 20 inches

The Tisbury series consists of very deep, moderately well-drained loamy soils formed in silty eolian (windblown) deposits overlying outwash. They are nearly level and gently sloping soils on outwash plains and terraces, typically in slight depressions and broad drainageways. Slope ranges from 0 to 3 percent. Permeability is moderate in the surface layer and subsoil and rapid or very rapid in the substratum.

Thickness of the soil profile ranges from 17 to 40 inches and typically corresponds to the depth to sand and gravel. Rock fragments range from 0 to 5 percent in the profile and from 0 to 70 percent in the substratum. The fragments are mainly rounded pebbles and typically make up 75 percent or more of the total rock fragments. Unless limed, the soil is very strongly acid to moderately acid.

Much of the acreage of this soil series is used for cultivated crops, hay or pasture. Common crops are silage corn, vegetables, tobacco and nursery stock. Some areas are idle, wooded or used for community development. Common trees are red, white and black oak, red maple, white ash, gray birch, white pine and hemlock.

b. Soil Maps – Appendix D

c. Limitations and Attributes of Soils

The soils at Sullivan Farm range from very poorly drained to excessively well drained, and from nearly level to sloping and steep.

Very poorly and poorly drained soils are considered inland wetlands in the state of Connecticut. Parts of the wetland areas at Sullivan Farm are left natural with un-cultivated vegetation and natural water flow. Such an area of wetland is associated with the Great Brook that drains through the center and lowest part of the site. The areas of vegetated riparian wetland help to protect the water quality of the Great Brook as well as providing habitat for many species of animals, (birds, insects, amphibians, mammals) and plants.

Wetland areas may be used for agricultural production under the Inland Wetland and Watercourses Act of the Connecticut General Statutes. Several areas of wetland at Sullivan Farm are in production for hay.

The variability of soil types provides opportunities to develop a diversity of crop enterprises to suit the varying soil moisture regimes. While excessively well-drained soils often become droughty during the growing season, the poorly drained and very poorly drained areas provide a source of potential irrigation to mitigate dry periods during the growing season.

Additionally, the sloping land provides opportunities to catch water moving through the site by overland flow (sheet flow).

4. Slopes:

a. Orientation and Exposure to Sunlight

Many of the fields are on sloping land with slopes oriented either to the west or to the east. All the potential crop areas have good to excellent exposure to sunlight. Lands sloping to the west with no shade are generally warmer and brighter than east-facing slopes. Sunlight exposure is generally good at the site for plants that require full-sun.

b. Degree of Slope

Slopes vary from gentle to steep. Appendix C shows a topographical map with contours at intervals of 10 feet. The elevation of land near Park Lane is approximately 400 feet. The land drops towards the east to approximately 360 feet and then climbs eastward to about 500 feet in the northeast corner. The degree of slope is depicted by the closeness of the contour lines. Close lines indicate a steep slope, while contour lines that are farther apart indicate less degree of slope.

All sloping land is subject to erosion when soil is tilled for conventional crop production. Innovative methods of growing crops may be employed to avoid soil tillage at all times, especially on sloping land because of the potential for erosion. This topic will be addressed in Section E below.

5. Buildings/Infrastructure:

a. Outbuildings

Several existing buildings are found near RT 202 (Park Lane). A large barn is located next to the road and is used as the salesroom with good visibility from the road and vehicular access. Parking is adequate in front of the entrance to the barn for brief customer use. Additional parking is available behind the barn for longer periods.

A smaller barn (See Photo 2) is situated behind (east) of the main barn and is used as a sugar-house to process maple syrup in the late winter and to store tools.

Photo #2: Rear of sales barn (R) and sugar house (background)

A third barn is located north of the main barn and is used to park equipment and store various other items.

A plastic hoop house (greenhouse) is located near the cluster of barns and is used to produce vegetable seedlings for transplant to the crop fields.

There is an easement for electric transmission lines which traverse the property from east to west through hay fields north of the barns.

Photo #3: Greenhouse

b. **Water Supply:** Currently, irrigation is provided by well water. Connecting to the city water supply is under consideration.

Photo #4: Well House; Wetland in Background

c. Roads

A stone driveway accesses the site from Park Lane, passing in front of the salesroom then continuing around the back of the barn to a parking area on the south side of the barn. Also, a farm road extends from the developed part of the site downhill and across the central wetland area, continuing westerly under power lines and through a woodland at the top of the hill on the west side. This farm road permits vehicles to access to all areas of the farm. The following photograph shows the driveway accessing the area behind the sales barn (right foreground). The barn in the background is the sugar-house.

Photo #5: Access driveway, with sugar-house in background

Photo #6: Farm road across wetland corridor

d. Vegetative Communities

a. Woodlands

Areas of woodlands surround most of the perimeter of the farm with the exception of along the frontage with Park Lane (RT 202). The woods comprise mostly deciduous species. The most common tree species are oaks, maples, hickories, cherries, and birch. Occasional hemlock trees were also observed.

Invasive species are prevalent throughout the woodlands and hedgerows. Part of the current long range plan for the farm is to address the invasive species and attempt to eradicate them. The most prevalent woody invasive species include autumn olive, bittersweet, burning bush and multiflora rose.

b. Fields

Cultivated fields are currently limited to the southwestern part of the site near Park Lane and also east of the sugar house barn. In previous years, attempts have been made to grow crops, such as pumpkins, in the northern and eastern fields but poor drainage in those areas led to unsatisfactory results.

Currently, cultivated fields are on level ground which minimizes the risk of soil erosion.

Photo #7: cultivated field southeast of farm buildings

Photo #8: View towards south of hay field and wetland

i. Hay fields are usually mowed in June and again in mid to late summer depending on the weather year to year. Quality of the hay varies with location on the farm. In addition to orchard grass and timothy, other herb species are present in the hay mixture. Species such as clover, a positive addition to the nutrient content

of the hay, should be encouraged. Other species such as bedstraw, also quite prevalent, is not a desired species in hay. Fertilizing the fields has proven to be beneficial in encouraging the desired species and this practice should be continued based on soil test results.

C. EXISTING CROPS:

1. **Perennial**:
   a. Rhubarb
   b. Maple Syrup

2. **Annual**:
   a. Beans
   b. Brassicas (e.g. Broccoli, Cabbage, Cauliflower etc.)
   c. Flowers
   d. Garlic
   e. Hay
   f. Lettuce
   g. Onions
   h. Peppers
   i. Potatoes
   j. Radicchio
   k. Squash (both winter and summer varieties)
   l. Tomatoes
   m. Other vegetables as time and space allow

D. CURRENT FARM OPERATION/BUSINESS STRUCTURE:

a. The land is owned by the Town of New Milford. Farm equipment has been purchased over the last 20 years through income created by the sale of products grown or made on the property.

b. High school and college students operate the farm. Some workers are paid and some are volunteers. Realistically, 5-6 people could run the farm but, because of the educational component, 20-25 people usually work at the farm during the season.

c. Produce is sold at the on-site market; the Northville Market; and Danbury's Farmers' Market. Prices are set in accordance with Boston Farmers' Market daily morning prices. Food is also donated to organizations serving senior citizens whenever possible.

d. Hay is sold mainly to one farm in Millbrook, NY

e. Over the last 20 years hundreds of Youth Agency students have benefited from the Sullivan Farm programs.

f. The farm operation is divided into 4 areas of activity supervised by one college-age supervisor in charge of each category/department:
   1. Sales – Retail/Wholesale
   2. Marketing
   3. Landscape maintenance – buildings, flower beds, tidying
   4. Gardens.

Up to 6 other students work under the department supervisors and these students rotate through each category to gain experience.

g. The farm manager (currently the Youth Agency Director) along with the 4 department supervisors holds a weekly breakfast meeting at 7:00 am on Mondays.

h. Current Educational Programs Offered:
   - Classes are held for high school students on Soil Conservation and Testing as well as Agricultural Overview classes
   - Farm to Kitchen to Table Classes
   - Sugar House Tours

PART 2 -POSSIBLE FUTURE PROJECTS AND ENTERPRISES

A. DEVELOP ADDITIONAL SOURCES OF WATER

Water sources could be increased around the farm with the establishment of sustainable water catchment/dispersal techniques, some of which are detailed below:

- **Farm ponds** near crops to provide source of irrigation. Farm ponds may be created in existing wetlands with the appropriate permit from the local Inland Wetland Agency. Keep created ponds healthy with vegetated riparian buffers to shade the water and attenuate fertilizer nutrients which may leach or run-off and otherwise would enter the open water where they may cause eutrophication.

Photo #9: Farm Irrigation and Cultivation Ponds (Cornell Small Farms Program)

- **Rainwater catchment** from all barn roofs and greenhouse. It is important not to capture water for food crops from any surface that may contain lead, such as older metal roofs.

Photo #10: Rain Tanks (CMR)

Construction of utility sheds or small barns in outlying parts of the farm which could be outfitted for water catchment and also provide storage of tools etc.

Ground-mounted solar panels or animal shade structures also provide water catchment surfaces.

Photo #11: Floating Mats for Cultivating Plants

Photo #12: Crater Gardens (Pinterest.com)

- **Swale and mound/berm** construction on sloping land to create water catchment behind every planting area. Swales and mounds permit the cultivation of trees, shrubs and herbaceous crops using the natural gradient to maintain soil moisture and to reduce erosion and sheet flow of rainwater often associated with hillside cultivation.

