



**Rhode Island Association  
of Conservation Districts**  
*Helping Rhode Island Conservation Districts Help Rhode Island*

conserving  
natural resources  
*for our future*  
2283 Hartford Avenue  
Johnston, RI 02819  
401-854-0840



**United States  
Department of  
Agriculture**

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# FFOS FARM CONSERVATION PLAN

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A Farm Management Plan fulfilling the requirements of Rhode Island's Farm, Forest & Open Space Act



**HENRY CABRERA**  
3812 Commodore Oliver Perry Hwy, RI

# FFOS Farm Conservation Plan – Rhode Island

**Farm/Facility:** 3812 Commodore Oliver Perry Hwy, RI

**Owner/Operator:** Henry Cabrera

**Plan Period:** November 2019 – October 2029

## Owner/Operator

As the owner/operator of this Farm Conservation Plan, I, as the decision maker, have been involved in the planning process and agree that the Best Management Practices (BMPs) listed in the plan are necessary, and that my goals and objectives have been outlined. I understand that the maps used in this farm plan are for planning purposes only and are not a legal document. **I understand that it is my responsibility to stay in accordance with the Department of Environmental Management Rules and Regulations for Enforcement of the Farm, Forest, Open Space Act, July 2002.**

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name (printed): \_\_\_\_\_

## Partner Planner

As a Conservation District Official, I certify that the plan meets the guidelines outlined in "A Citizens Guide to the Farm, Forest, and Open Space Act".

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name (printed): \_\_\_\_\_ Title: \_\_\_\_\_

## Certified Conservation Planner

As a Certified Conservation Planner, I certify that I have reviewed the *FFOS Farm Conservation Plan* and that the elements of the document will meet USDA NRCS Conservation Plan criteria.

Signature: Melissa Hayden Date: 11/25/19

Name (printed): Melissa Hayden Title: DC

***"Conservation means harmony between men and land. When land does well for its owner, and the owner does well by his land; when both end up better by reason of their partnership, we have conservation. When one or the other grows poorer we do not.... It is the individual farmer who will weave the greater part of the rug on which America stands."***

**-Aldo Leopold**

***What is a Farm Conservation Plan?***

A farm conservation plan is a document developed by your Conservation District and you, the farmer or landowner. For the purpose of the Rhode Island Farm, Forest and Open Space (FFOS) Program, it is a series of actions developed to meet a farmer's goals while protecting water quality, soil health and soil erosion. Some of the things considered in a farm plan are farm size, soils type, slope of the land, proximity to streams or water bodies, type of livestock or crops and the farmer's goals. Using this Farm Conservation Plan, a landowner may apply for farmland designation with RI Department of Environmental Management (RI DEM) and the town/city. To implement the plan, a landowner may apply for financial assistance from US Department of Agriculture Natural Resources Conservation Service (USDA NRCS).

This plan identifies measurable and/or observable natural resource concerns and provides basic strategies for best managing and improving natural resource concerns to protect and improve the farm.

This Farm Conservation Plan was developed to meet the requirements of the Farm, Forest and Open Space Program and to meet the criteria for a NRCS Conservation Plan. The Farm Conservation Plan is your plan developed with your input unique to your operation. It provides landowners with the opportunity to document their environmental stewardship and contribute to a positive image of agriculture in their communities. If a potential environmental concern is identified through the assessment process, landowners can then take steps to plan for and then implement an appropriate course of action.

The plan is set up to provide the following:

1. Best Management Practices (BMPs) by land use

*Best Management Practices (BMPs) are management strategies capable of protecting the environment. These management strategies must be on-going in order to maintain the stewardship level required for this program.*

2. An assessment of the following natural resources for Resource Concerns (RC):

*Water Quality (ground and surface), Soil Erosion and Soil Quality.*

As a result of the assessment, conservation practices will be planned (with input from the landowner) to improve the resource concerns identified. Landowners may apply for financial assistance from US Department of Agriculture Natural Resources Conservation Service (USDA NRCS) to help implement these conservation practices.

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## SECTION 1. FARM BACKGROUND

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3812 Commodore Oliver Perry Highway is an approximately 13.45 acre property located in South Kingstown, RI. Since the previous spring, the farm, so named as “Lavender Waves Farm” has been primarily used to produce and sell several lavender plant species. The lavender crops are grown in rows radiating out from a center gazebo with grassed areas in between. The arrangement serves as a sufficient form of production for the crop, as well providing an aesthetically pleasing area. Fertilizer is not used on any of the crops nor are they irrigated. Livestock are also housed on the property and include a llama, one donkey, 6 sheep, 3 goats, and a mix of approximately 75 geese, chickens, and guinea hens. The fowl reside in a permanent enclosure while the rest of the livestock are rotated periodically between paddocks with moveable fencing. In addition to natural forage, supplemental feed is also provided when needed. Year round structures offer cover for the livestock. Solar panels on roofs provide most of the electricity for the barn(s) and farmstead.

The property is situated in the Ninigret Pond-Frontal Block Island Sound watershed. The watershed covers approximately 18,017 acres in southern Rhode Island. Multiple wildlife refuges, salt ponds, and coastal beaches are located within this watershed and serve important ecological, as well as recreational purposes to the state and its people. Per RI Department of Environmental Management (RIDEM) data there are state listed stormwater impaired waters

and special resource protection waters within the watershed. None of these listed waters occur within the property boundary.

The property does not fall within a mapped flood zone hazard area, nor is it located in proximity to any state listed impaired waters as identified under the federal Clean Water Act (CWA) Section 303(d). The property *does* reside in a wellhead protection area. Lastly, it should be noted that prime and unique farmland soils are also mapped across a majority of the property (See [Section 6.1](#) for Associated Plan Maps).

Some agricultural activities can have a lasting effect on our natural resources. Farmers have understood this for many years and over the years have adapted best management practices (BMPs) on their farm that help these agricultural activities from having a negative impact on their natural resources. Based on the operation on your farm, the following agricultural activities with BMPs are included in your Farm Conservation Plan. The activities identified in these BMPs will help ensure good stewardship.

#### **BMPs included in this plan**

1. Soil Management
2. Water Supply

Best Management Practices (BMPs) are designed to minimize water contamination from stored or transferred nutrients. These BMPs should be implemented on a day-to-day basis to minimize the potential environmental impacts of your farm.

#### **Cultural Resources**

Cultural Resources are tangible remains of past human activity. These may include buildings; structures; prehistoric sites; historic or prehistoric objects or collection; rock inscription; earthworks, canals, or landscapes. These nonrenewable resources may yield unique information about past societies and environments and provide answers for modern day social and conservation problems. Although many have been discovered and protected, there are numerous forgotten, undiscovered, or unprotected cultural resources in rural America.

The Conservation Districts and NRCS consider cultural resources in their conservation planning for the same reason they protect the natural resources; the soil, water, air, plants and animals on your property. Keeping natural resources in balance helps provide the basis for a healthy and profitable farm environment; keeping cultural resources provides the basis for understanding our human past. The stewardship of these nonrenewable resources is an important link in the conservation ethic that underlies the Districts' and NRCS missions.

The property *does not* fall within mapped records of potential cultural resources. Although the property doesn't fall within any mapped records, a cultural resources review will have to be documented if you decide to seek financial assistance for implementation of recommended practices with NRCS. (See [Section 6.1](#) for Cultural Resources Map)

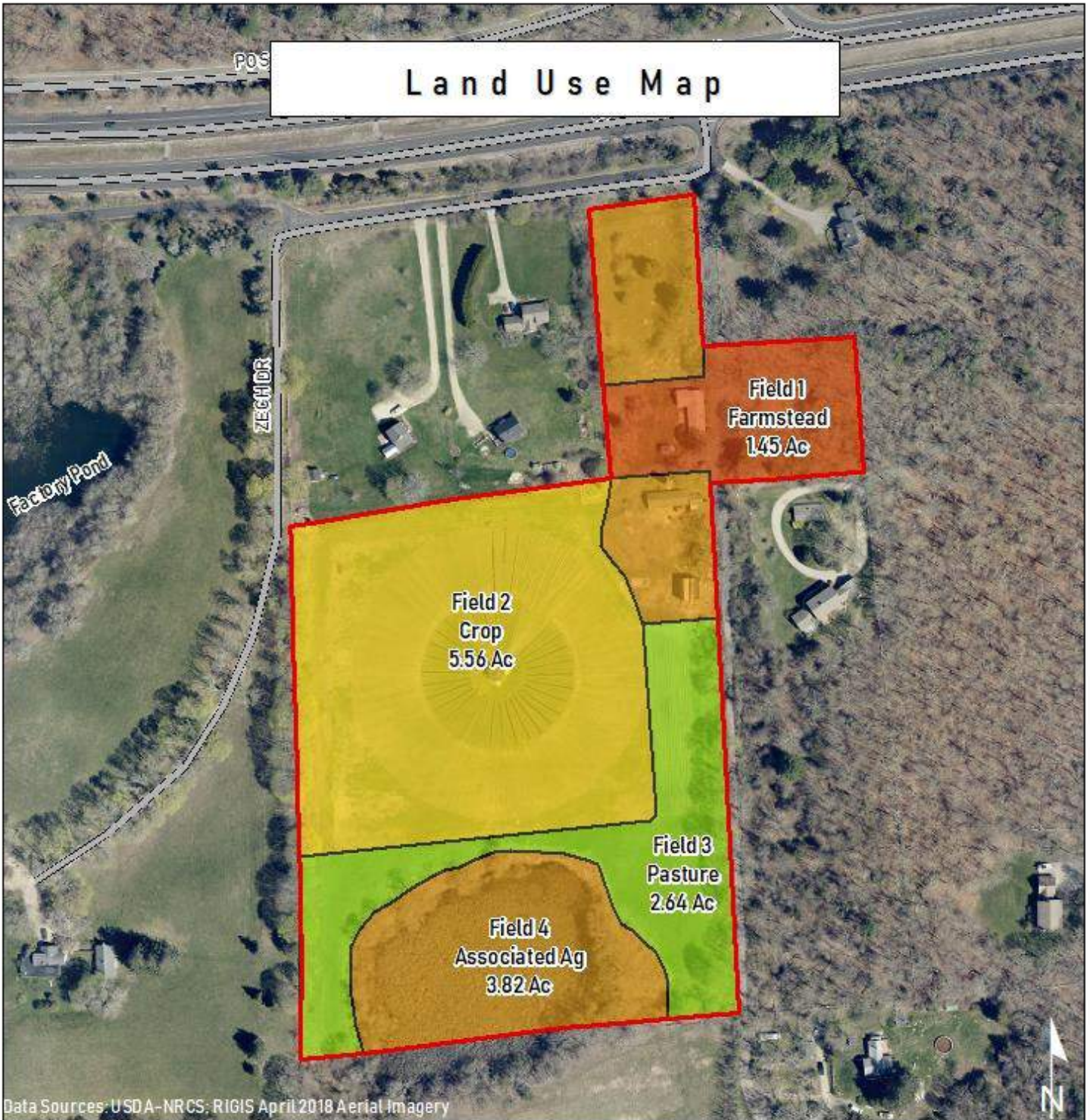
### **Threatened and Endangered Species**

NRCS has the obligation under the Endangered Species Act (ESA) to protect and conserve plant and animal species listed or proposed for listing as federally listed and state listed rare, threatened, or endangered. NRCS must make sure actions and activities do not result in the destruction or adverse modification of T&E species critical habitat.

The property *does* fall within a threatened and endangered species range and/or habitat which is mapped within the boundaries of your property. If you decide to seek financial assistance for implementation of recommended practices with NRCS, a biological review will be conducted. (See [Section 6.1](#) for Threatened and Endangered Species Map).

**Goals & Objectives:** The primary goal of the landowner is to reduce the presence of invasive species on the property and to maintain, as well as improve the natural quality and aesthetics of the land.

# Land Use Map



Data Sources: USDA-NRCS: RIGIS April 2018 Aerial Imagery

0 62.5 125 250 375 500 Feet

Map Date: 11/13/19  
County: Washington *Henry Cabrera*  
Farm #: N/A *3812 Commodore Oliver Perry Hwy*  
Tract #: N/A *South Kingstown, RI 02879*  
Prepared by: Kyle Lemoine, SRICD