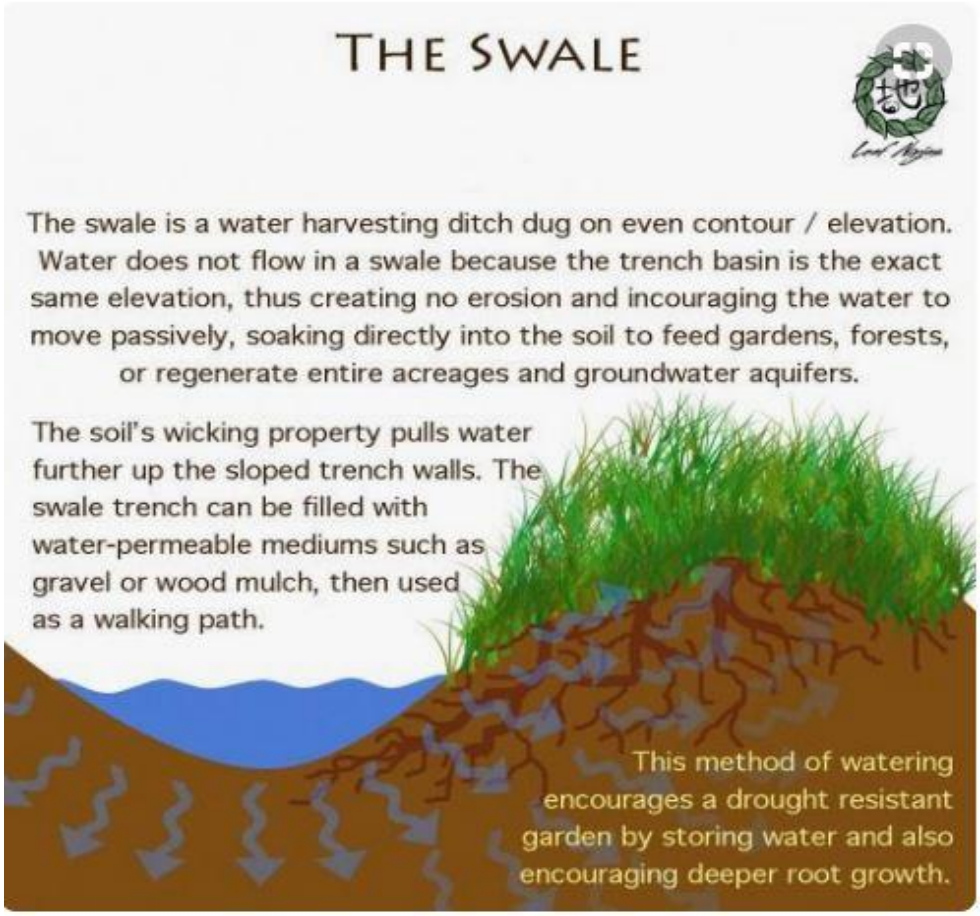


Photo #13: The Swale (Pinterest.com)

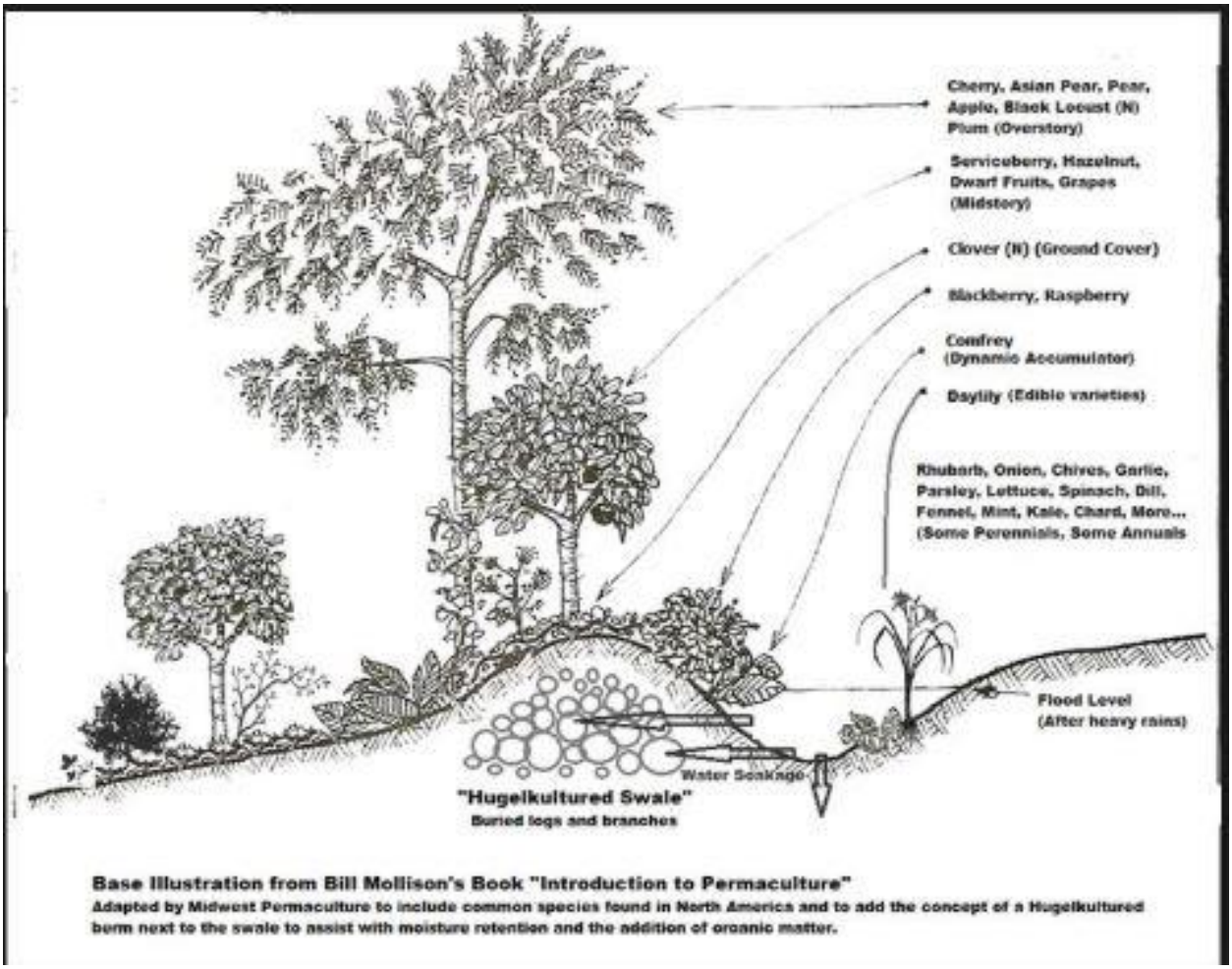


Photo #14: Swale and Mound Horticulture on Hillside, "Introduction to Permaculture", Bill Mollison

A distinct type of mound cultivation is known as "hugelkultur" (**See Reference Section).** Hugelkultur mounds are no-dig raised beds which hold moisture, build fertility, maximize surface volume and are great spaces for growing fruit, vegetables and herbs. Hugelkultur, pronounced Hoo-gul-culture, means hill culture or hill mound. (Permaculture Magazine, 10/17/2018)

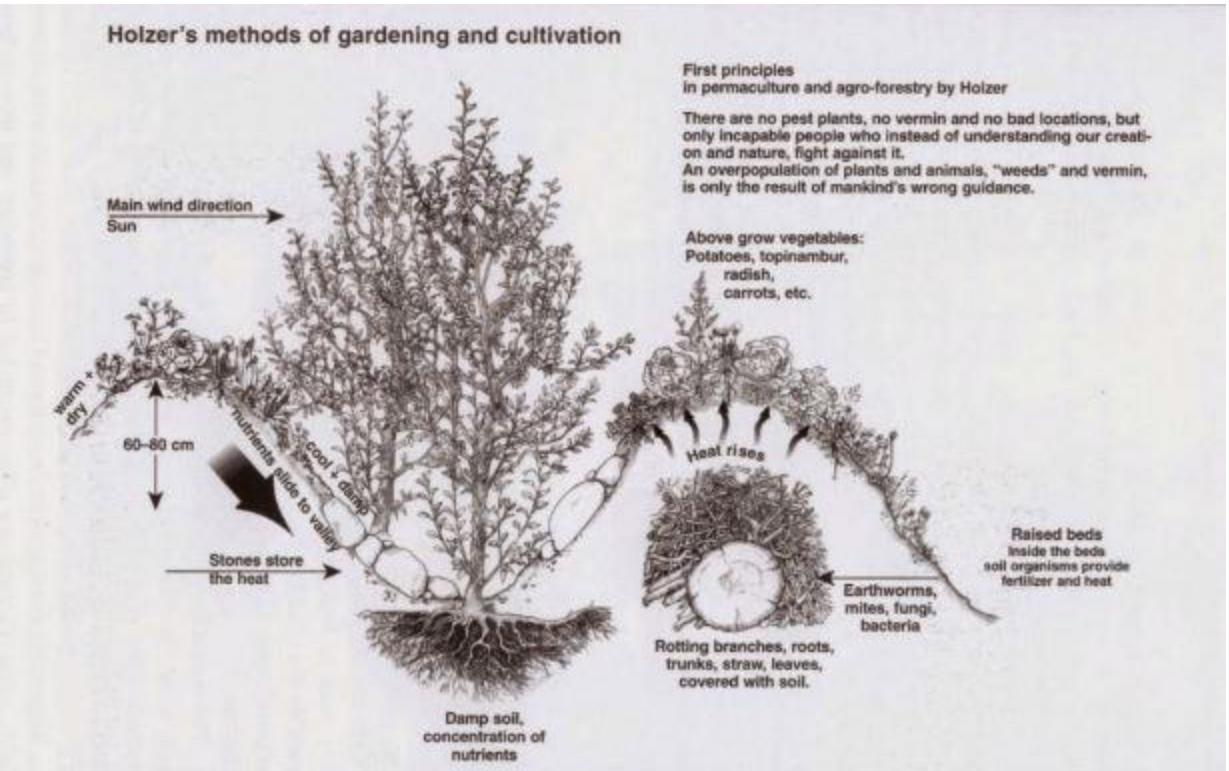


Photo #15: Construction of Hugelkultur Mound Diagram

Photo #16: Students Build Hugelkultur Mounds

The first step in building hugelkultur mounds is to lay logs of wood on the ground surface combined with narrower brushy material and layered with soil and compost. Over a long period of time, the wood breaks down and water is retained in the organic matter.