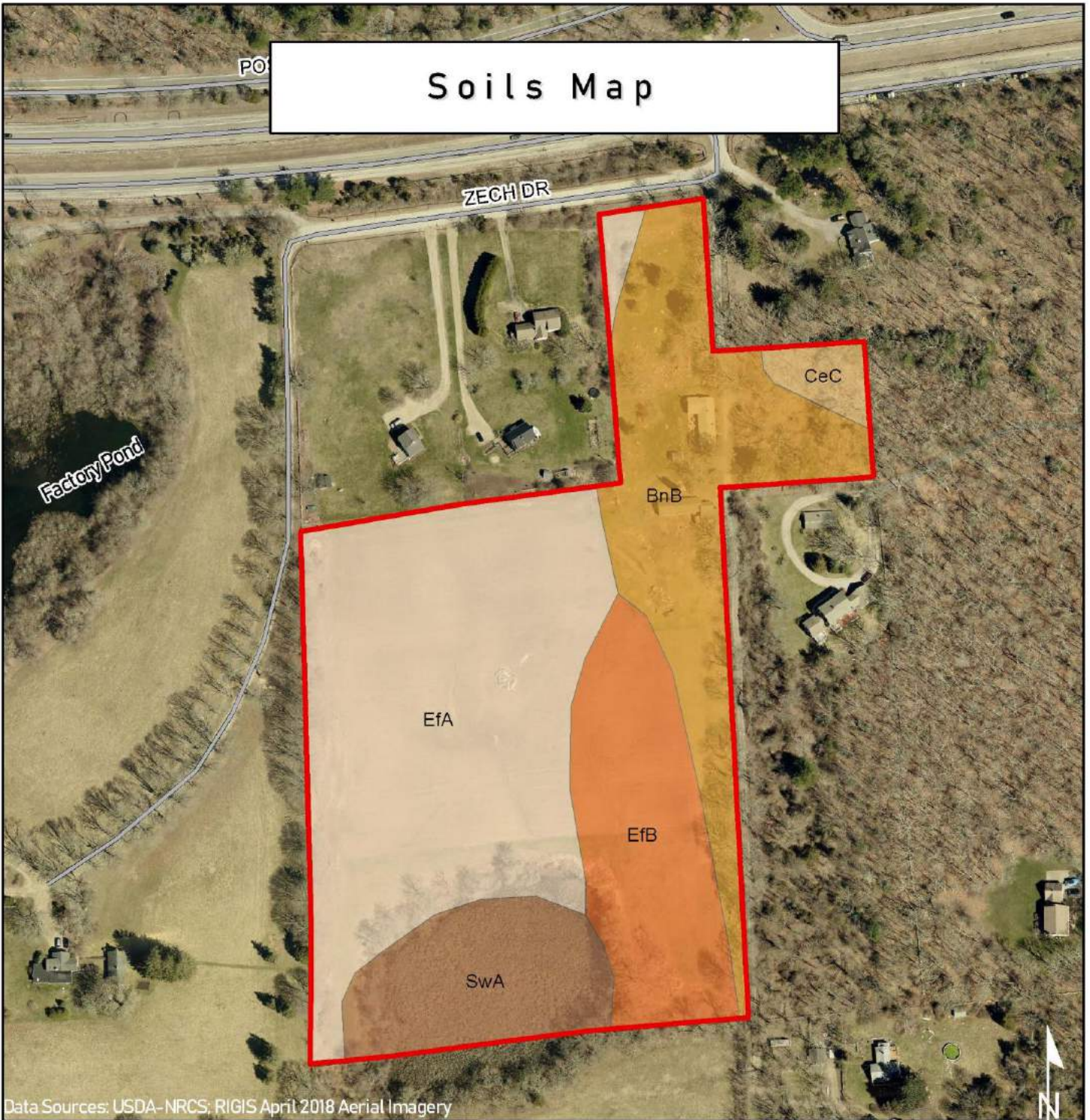
## Legend

- Associated Ag
- Farmstead
- Pasture
- Crop
- Property Boundary
- Roads
- Towns

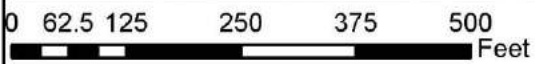


Prepared with assistance from USDA-Natural Resource Conservation Service

# Soils Map



Data Sources: USDA-NRCS; RIGIS April 2018 Aerial Imagery



## Legend

- Property Boundary
  - Roads
  - Towns
- Soil Classification**
- BnB
  - CeC
  - EfA
  - EfB
  - SwA

Map Date: 10/10/19  
 County: Washington *Henry Cabrera*  
 Farm #: N/A *3812 Commodore Oliver Perry Hwy*  
 Tract #: N/A *South Kingstown, RI 02879*  
 Prepared by: Kyle Lemoine, SRICD



Prepared with assistance from USDA-Natural Resource Conservation Service

# Map Unit Description

State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties

[Minor map unit components are excluded from this report]

Map unit: BnB - Bridgehampton-Charlton complex, very stony, 0 to 8 percent slopes

Component: Bridgehampton (60%)

*The Bridgehampton component makes up 60 percent of the map unit. Slopes are 0 to 8 percent. This component is on ground moraines on uplands. The parent material consists of coarse-silty loess over sandy and silty melt-out till derived from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is very high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.*

Component: Charlton (25%)

*The Charlton component makes up 25 percent of the map unit. Slopes are 0 to 8 percent. This component is on uplands, hills. The parent material consists of coarse-loamy melt-out till derived from granite and/or schist and/or gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.*

Map unit: CeC - Canton and Charlton fine sandy loams, 3 to 15 percent slopes, very rocky

Component: Canton, very stony (55%)

*The Canton, very stony component makes up 55 percent of the map unit. Slopes are 3 to 15 percent. This component is on hills on glaciated uplands. The parent material consists of coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist. Depth to a root restrictive layer, strongly contrasting textural stratification, is 19 to 39 inches (depth from the mineral surface is 18 to 34 inches). The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 95 percent. Below this thin organic horizon the organic matter content is about 8 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.*

Component: Charlton, very stony (30%)

*The Charlton, very stony component makes up 30 percent of the map unit. Slopes are 3 to 15 percent. This component is on hills on glaciated uplands. The parent material consists of coarse-loamy melt-out till derived from granite, gneiss, and/or schist. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 95 percent. Below this thin organic horizon the organic matter content is about 10 percent. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria.*

Map unit: Efa - Enfield silt loam, 0 to 3 percent slopes

Component: Enfield (90%)

*The Enfield component makes up 90 percent of the map unit. Slopes are 0 to 3 percent. This component is on terraces on valleys, outwash plains on valleys. The parent material consists of coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 70 percent. Below this thin organic horizon the organic matter content is about 4 percent. Nonirrigated land capability classification is 1. This soil does not meet hydric criteria.*

# Map Unit Description

State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties

Map unit: Efb - Enfield silt loam, 3 to 8 percent slopes

Component: Enfield (90%)

*The Enfield component makes up 90 percent of the map unit. Slopes are 3 to 8 percent. This component is on outwash plains on valleys, terraces on valleys. The parent material consists of coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 70 percent. Below this thin organic horizon the organic matter content is about 4 percent. Nonirrigated land capability classification is 2e. This soil does not meet hydric criteria.*

Map unit: SwA - Swansea muck, 0 to 1 percent slopes

Component: Swansea (80%)

*The Swansea component makes up 80 percent of the map unit. Slopes are 0 to 1 percent. This component is on swamps on outwash plains. The parent material consists of highly decomposed organic material over loose sandy and gravelly glaciofluvial deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is very high. Shrink-swell potential is low. This soil is rarely flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, April, May, June, July, August, September, October, November, December. Organic matter content in the surface horizon is about 65 percent. Nonirrigated land capability classification is 8w. This soil meets hydric criteria.*

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## SECTION 2. FIELD BACKGROUND INFORMATION

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\*The assessed resources listed for each field are those which were identified with the aid of the NRCS Resource Concerns Checklist. The concerns are based upon visual inspections in the field, discussion with the landowner, and by using GIS/resource assessment tools. Those highlighted in **red** are deemed resource concerns of the landowner. Those in **green** are not considered a concern. (To view the complete checklist; See [Section 6.2](#))\*

**Field 1** is a 1.45-acre farmstead. This field hosts the main house, driveway, parking area, and lawn. The dominant soil type within this field is a very stony Bridgehampton-Charlton complex with 0 to 8 percent slopes (BnB).

### Assessed Resource Concerns on Field 1:

An assessment was not conducted for this field as there are no intentions to use, manage, or convert any portion of this field at the current time.