B. SOIL HEALTH

Enhance soil health with a variety of regenerative soil care techniques. (**See Reference section in Appendix).**

Soil health refers to the physical health (structure and cohesion), chemical health (nutrient levels and pH), and microbial health referred to as the Soil Food Web (NRCS).

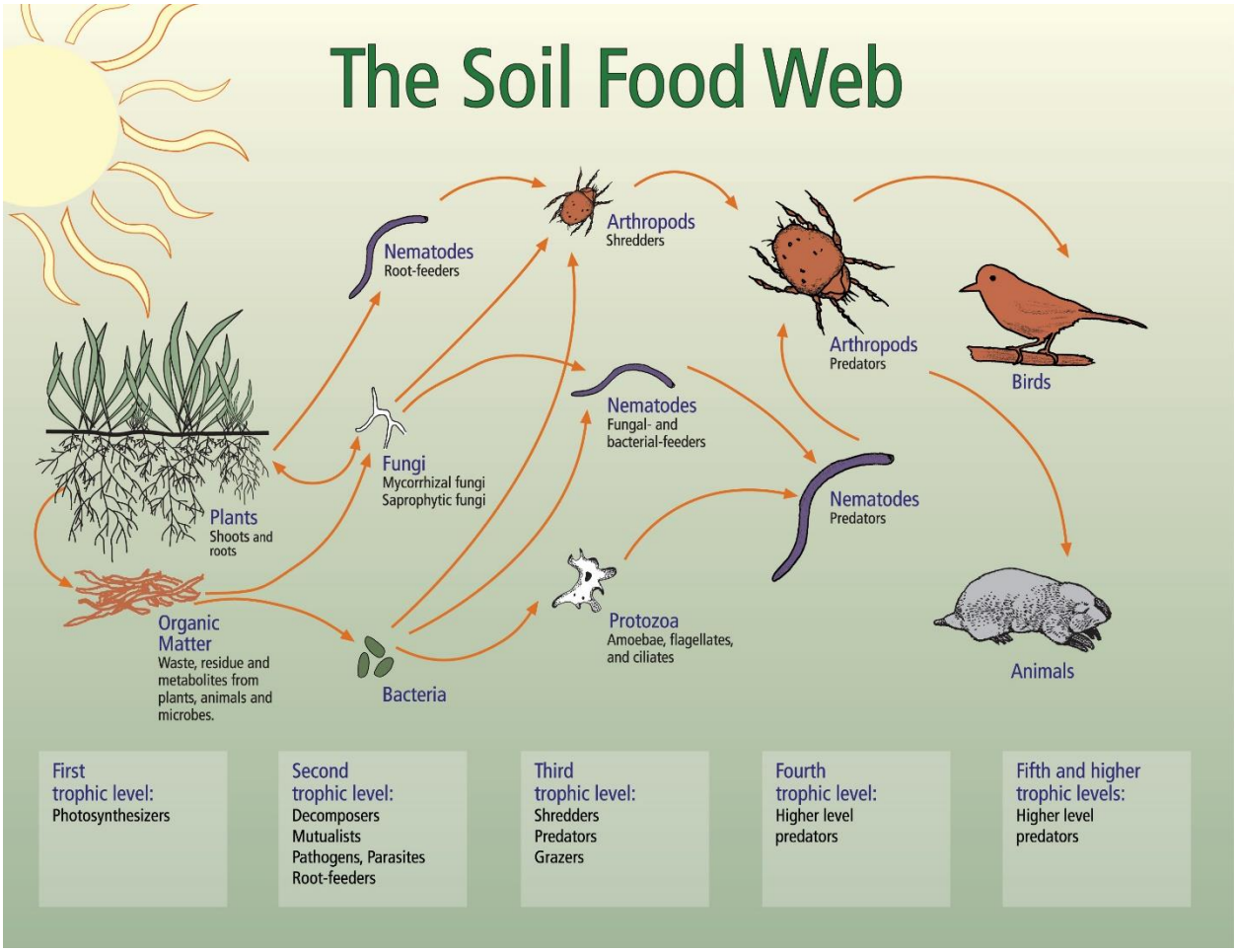


Photo #17: Soil Food Web (NRCS)

Use cover crops to add organic matter and nutrients. A diversity of plant species may be used for cover crops. Cover crops are used late in the season to provide soil cover during the winter or non-growing season. Also, cover crops may be used during the growing season between crop beds or within the bed under the standing crop. Cover crops may be tilled into the soil prior to seeding or transplanting the crop, although tilling soil is not ideal soil management. Instead, cover crops can be flattened and allowed to lie on the soil surface as a mulch as the crop grows. Cover crops maintain less fluctuating soil moisture (moisture is lost from bare soil by evaporation). Also, covering the soil surface reduces soil temperature fluctuation and protects soil structure from mechanical damage from rain. Cover crops also

help to maintain and restore soil carbon levels. High soil carbon content is beneficial for all farming activities, and also as a counterpoint to climate change.

Photo #18: Cover crop in corn

Maintain biodiversity through crop rotation and intercropping.

Reduce or avoid tilling the soil to maintain soil structure and the health of the microbiological population. The microbial life in the soil is critical for soil health and crop resiliency and health. Instead of tilling to prepare new planting beds, sheets of cardboard from broken-down shipping boxes may be laid over the ground and covered with mulch, composted manure, or composted vegetation/fallen leaves. After a few weeks, transplants may be planted right through the cardboard and mulch. In this way, the integrity of the soil structure, microbial population and soil horizons is maintained. Fall mulching for planting in the spring is a popular approach.

Fertilize existing crop fields in accordance with UConn Soil Testing Lab test results and recommendations. (**See soil test results in Appendix E).** Additional soil tests are recommended periodically for the hay fields and for any future crop areas that are developed.

Use additional comprehensive laboratory testing periodically to assess micronutrient availability. Laboratory names available on request.

Use organic and natural sources of fertilizers to feed soil microbial populations e.g. compost tea. Compost tea may be made on-farm or purchased. For more information about compost tea production, refer to the NOFA, Mass. website given in reference section. For a local source of biological soil amendments, see enclosed pamphlet of Kingdom Aquaponics in Bantam, CT. (No commercial endorsement is given with the inclusion of the pamphlet which is given for information purposes only). Also, CT-NOFA offers a bulk order for farms to obtain good quality organic products at a discounted bulk rate. Order forms are posted on the CT-NOFA website.

C. MICROCLIMATES AND HABITAT

Create microclimates and improve wildlife and pollinator habitat with diverse buffers and hedges. **(See "Xerces Conservation Guide" in References).**

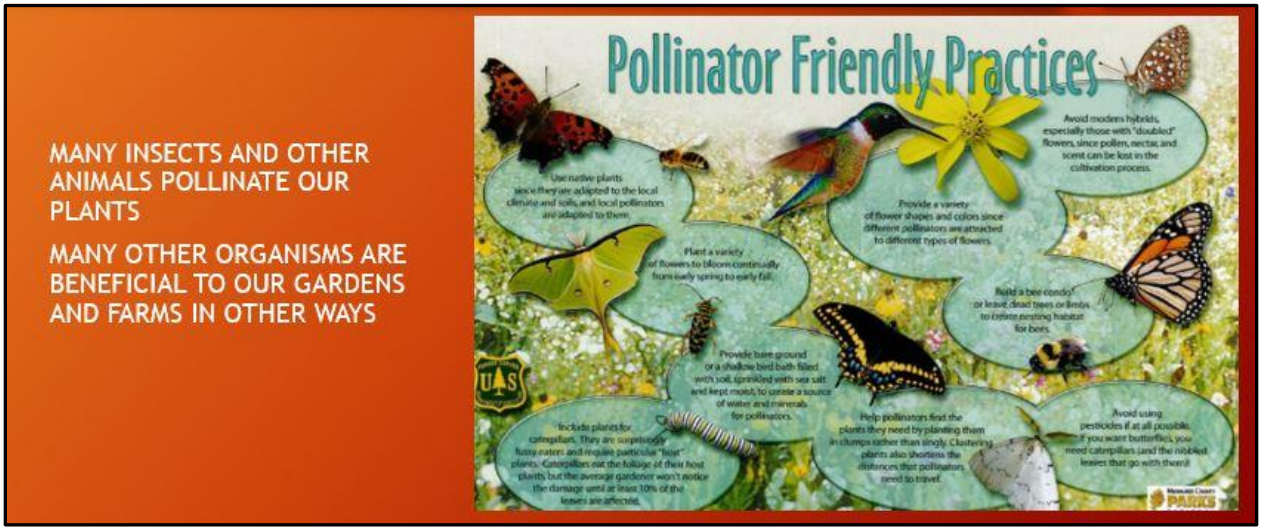


Photo #19: Attract Diverse Pollinators and Other Beneficial Fields to Crop Fields

Photo #20: Plants to Attract Beneficial Insects

Many insects provide beneficial services in the agricultural ecosystem. For instance, many insect species prey on plant pest insects. By providing habitat for the many predator insects, pest insect populations decline. The key is to provide a diversity of plant habitats where many species of insects may live out their life cycles in proximity to agricultural crops.

D. AGROFORESTRY

"AFTA defines agroforestry as an intensive land management system that optimizes the benefits from the biological interactions created when trees and/or shrubs are deliberately combined with crops and/or livestock. There are five basic types of agroforestry practices today in the North America: windbreaks, alley cropping, silvopasture, riparian buffers and forest farming. Within each agroforestry practice, there is a continuum of options available to landowners depending on their own goals (e.g., whether to maximize the production of interplanted crops, animal forage, or trees)". (The Association for Temperate Agroforestry). **(See References)**

Combining grazing animals with orchards is a way of building multi-functionality into a single farm area. Benefits include the control of weeds and reduction of mowing under trees, and the addition of manure to the soil. Animals benefit from a diet that includes dropped fruit or vegetative matter from the trees, and from the shade and cooling effects of the trees. Goats, in particular, are often used to eradicate nuisance or invasive plants such as Japanese knotweed, and poison ivy.

Photo #21: Silvopasture with Sheep

E. EDIBLE FOREST GARDENING (EFG)

Edible Forest Gardening is an approach to cultivating food-producing trees, shrubs and herbaceous perennials in a permanent comingled plot. Mimicking a natural forest with its tree canopy, understory shrubs, perennials, root crops and vines, an EFG is an efficient use of space and time that permits the production of fruits, nuts, perennial vegetables, medicinal and tea herbs. (**See Reference Section)**

F. WOODLOT IMPROVEMENT

Removal of invasive species from the shrub layer and vine layer of woodlands will benefit overall health of the trees and other native species in the woods. Removing vines growing on the trees will prevent 'strangling' of the trees and subsequent death. Selective removal of trees will permit healthy development of remaining trees. Consulting with a professional forester to develop a plan for each woodland area is highly recommended.

Woodlot management and/or coppice areas to provide firewood, fencing and trellising material, or wood for stick furniture. (**See Photos # - # in Appendix D).**
Coppicing is an approach to woodland management which exploits the ability of many species of trees to generate new shoots from their stump or roots when cut down. In a coppiced wood, (also called a copse) young tree stems are periodically cut down to create a low 'stool'. Managing a woodland by coppicing promotes a permanent source of wood material of different sizes that may be harvested without disturbing the soil or overall habitat of the woodlands. Student employees of Sullivan Farm and other students of the New Milford Agency can benefit from learning the craft of riven woodworking. Combining the skills of coppice woodland management with woodworking skills provides a productive apprenticeship for students as well as a renewable commercial enterprise for Sullivan Farm. Education classes in these skills are available from Mark Krawczyk of Rivenwoodcrafts, Vermont. He may be contacted at rivenwoodcrafts@gmail.com.

Photo #22: Stick chair

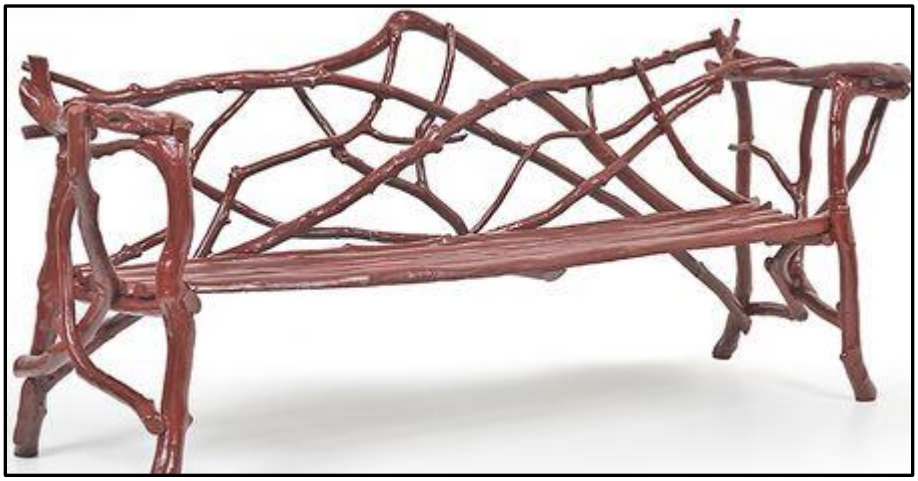


Photo #23: Stick loveseat

G. **PERENNIAL CROPS**

Increase perennial crops in permanent plantings. The following are some of the herbaceous perennial crops which may be grown in a Zone 5 climate:

Arrowheads (*Sagittaria*)
Asparagus (*Asparagus* officinalis)
Babington's Leek (*Allium* ampeloprasum var. babingtonii)
Basswood (aka Lime, Linden) (*Tilia* cordata)
Bunching Onion or Welsh Onion (*Allium* fistulosum)
Chives (*Allium* schoenoprasum)
Egyptian Onion (*Allium* cepa, Proliferum Group)
Fuki (*Petasites* japonicas)
Garlic Chives (*Allium* tuberosum)
Good King Henry (Chenopodium bonus-henricus)
Groundnut (*Apios* Americana)
Herbs, perennial types
Horseradish (*Armoracia* rusticana)
Jerusalem Artichoke (*Helianthus* tuberosus)
Lovage (*Levisticum* officinale), perennial celery
Ostrich Fern fiddleheads (*Matteuccia* struthiopteris)
Pig Nut (*Bunium* bulbocastanum)
Quamash (*Camassia* quamash)
Ramps (*Allium* tricoccum)
Rhubarb (*Rheum* spp.)
Sea Kale (*Crambe* maritima)
Skirret (*Sium* sisarum)
Sorrel (*Rumex* "Profusion" and Red-Veined)
Strawberries (*Fragaria* spp.)
Wild Arugula (*Eruca* selvatica, *Diplotaxis* muralis or *Diplotaxis* tenuifolia)

In addition to the herbaceous edible perennials listed above, there are many shrub plants, some native to Connecticut, which produce edible fruits or nuts and that are easy to cultivate with minimal labor inputs. The following is a partial list:

Amelanchier spp. (Juneberry, Serviceberry, Shadbush, Shadblow, Saskatoon)
Amelanchier stolonifera (Running Serviceberry)
Aronia arbutifolia (Red Chokeberry)
Aronia melanocarpa (Black Chokeberry)
Asimina triloba (Pawpaw)
Castanea pumila (Chinkapin Chestnut)
Corylus spp. (Hazelnuts)
Diospyros virginiana (American Persimmon)
Hippophae rhamnoides (Seaberry)
Ribes nigrum (Black Currants)

Ribes rubrum (Red Currants)
Ribes uva-crispum (Gooseberries)
Sambucus canadensis (American Elderberry)

Sources of perennial fruits, vegetables and herbs are often the well-known nurseries that provide much of the country's seeds and plants. Some of the more unusual plant species mentioned above are harder to find. A comprehensive list of sources may be found in Eric Toensmeier's book, "Perennial Vegetables", referenced in the Appendix reference list. Sources for many unusual plants may also be found with a Google search.

In addition to growing perennial plants for their saleable edible parts, there is a growing market demand for these plants in Connecticut and surrounding states. This creates an opportunity for farms to consider adding propagation enterprises. This would entail establishing a permanent planting of a variety of plant species and propagating them through either seed collection (sexual propagation) and/or cuttings, root divisions, bud or stem grafts (asexual or vegetative propagation). Such propagation techniques are usually carried out in specially outfitted greenhouses with heat mats on benches and overhead watering with misters. Plastic hoop houses are adequate for these operations.

H. EXPANSION OF EDUCATIONAL PROGRAMMING

Development of educational tours or seminars for the public to learn sustainable small-scale farming techniques and permaculture. All of the above-mentioned innovative farming techniques and crops are of interest in the farming community and are scaleable to the gardening community. This presents an opportunity for Sullivan Farm to add an educational component to its operations as an additional source of income. Farm tours and workshops can be organized on a seasonal schedule or more regularly, as time and staffing permits.

Photo #24: The Horn Farm Center for Agricultural Education

I. UNTAPPED MARKET OPPORTUNITIES

Sullivan Farm is well-positioned on a busy state highway with good passing traffic. This provides ease of access for both regular customers and for occasional passers-by. Signage at the roadside could be improved. If zoning regulations permit, signs a few hundred feet before the sales barn, in both directions, would alert drivers that the farm is "just ahead". It is easy not to see the farm until you've driven by it, unless drivers know exactly where they are going.

Another possible avenue for Sullivan Farm is to create additional "value-added" products. One idea currently under consideration is for a creamery. A creamery would require a Health Department approved kitchen and septic system. Ice cream, sorbet and gelato would be offered to the public in the form of cones, cups and containers. If this investment is made, the kitchen could also be used for a variety of other food products such as jams and preserves, and baked goods like pies and breads using fruit produced on the farm, which are currently processed at the Maxx kitchen.