**Field 2** is a 5.56 acre crop field. This field contains a variety of lavender crops, radiating from a center viewing gazebo. Historically, the field has been tilled to produce corn and other row crops. The entire field had been reseeded to establish a cover of grass prior to planting of the lavender. The dominant soil type in this field is an Enfield silt loam with 0 to 3 percent slopes (EfA).

### Assessed resource concerns on Field 2:

#### **Soil Erosion:**

- **Concentrated flow erosion:** Ephemeral gullies are occurring.

*Assessment:*

- Conservation practices and management are in place to prevent or control ephemeral gullies

#### **Insufficient water:**

- **Inefficient use of irrigation water:** PLU is irrigated

*Assessment:*

- The irrigation system components and management meet state specific efficiency criteria

#### **Water quality degradation:**

- **Excessive sediment in surface waters:** Permanent ground cover >90% and slope >10% AND classic gullies are present AND Streams are not on or adjacent to the site

*Assessment:*

- Upslope treatment and buffer practices address concentrated flows to water bodies

**Degraded plant condition:**

- **Excessive plant pest pressure:** Plant productivity is limited from plant pressure.

*Assessment:*

- Plants pests, including noxious and invasive species are NOT managed to meet client objectives

**Field 3** is an approximately 2.64 acre associated agricultural land. This field contains the barn(s) to house livestock and equipment. An open area at the north end of the property is occasionally used to graze the sheep and goats. The main portion of this field is a freshwater scrub/shrub wetland which may have been used as a water source for livestock in the past. The dominant soil type in this field is a Swansea muck with 0 to 1 percent slopes (SwA).

Assessed resource concerns on Field 3:

**Degraded plant condition:**

- **Excessive plant pest pressure:** Plant productivity is limited from plant pressure.

*Assessment:*

- Plants pests, including noxious and invasive species are NOT managed to meet client objectives

**Field 4** is an approximately 2.64 acre pasture. The livestock are allowed to rotationally graze through this field. Moveable fencing is used to layout a single area for the livestock at a time to graze. Water troughs and buckets are provided as water sources for the livestock. The dominant soil types in this field are an Enfield silt loam with 0 to 3 percent slopes (EfA) and an Enfield silt loam with 0 to 8 percent slopes (EfB).

Assessed resource concerns on Field 4:

**Degraded plant condition:**

- **Excessive plant pest pressure:** Plant productivity is limited from plant pressure.

*Assessment:*

- **Plants pests, including noxious and invasive species are NOT managed to meet client objectives**

**Livestock production limitation:**

- **Inadequate feed and forage/shelter/water:** Land is grazed

*Assessment:*

- Livestock forage, roughage and supplemental nutritional requirements are addressed.
- Artificial shelters meet animal needs and client objectives
- Water is of acceptable quantity and quality to meet animal needs

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SECTION 3. RESULTS AND DECISIONS

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3.1 Review of Resource Concerns and Proposed Alternatives

Based upon your objectives, below are the resource concerns identified on your farming operation.

Field #	Resource Concern(s) Identified
2,3,4	Excessive plant pressure

See [Section 6.2](#) for assessment documents used for determinations.

## 3.2 Assessment Summaries

## 3.3 Conservation Practice Recommendations

Below is a list of alternatives that were discussed, that you can implement on your farm to address the resource concern(s) present on the property. NRCS may offer financial assistance to eligible participants for carrying out these practices. The below recommendations can also be implemented by the landowner without financial assistance and by following the BMPs listed in Section 4 of your plan.

### Management Recommendations

<b>Degraded plant condition: Excessive plant pressure</b>
Best Management Practices Brush Management (314)

Based on visual inspections performed on Fields 2, 3 and 4, there is an increasing presence of woody invasives on the property. Autumn olive (*Elaeagnus umbellata*) and oriental bittersweet (*Celastrus orbiculatus*) were both identified primarily along the borders of Fields 2 and 3 and in sections throughout Field 4. Removing invasive species will allow native vegetation to regenerate and ultimately form a more diverse and resilient plant community, as well as provide a greater variety of wildlife habitat. Removal and management can incorporate all or a selection of mechanical, chemical, and biological control methods. **Brush Management (314)** is an NRCS practice that provides financial assistance for the removal or management of woody plants which are invasive or noxious. **Please note, NRCS will only offer financial assistance on this practice for associated agricultural land, forest, and pasture, but not on active cropland.** Any brush management on Field 2 will have to be conducted without NRCS financial assistance. If you so wish to conduct the management yourself, please refer to [Section 6.3](#) for additional informational sheets and resource documents pertaining to management of the identified woody species. The following resources can also provide further information on identifying species of importance as well as basic management of them:

- <https://www.nativeplanttrust.org/conservation/invasive/>
- <https://www.invasive.org/index.cfm>



Figure 1: Vegetated ephemeral gully in Fields 2 & 3

Evidence of ephemeral gullies were observed through Fields 2 and 3, although they were well vegetated at the time of inspection. Even though this was the first year after the establishment of grass, runoff appeared to be minimal and controlled. Monitoring of the gullies should be done regularly to make sure vegetation remains and that no additional erosion or widening of the gully is occurring.

At the time of inspection, the freshwater shrub wetland located at the lower center of the property was not being used for any agricultural purposes. It was believed the wetland may have been used for a water source either for crops or livestock in the past. If there are any intentions to use this source of water again for agricultural purposes, it is recommended to seek out advice from the Rhode Island Department of Environmental Management, Division of

Agriculture. Guidance will be provided if there is a need to acquire an agricultural wetlands permit or not.

A final recommendation would pertain to increasing the forage quality of the pasture areas. Current management and rotations of the livestock between sections of the pasture(s) appear to work sufficiently. Although, based on a quick visual inspection, the diversity and quality of species in the fields can be improved. A full assessment of the pastures has not been conducted, nor has there been a completed soil test to determine nutrient levels. If there is an intention to improve the forage quality in the future, it is suggested to have both of these items completed. Keep in mind your local Conservation district or NRCS office can aid you in fulfilling these tasks if need be.

### 3.4 Conservation Plan Map

The following map is provided as a general recommendation for the location and timing of installation for the suggested practices. If decided to seek a contract through NRCS programs to fulfill the practices, a more detailed schedule of operations will be formed with job specifications and an exact acreage can be calculated.

# Conservation Practices Map

Factory Pond

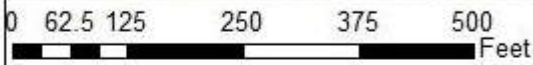
POS

POST RD

ZECH DR

(314)  
Fields 1,3,4  
2.67 Ac

Data Sources: USDA-NRCS: RIGIS April 2018 Aerial Imagery



### Legend

- Property Boundary
- Roads
- Towns
- Brush Management (NRCS Practice 314)

Map Date: 11/13/19  
County: Washington  
Farm #: N/A  
Tract #: N/A  
Prepared by: Kyle Lemoine, SRICD

*Henry Cabrera*  
3812 Commodore Oliver Perry Hwy  
South Kingstown, RI 02879



## 4.1 Soil Management

### **Introduction**

Soil management encompasses all operations, practices, and treatments used to protect soil and enhance its performance. Every aspect of a farm is related and dependent on its soil, so preventing erosion and improving soil quality should be the highest priority on all farms. Healthy soils allow the infiltration and storage of water, cycle nutrients, support high crop yields, trap and degrade pesticides and toxins, suppress pests and weeds, and resist many natural erosive forces. Unfortunately, soil quality and health are relatively fragile and degrades quickly when stressful or destructive farming practices are maintained over a period of time. Degraded, unhealthy soils may exhibit poor soil structure, instability and compaction, less organic matter, reduced water and nutrient cycling, and become highly erosive. In order to achieve crop yield potentials, many farms offset poor soil performance with costly inputs of fertilizer, pesticides, and frequent aggressive tillage practices; resulting in the potential for contaminated runoff and water quality impairments.

### **Environmental Concerns**

Soil management is extremely important because farms utilize many acres of the land base. As soil health decreases, runoff concerns increase. Soil erosion from farmland can carry sediments, nutrients, pesticides and potentially pathogens to surface waterbodies, degrading water quality. Concentrations of nutrients, especially nitrogen and phosphorus, can threaten aquatic habitats and contaminate drinking water supplies. Erosion of agricultural lands also contributes to the sedimentation of ditches, culverts, stream channels and shortens the life of ponds, reservoirs, and lakes. Stream corridors and floodplains may become unstable if farms till, crop, or pasture livestock too close to the stream banks; buffering vegetation and root structures are removed. Implementing proper soil management practices may eventually improve soil health and stability, thus decreasing runoff concerns and potentially threats to water quality.

### **Best Management Practices**

Minimize Soil Erosion:

- Use conservation tillage practices or reduced tillage practices.
- Spring tillage, contour tilling and planting, strip cropping, and water control structures.

- Cover crops, mulches, or crop residues.
- Managed livestock grazing and access.
- Minimize Soil Compaction.
- Control equipment access and weight loads.
- Managed livestock grazing and access.
- Adopt appropriate crop rotations and cover crops.

#### Minimize Soil Contamination:

- Apply nutrients and other chemicals according to soil test recommendations, a nutrient management plan, a CNMP, regulations, or specifications.
- Monitor soils with appropriate soil tests.
- Maintain Buffer Zones.
- Tillage setbacks and permanent vegetative buffers.
- Restrict equipment and livestock access.

#### More Information:

##### Soil Health:

<https://nevegetable.org/cultural-practices/soil-health>

<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health/>

##### Crop Rotation:

<https://nevegetable.org/cultural-practices/crop-rotation>

## 4.2 Water Supply

### Introduction

Preventing well water and spring development contamination should be a priority concern for every farm. The condition of a well or spring and its proximity to potential sources of contamination determine the risk posed to the quality of the water. When the risk is high, there is a high probability that well water could become contaminated. The outcome of a well becoming contaminated can be serious as water quality is often threatened by pathogens or chemical contamination which could have severe impacts on human or animal health. If a

drinking water supply becomes contaminated, remediating contaminated water supplies can be extremely difficult and be very costly. It is in the best interest of the farm to be proactive when it comes to protecting farmstead water supplies, as well as, preventing contamination of neighboring wells. Agricultural best management practices should be carried out so as to prevent potential agricultural pollutants from impacting drinking water sources.

### **Environmental Concerns**

Harmful bacteria and chemicals can enter well water and springs by surface water. Surface water can transport these contaminants in runoff which can then percolate through the ground to the aquifer. The runoff can also pool in catchment areas, seep down the edges of the well or into cracks in the casing, directly contaminating well water. Current regulations for well construction have several measures to prevent this pathway so; in general, older wells may be more susceptible to this path of contamination. Contamination of wells and springs can occur if separation distances from other possible sources are not met. These sources can include: septic tanks and septic leach fields, livestock yards and silos, petroleum tanks, manure storages, and agri-chemical storage and handling facilities. Consuming contaminated drinking water can have very serious health impacts to humans and animals. For example, excessive amounts of nitrate (source – fertilizers, manure) can cause the blood to be unable to carry sufficient oxygen to individual body cells. This condition is most common in young children and can be known as “blue baby syndrome”. Drinking water that has been contaminated with disease causing bacteria (source – wildlife, pet, livestock excrement) can cause gastrointestinal illnesses in people/animals and pose an even greater risk to young children and the elderly who have a higher probability of being seriously affected.

### **Best Management Practices**

- Identify and document all water supplies on the farmstead, as well as, any wells located on neighboring properties adjacent to farm fields or potential sources of pollution.
- Ensure new wells are located upslope from potential pollution sources and appropriate separation distances are maintained.
- Maintain the well casing, well cap, and surface material around the well casing to prevent contaminants from entering water supply.
- Regularly test water supply for bacteria and nitrates and conduct regular inspections of the plumbing system.
- Properly decommission any unused or abandoned wells.

- For dug wells, driven point wells, or springs: Exclude livestock and surface water from all catchment areas, secure all covers, overflow pipes, and vent screens.

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## SECTION 5. REFERENCES

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- 1) Rhode Island General Laws 44-27
- 2) RIDEM publication, Citizen's Guide To Farm, Forest And Open Space Act, Revised January 2003
- 3) NRCS GM-180-409
- 4) New York State Soil & Water Conservation Committee, Agricultural Environmental Management (AEM) Program. The AEM planning process is based on well-established environmental planning processes. Environmental protection measures are based on scientific principles and research. Website - <https://www.nys-soilandwater.org/aem/aemcc.html>