Planting of the fallow fields at the northeast corner of the property with fruit trees and shrubs, hops or grapes would be an ideal utilization of this area. Another use for the fallow field areas could be the construction of solar arrays with agricultural crops grown in between the panels. This would eliminate the need for ground maintenance and serve a dual purpose for this property.

In keeping with the need for space to accommodate educational programming and workshops, the construction of a 100' x 30' post and beam barn could be considered. This facility could also be utilized as a rental venue for weddings, picnics, corporate events. It would add an additional source of revenue to the farm's yearly budgetary needs.

Expand on the educational, agricultural activities at the farm by attracting school groups, organizations and others to participate in workshops and activities that center around agricultural skills utilized on the farm. This would include tours of the sugar house, planting, harvesting, blacksmithing, bee keeping, etc.

J. PLANNING FOR THE FUTURE

In conclusion, this plan draws from permaculture methods and techniques for designing sustainable and human-scale farm operations. The plan considered ways which best serve the community of people involved with the farm and with the wider community of the Town of New Milford. Permaculture is a design system which relies on planning before acting. In order to implement changes to the current farm plan, it is imperative to first understand and carefully consider any new activities before implementing. Also, the spatial planning is also important. Where new enterprises are located must be laid out and considered in

relation to all farm activities in order to build economies of scale and of energy use (energy of workers as well as material and equipment usage).

Many possible ideas and enterprises have been introduced in this plan. Some of the proposals may be immediately appealing, others not so much. Thought and consideration about the labor pool, the financial resources and other aspects of the farm's inherent character must be assessed first. The report provides physical information about the nature of the land, the soils, the climate. All of the ideas presented are compatible with the physical qualities.

Central to the continuation of the farm is the importance of raising revenue to support a seasonal farm manager. This individual would be employed from February through November and be responsible for the day to day operation of the farm and supervision of the youth who work there. The Agency's Administrator would maintain supervision of this position and ensure that the farm is running within its current budget.

Another attribute of Sullivan Farm is the enthusiastic labor pool of young people and good leadership. Although the individual workers may change from year to year, there is continuity in the management and in the leadership of students who return each year during college vacations. It is likely that the addition of interesting and progressive farming and marketing techniques will give students an even greater appreciation for their work. The program will expand to include more skills and techniques that will stay with the student-workers through life and encourage self-reliance and confidence.

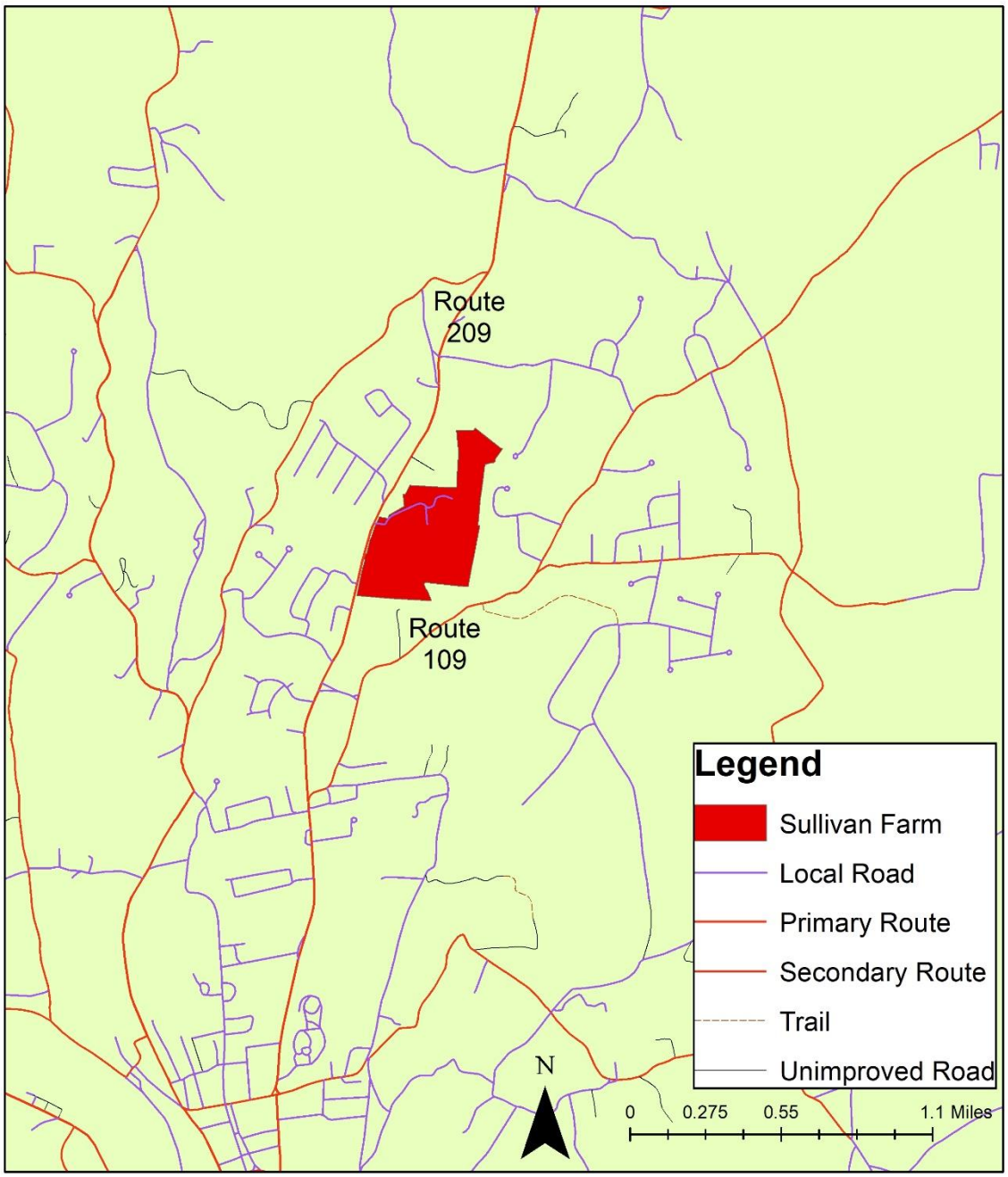
Educational programming, as discussed earlier, will bring more people to the farm and help to create a recognizable profile for the operation where people may go for locally produced food and advice and skills training.

Any adoption of land-shaping or alteration has to be carefully considered in respect to the need for land-use permits. Although farming is permitted by right under the Inland Wetland and Watercourses Act of the Connecticut General Statutes, it is advisable to obtain a permit or the approval of the local Inland Wetlands Agency for creating ponds or for any proposed changes to the land surface in or near wetland areas. Wetlands regulations may affect work in an upland review area beyond the wetlands themselves. The Northwest Conservation District (NWCD) is available for advice on these types of issues.

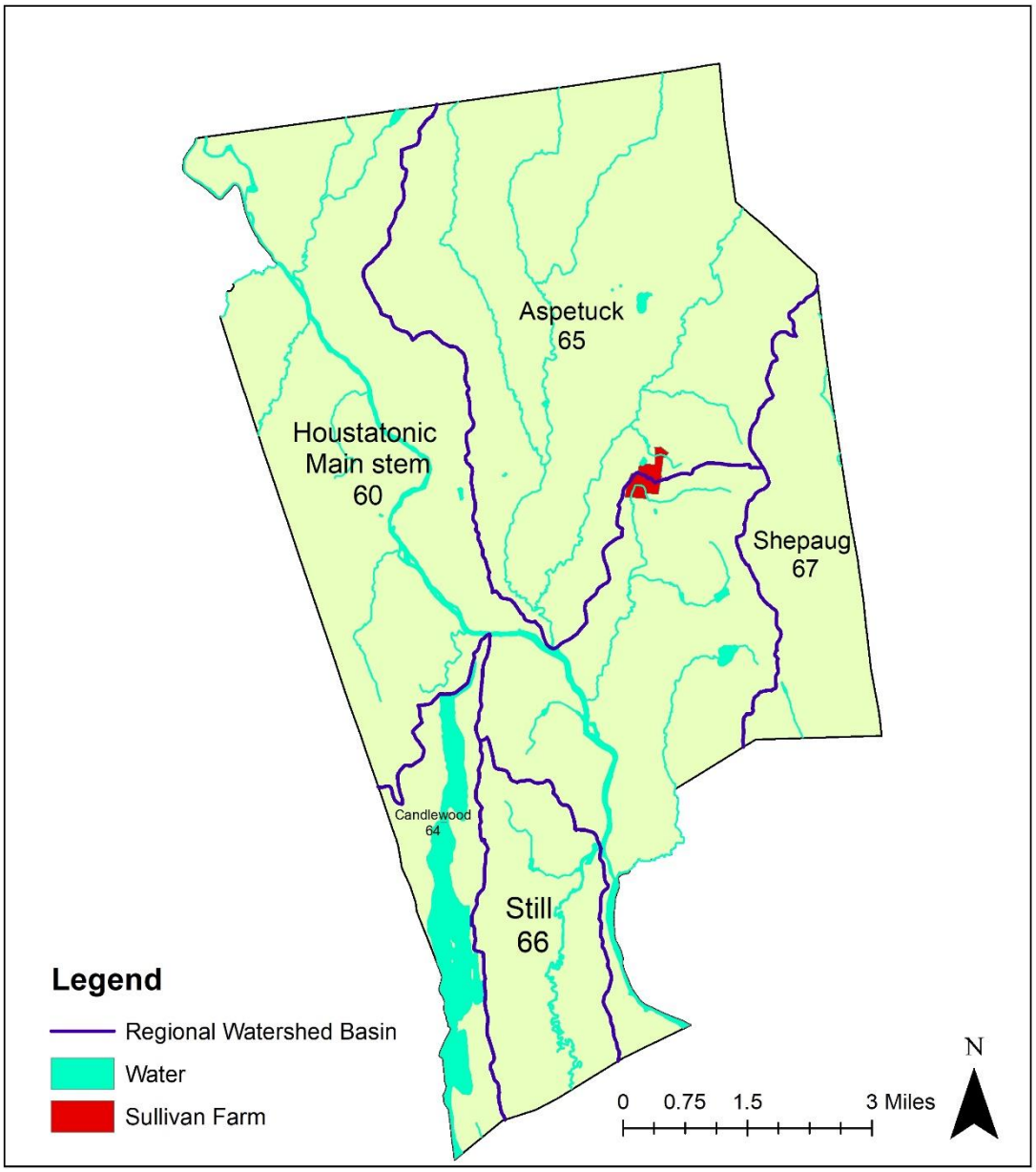
In planning for expanding the activities of the farm, it is a good idea to use tracing paper over the property map to sketch out proposed locations for each enterprise and assessing the most convenient places to locate them and how all the enterprises interrelate in the most beneficial and cohesive way. Again, NWCD is available to advise during this phase.