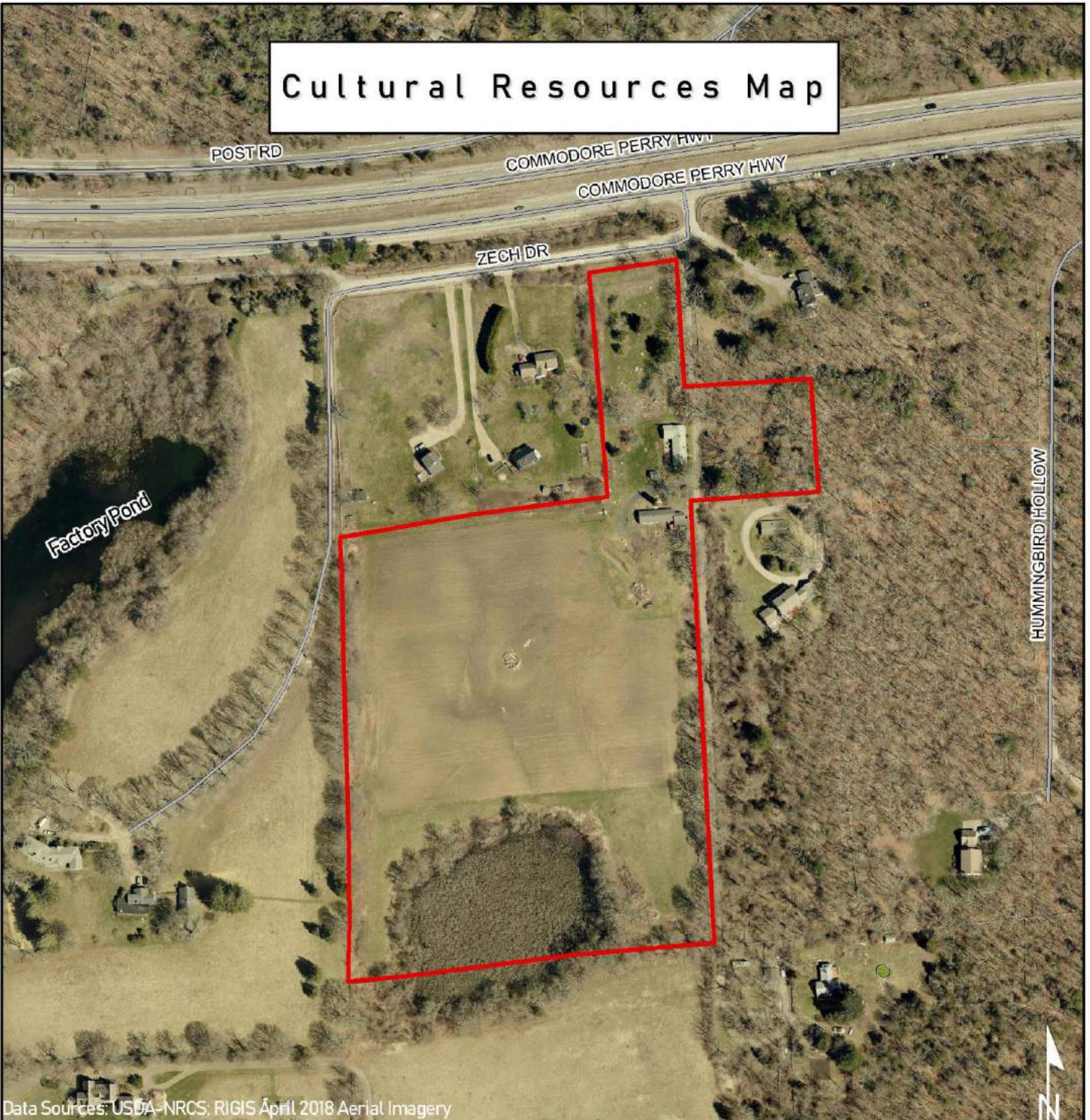
## 6.1 Associated Plan Maps

### **Cultural Resources Map**

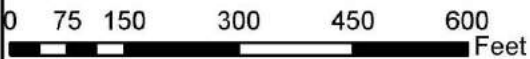
The Cultural Resources map is comprised of the following data:

- CULT\_Historic\_Districts - RIGIS, 1995. Historic Districts in Rhode Island: This data represents approximate locations of registered historic districts and properties listed on the National Register of Historic Places.
- CULT\_Historic\_Candidate\_Sites - RIGIS, 1992. Historic Candidate Sites of Rhode Island: This data represents Historic sites in RI that are significant but not listed on the National Register of Historic Places by the RI Historic Preservation & Heritage Commission.
- CULT\_Historic\_Sites - RIGIS, 1995. Historic Sites of Rhode Island: This data represents Historic site point building property or monument listed on the National Register of Historic, Places by the RI Historic Preservation & Heritage Commission.

# Cultural Resources Map



Data Sources: USDA-NRCS: RIGIS April 2018 Aerial Imagery



Map Date: 10/10/19  
 County: Washington *Henry Cabrera*  
 Farm #: N/A *3812 Commodore Oliver Perry Hwy*  
 Tract #: N/A *South Kingstown, RI 02879*  
 Prepared by: Kyle Lemoine, SRICD

## Legend

-  Property Boundary
-  Historic\_Districts
-  Historic\_Candidate\_Sites
-  Historic\_Sites
-  Historical\_Cemeteries
-  Roads
-  Towns



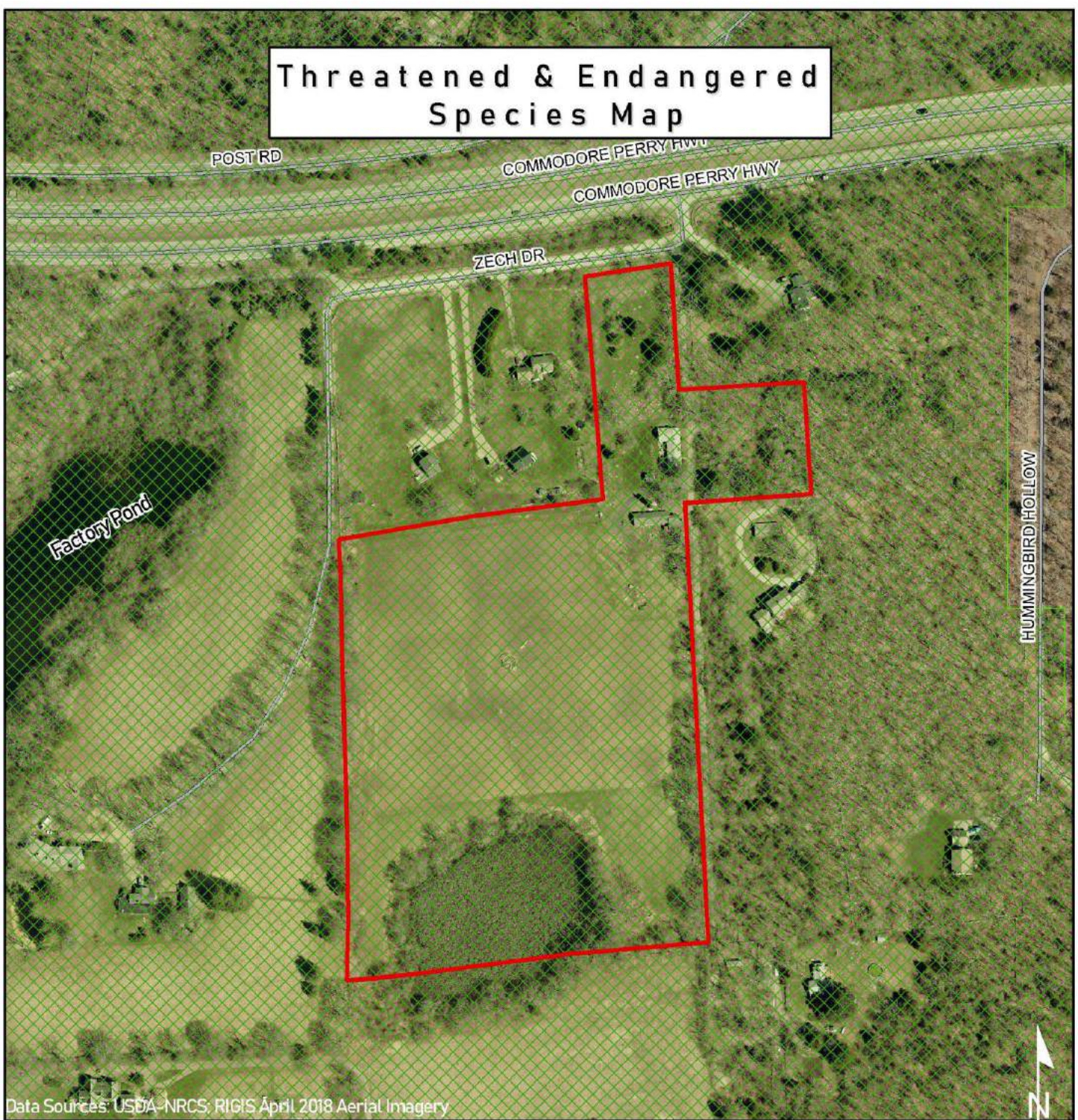
Prepared with assistance from USDA-Natural Resource Conservation Service