Lastly, the action plan for the Farm should include a stepwise program based on ability to invest and realistic assessment of the work and time involved for any activity embarked upon. Improvements to infrastructure or land should be done first, bearing in mind all future planned-for goals

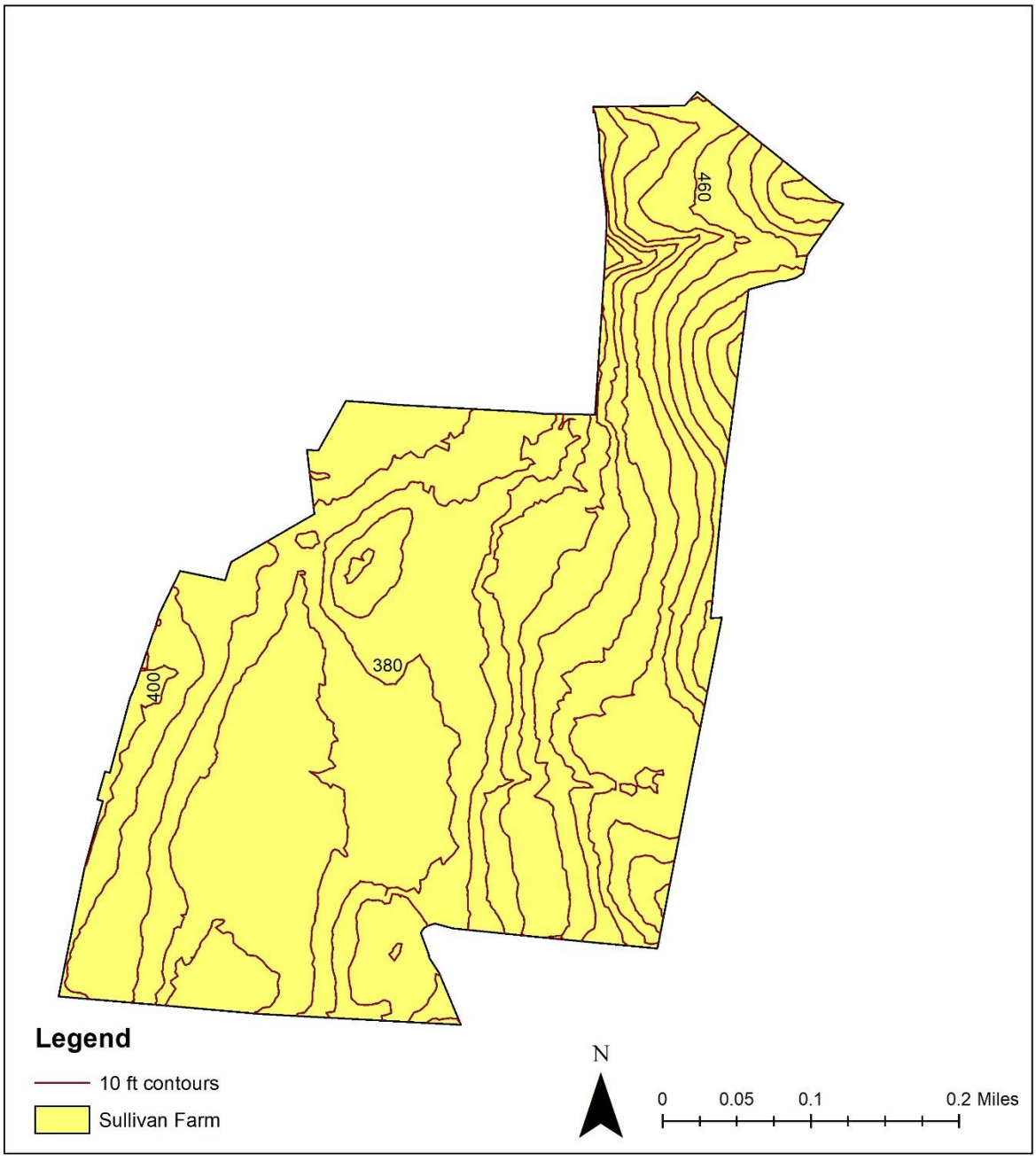
Appendix A: Sullivan Farm Location



Appendix B: Sullivan Farm Regional Watershed

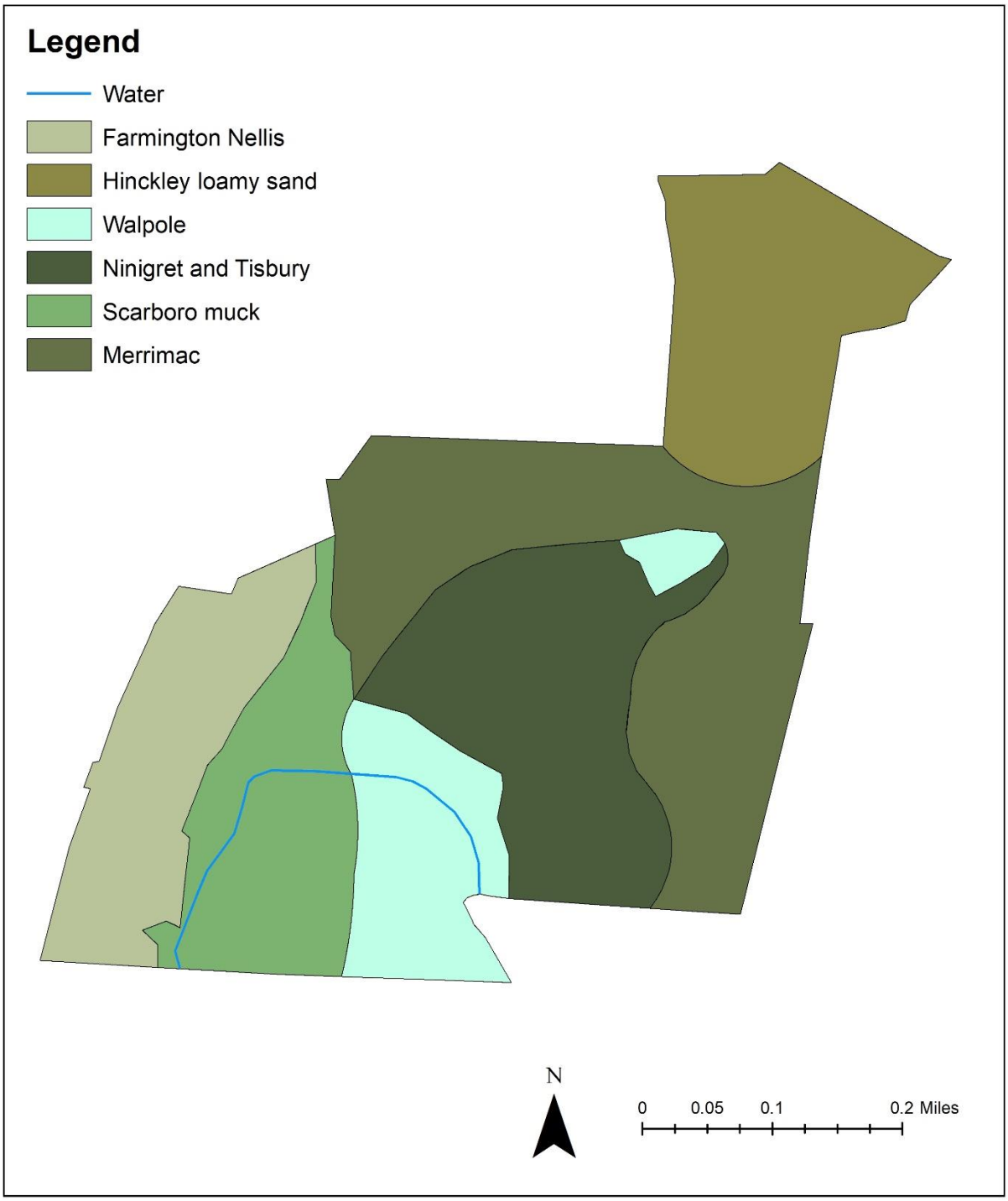


Appendix C: Sullivan Farm Topographic Map

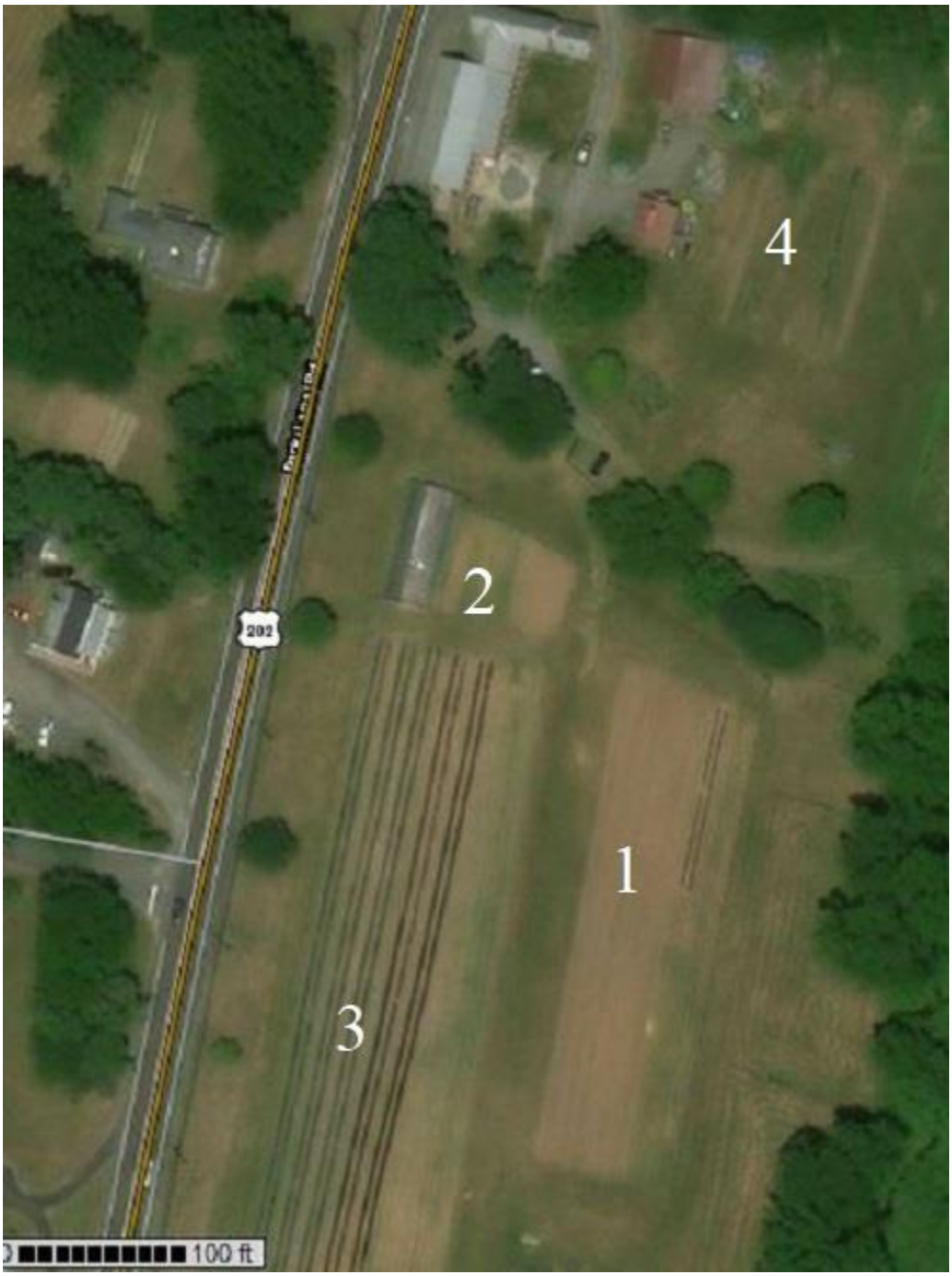


APPENDIX D

Sullivan Farm Soils Map



APPENDIX E: SOIL TEST LOCATIONS AND RESULTS


4
2
202
1
3
100 ft

UConn Soil Nutrient Analysis Laboratory
6 Sherman Place, Unit 5102, Union Cottage
Storrs, CT 06269-5102
860-486-4274
www.soiltest.uconn.edu

UCONN
COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES
PLANT SCIENCE AND LANDSCAPE ARCHITECTURE

Soil Test Report

Order Number: 4756

Prepared For:
Cynthia Rabinowitz
NW Conservation District
1185 New Litchfield St
Torrington, CT 06790

cynthiar@nwcd.org
860.626.7222

Sample Information:
Sample Name: s1
Lab Number: 3939
Area Sampled:
Received: 5/17/2018
Reported: 5/29/2018

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**3041 lbs/acre**				
Magnesium	**> 500 lbs/acre**				
Phosphorus	**53 lbs/acre**				
Potassium	**131 lbs/acre**				

** Excessive only defined for Phosphorus (>40 lbs/acre)*

Soil pH (1:1, H2O)	6.8
Buffered pH (Mod. Mehlich)	6.5
Est. Cation Exch. Capacity (cmole+/100g)	14.8
Exch. Acidity (meq/100g)	0.1
% Organic Matter	3.5
Soluble Salts (mmhos/cm)	0.13

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	47	10 - 30

Element	***ppm***	***Soil Range***
Boron (B)	0.4	0.1 - 2.0
Copper (Cu)	0.1	0.3 - 0.8
Iron (Fe)	1.4	1.0 - 40.0
Manganese (Mn)	3.0	3.0 - 20.0
Zinc (Zn)	3.2	0.1 - 70.0
Sulfur (S)	32.0	10 - 100
Aluminum (Al)	7.5	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for Onions, Leeks

Limestone (Target pH of 6.6)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
0 lbs / acre	**130 - 150 lbs / acre**	**0 lbs / acre**	**150 lbs / acre**

Comments:

LIMESTONE:
No limestone is necessary
Apply no more than 70 lb/acre combined weight of N plus K2O starter with the planter, 2" on the side and 2" below the seed as a band.
Soil test values for phosphorus are above optimum. Do not add additional phosphorus at this time
Consult the New England Vegetable Management Guide for more information regarding timing and placement of amendments.

Limestone & Fertilizer Recommendations for Beans: Dry/Snap/Lima

Limestone (Target pH of 6.6)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
0 lbs / acre	50 lbs / acre	0 lbs / acre	75 lbs / acre

Comments:

LIMESTONE:
No limestone is necessary

A sidedressing of 30 lb nitrogen per acre at prebloom may extend harvest period and increase yields, especially on sandy soils.
Machine harvested beans are unlikely to need sidedressing.
Apply no more than 70 lb/acre combined weight of N plus K2O starter with the planter, 2" on the side and 2" below the seed as a band.
Soil test values for phosphorus are above optimum. Do not add additional phosphorus at this time
Consult the New England Vegetable Management Guide for more information regarding timing and placement of amendments.

Limestone & Fertilizer Recommendations for Potatoes Scab Susceptible

Limestone (Target pH of 5.1)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
0 lbs / acre	120 - 180 lbs / acre	0 lbs / acre	200 lbs / acre

Comments:

LIMESTONE:
No limestone is necessary

Soil pH is relatively high for potatoes. Consider planting scab resistant varieties.
Soil test values for phosphorus are above optimum. Do not add additional phosphorus at this time
Consult the New England Vegetable Management Guide for more information regarding timing and placement of amendments.

References (Crop Related):

Soil Test Interpretation and Recommendations	http://www.soiltest.uconn.edu/documents/interpretationofsoiltestresults6-2016.pdf
New England Vegetable Management Guide	https://nevegetable.org/cultural-practices

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Soil Test Report

Order Number: 4756

Prepared For:
Cynthia Rabinowitz
NW Conservation District
1185 New Litchfield St
Torrington, CT 06790

cynthiar@nwcd.org
860.626.7222

Sample Information:
Sample Name: s2
Lab Number: 3940
Area Sampled:
Received: 5/17/2018
Reported: 5/29/2018

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**3529 lbs/acre**				
Magnesium	**> 500 lbs/acre**				
Phosphorus	**67 lbs/acre**				
Potassium	**90 lbs/acre**				

** Excessive only defined for Phosphorus (>40 lbs/acre)*

Soil pH (1:1, H2O)	6.9
Buffered pH (Mod. Mehlich)	6.6
Est. Cation Exch. Capacity (cmole+/100g)	16.8
% Organic Matter	3.3
Soluble Salts (mmhos/cm)	0.16

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	47	10 - 30
Calcium	53	40 - 50

Element	***ppm***	***Soil Range***
Boron (B)	0.5	0.1 - 2.0
Copper (Cu)	4.4	0.3 - 0.8
Iron (Fe)	2.3	1.0 - 40.0
Manganese (Mn)	3.5	3.0 - 20.0
Zinc (Zn)	203.8	0.1 - 70.0
Sulfur (S)	40.3	10 - 100
Aluminum (Al)	4.6	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for Onions, Leeks

Limestone (Target pH of 6.6)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
0 lbs / acre	**130 - 150 lbs / acre**	**0 lbs / acre**	**175 lbs / acre**

Comments:

LIMESTONE:
No limestone is necessary
Apply no more than 70 lb/acre combined weight of N plus K2O starter with the planter, 2" on the side and 2" below the seed as a band.
Soil test values for phosphorus are above optimum. Do not add additional phosphorus at this time
Consult the New England Vegetable Management Guide for more information regarding timing and placement of amendments.