## **Threatened and Endangered Species Map**

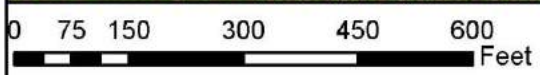
The Threatened and Endangered Species map is comprised of the following data:

- **BIO\_Natural\_Heritage\_Areas - RIGIS, 2016.** Rhode Island Natural Heritage Areas: This data represents observations of a community or nesting site of State or Federally listed rare or threatened species OR species deemed noteworthy by the State. Dataset was developed as an aid in the identification and protection of plant and animal species listed in the RI Natural Heritage Data.

# Threatened & Endangered Species Map



Data Sources: USDA-NRCS, RIGIS April 2018 Aerial Imagery



Map Date: 10/10/19  
 County: Washington  
 Farm #: N/A  
 Tract #: N/A  
 Prepared by: Kyle Lemoine, SRICD

*Henry Cabrera*  
 3812 Commodore Oliver Perry Hwy  
 South Kingstown, RI 02879

- Legend**
- Property Boundary
  - T&E
  - Roads
  - Towns



## Agricultural Soils Map

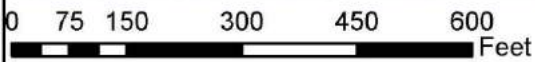
The Agricultural Soils Map identifies those lands in Rhode Island that have a combination of physical and chemical features that make them best suited for farming. These “Important Farmlands” are subdivided into: 1) “Prime Farmlands” which are the best soils for agricultural use, and 2) “Additional Farmlands of Statewide Importance” which are other soils that are less well suited for intensive farming but are still valuable for many enterprises.

- *Prime Farmland* is land that has the best combination of physical and chemical characteristics for producing food, forage, fiber, and oilseed crops, and is also available for these uses. It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods.
- *Additional Farmland of Statewide Importance* is land, in addition to prime and unique farmland, that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Criteria for defining and delineating this land are to be determined by the appropriate state agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce as high a yield as prime farmlands if conditions are favorable.

# Prime & Unique Farmland Soils Map



Data Sources: USDA-NRCS, RIGIS April 2018 Aerial Imagery



Map Date: 10/10/19  
 County: Washington *Henry Cabrera*  
 Farm #: N/A *3812 Commodore Oliver Perry Hwy*  
 Tract #: N/A *South Kingstown, RI 02879*  
 Prepared by: Kyle Lemoine, SRICD

## Legend

Property Boundary

## Prime and Unique Farmlands

Prime

State Important

Roads

Towns



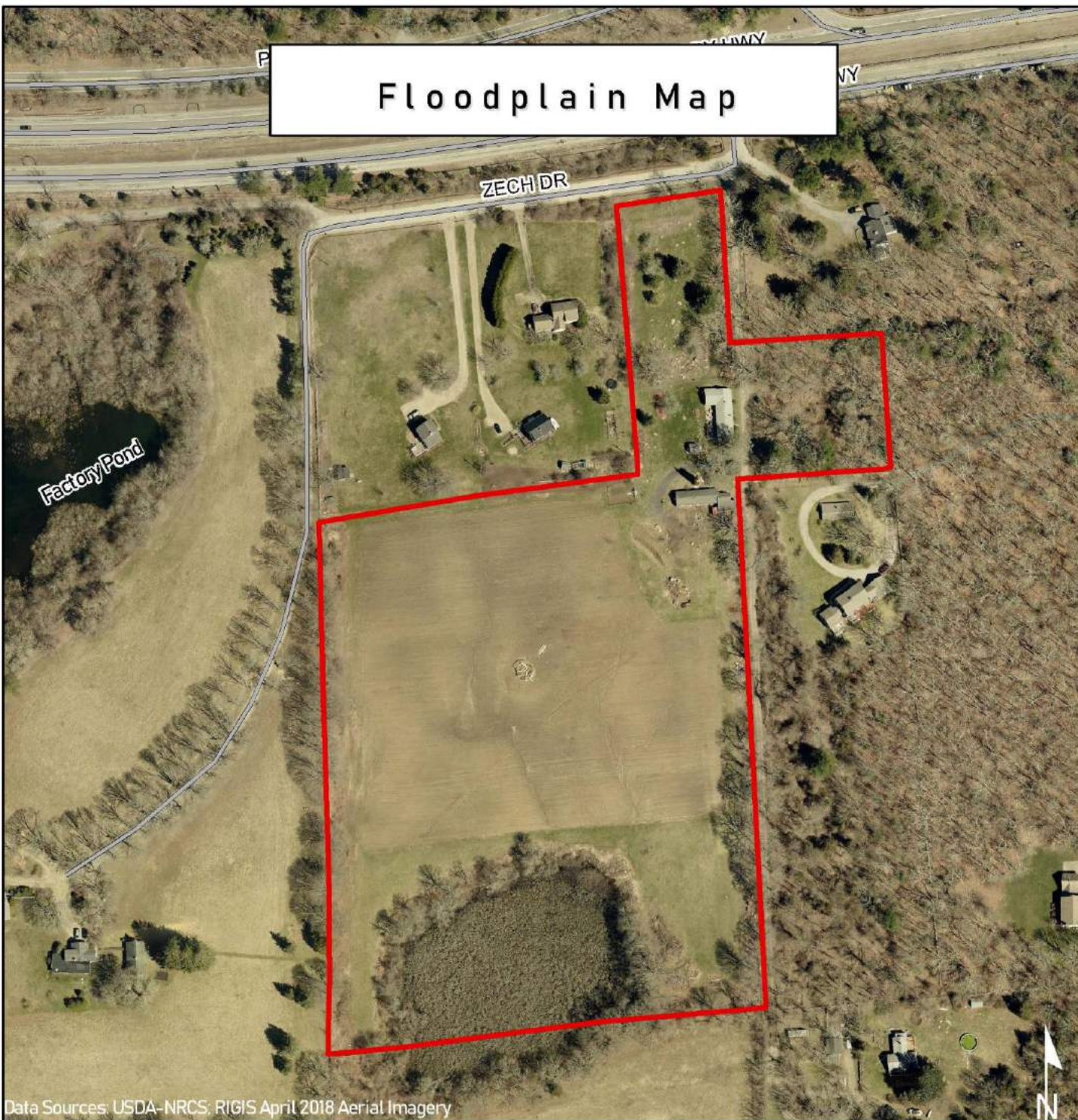
Prepared with assistance from USDA-Natural Resource Conservation Service

## **Floodplain Map**

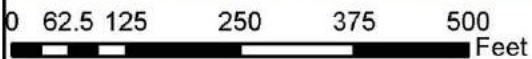
Statewide flood hazard areas compiled from county-based Digital Flood Insurance Rate Map (DFIRM) databases for Rhode Island. The Digital Flood Insurance Rate Map (DFIRM) Database depicts flood risk information and supporting data used to develop the risk data. This dataset provides the user with information on the flood risk hazard zones throughout the state of Rhode Island. The data is also useful in determining when management decisions should be mitigated for purposes of natural resources management. The Floodplain map is comprised of the following data:

- Flood Hazard Areas - RIGIS, 2015. Statewide Digital Flood Insurance Rate Map Database (DFIRM); DFIRM\_Statewide15: This data represents Statewide flood hazard areas compiled from county-based Digital Flood Insurance Rate Map (DFIRM) databases for Rhode Island.