Limestone & Fertilizer Recommendations for Tomatoes

Limestone (Target pH of 6.6)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
0 lbs / acre	140 - 160 lbs / acre	0 lbs / acre	250 lbs / acre

Comments:

LIMESTONE:
No limestone is necessary
Apply no more than 70 lb/acre combined weight of N plus K2O starter with the planter, 2" on the side and 2" below the seed as a band.
Soil test values for phosphorus are above optimum. Do not add additional phosphorus at this time
Consult the New England Vegetable Management Guide for more information regarding timing and placement of amendments.

Limestone & Fertilizer Recommendations for Broccoli

Limestone (Target pH of 6.6)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
0 lbs / acre	160 lbs / acre	0 lbs / acre	175 lbs / acre

Comments:

LIMESTONE:
No limestone is necessary

NOTE: Add 1-2 lb boron (5 to 10 lbs Solubor) per acre to main fertilizer application before planting broccoli or caulflower.
Apply no more than 70 lb/acre combined weight of N plus K2O starter with the planter, 2" on the side and 2" below the seed as a band.
Soil test values for phosphorus are above optimum. Do not add additional phosphorus at this time
Consult the New England Vegetable Management Guide for more information regarding timing and placement of amendments.

References (Crop Related):

Soil Test Interpretation and Recommendations	http://www.soiltest.uconn.edu/documents/interpretationofsoiltestresults6-2016.pdf
New England Vegetable Management Guide	https://nevegetable.org/cultural-practices

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Soil Test Report

Order Number: 4756

Prepared For:
Cynthia Rabinowitz
NW Conservation District
1185 New Litchfield St
Torrington, CT 06790

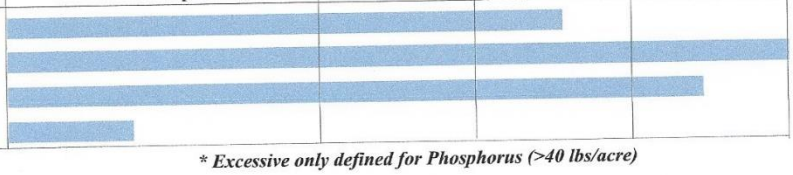
cynthiar@nwcd.org
860.626.7222

Sample Information:
Sample Name: s3
Lab Number: 3941
Area Sampled:
Received: 5/17/2018
Reported: 5/29/2018

Results

Nutrients Extracted From Your Soil (Modified Morgan)

		Below Optimum	Optimum	Above Optimum	Excessive*
Calcium	**3270 lbs/acre**				
Magnesium	**> 500 lbs/acre**				
Phosphorus	**67 lbs/acre**				
Potassium	**101 lbs/acre**				



**** Excessive only defined for Phosphorus (>40 lbs/acre)***

Soil pH (1:1, H2O)	7.0
Buffered pH (Mod. Mehlich)	6.6
Est. Cation Exch. Capacity (cmole+/100g)	16.0
% Organic Matter	3.7
Soluble Salts (mmhos/cm)	0.13

Base Saturation	***%***	***Suggested***
Potassium	1	2.0 - 7.0
Magnesium	48	10 - 30
Calcium	51	40 - 50

Element	***ppm***	***Soil Range***
Boron (B)	0.5	0.1 - 2.0
Copper (Cu)	5.9	0.3 - 0.8
Iron (Fe)	2.4	1.0 - 40.0
Manganese (Mn)	3.7	3.0 - 20.0
Zinc (Zn)	252.9	0.1 - 70.0
Sulfur (S)	37.6	10 - 100
Aluminum (Al)	5.0	10 - 300
Est. Total Lead (Pb)	low	

Limestone & Fertilizer Recommendations for Eggplant

Limestone (Target pH of 6.6)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
0 lbs / acre	**80 - 100 lbs / acre**	**0 lbs / acre**	**100 lbs / acre**

Comments:

LIMESTONE:
No limestone is necessary
Apply no more than 70 lb/acre combined weight of N plus K2O starter with the planter, 2" on the side and 2" below the seed as a band.
Soil test values for phosphorus are above optimum. Do not add additional phosphorus at this time
Consult the New England Vegetable Management Guide for more information regarding timing and placement of amendments.

Limestone & Fertilizer Recommendations for Peppers

Limestone (Target pH of 6.6)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
0 lbs / acre	140 lbs / acre	0 lbs / acre	150 lbs / acre

Comments:

LIMESTONE:
No limestone is necessary
Apply no more than 70 lb/acre combined weight of N plus K2O starter with the planter, 2" on the side and 2" below the seed as a band.
Soil test values for phosphorus are above optimum. Do not add additional phosphorus at this time
Consult the New England Vegetable Management Guide for more information regarding timing and placement of amendments.

Limestone & Fertilizer Recommendations for Tomatoes

Limestone (Target pH of 6.6)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
0 lbs / acre	140 - 160 lbs / acre	0 lbs / acre	150 lbs / acre

Comments:

LIMESTONE:
No limestone is necessary
Apply no more than 70 lb/acre combined weight of N plus K2O starter with the planter, 2" on the side and 2" below the seed as a band.
Soil test values for phosphorus are above optimum. Do not add additional phosphorus at this time
Consult the New England Vegetable Management Guide for more information regarding timing and placement of amendments.

References (Crop Related):

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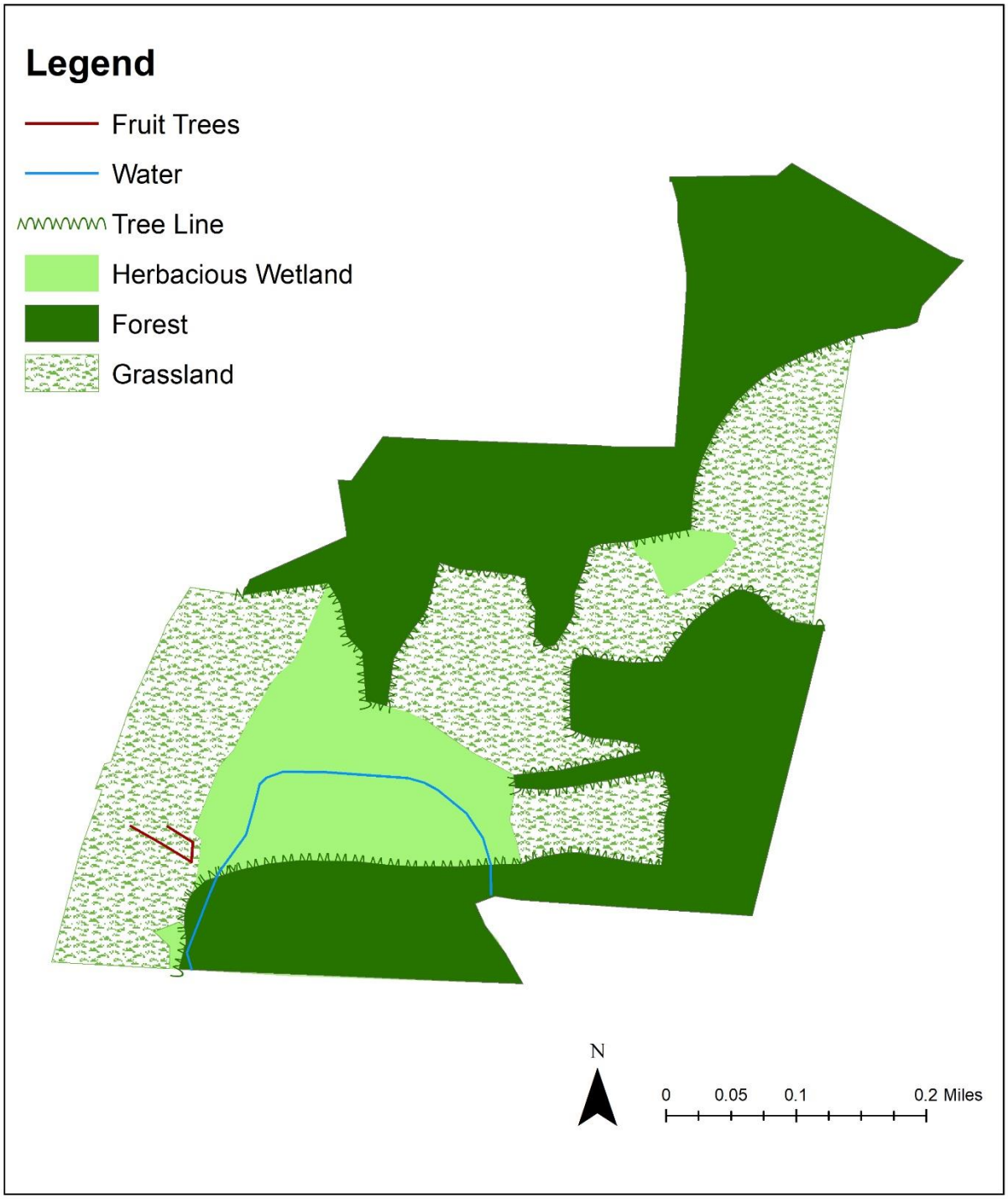
APPENDIX F

Sullivan Farm Vegetation Map



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