# Floodplain Map



Data Sources: USDA-NRCS: RIGIS April 2018 Aerial Imagery



## Legend

Property Boundary

## Washington County - Flood Hazard Area

### Flood Zone

- A - High Risk - Areas subject to inundation by the 1% annual-chance flood event
- AE - High Risk - Areas subject to inundation by the 1% annual-chance flood event
- VE - High Risk - Coastal areas subject to inundation by the 1% annual-chance flood event
- Roads
- Towns

Map Date: 10/10/19

County: Washington

Farm #: N/A

Tract #: N/A

Prepared by: Kyle Lemoine, SRICD

*Henry Cabrera*

*3812 Commodore Oliver Perry Hwy*

*South Kingstown, RI 02879*



### **Terrain Analysis Maps 1-3**

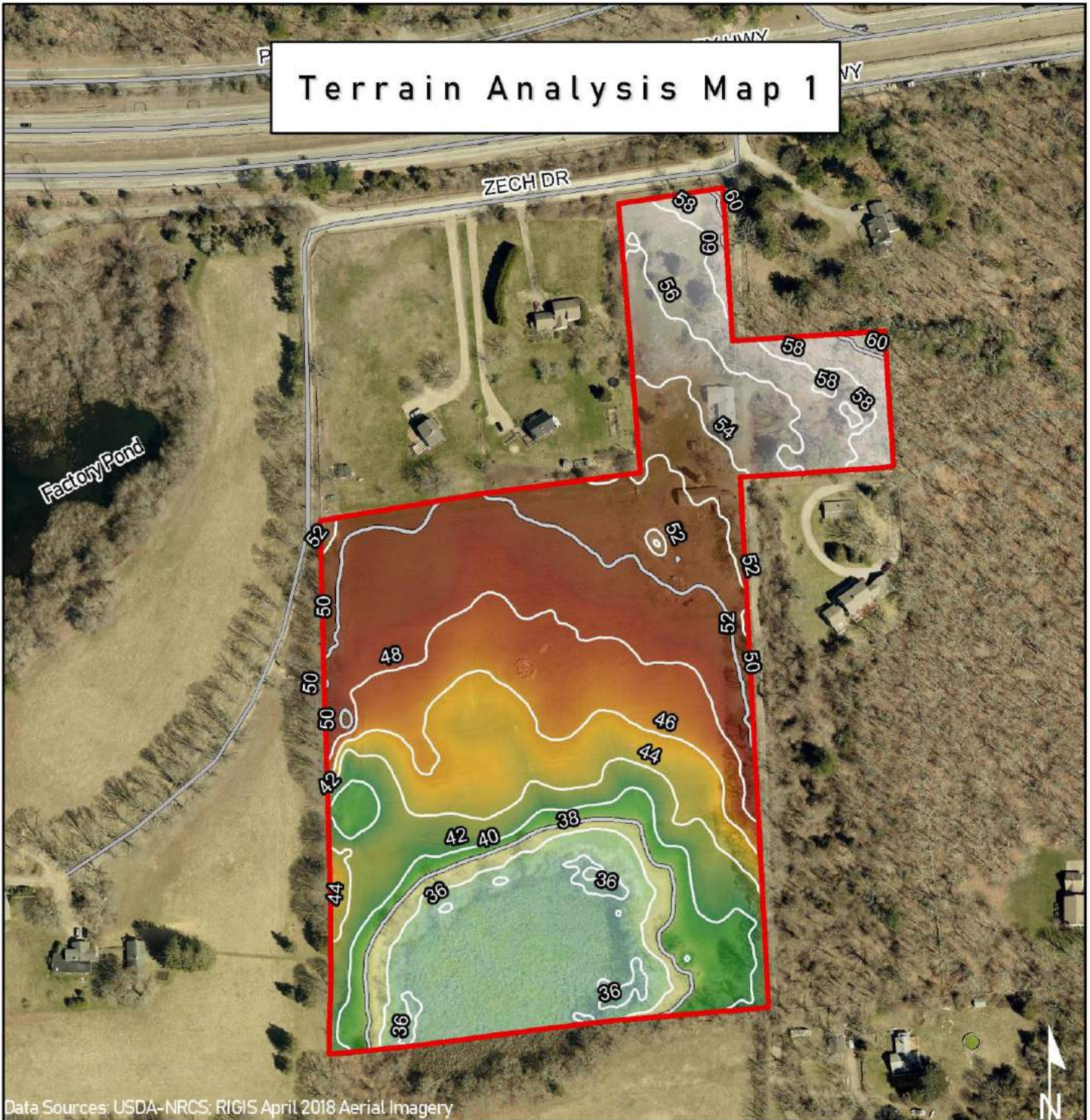
For environmental planning to proceed, an inventory of the properties of the surface environments are made. Proper terrain analysis is essential to successful planning. Planners analyze relevant data and modify their plan based on this evaluation of data and in regards to the specific situation. These maps are derived from Rhode Island county Digital Elevation Model (DEM) utilizing NRCS Engineering Tools which is a set of tools developed for experienced ArcGIS users of LiDAR data to aid in hydrologic and terrain analysis.

#### **Terrain Analysis Map 1**

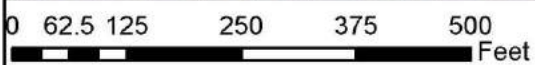
The Terrain Analysis Map 1 is comprised of the following data:

- Digital Elevation Model (DEM): A digital elevation model (DEM) is a digital model or 3D representation of a terrain's surface.
- Contour data: Contour line data created which are based on the elevation data of your DEM. May be created at different intervals such as two-foot contours or 10 foot contours.

# Terrain Analysis Map 1



Data Sources: USDA-NRCS: RIGIS April 2018 Aerial Imagery



Map Date: 10/10/19  
 County: Washington  
 Farm #: N/A  
 Tract #: N/A  
 Prepared by: Kyle Lemoine, SRICD

*Henry Cabrera*  
 3812 Commodore Oliver Perry Hwy  
 South Kingstown, RI 02879

### Legend

- Property Boundary
- Roads
- Towns
- Index Contour

### DEM

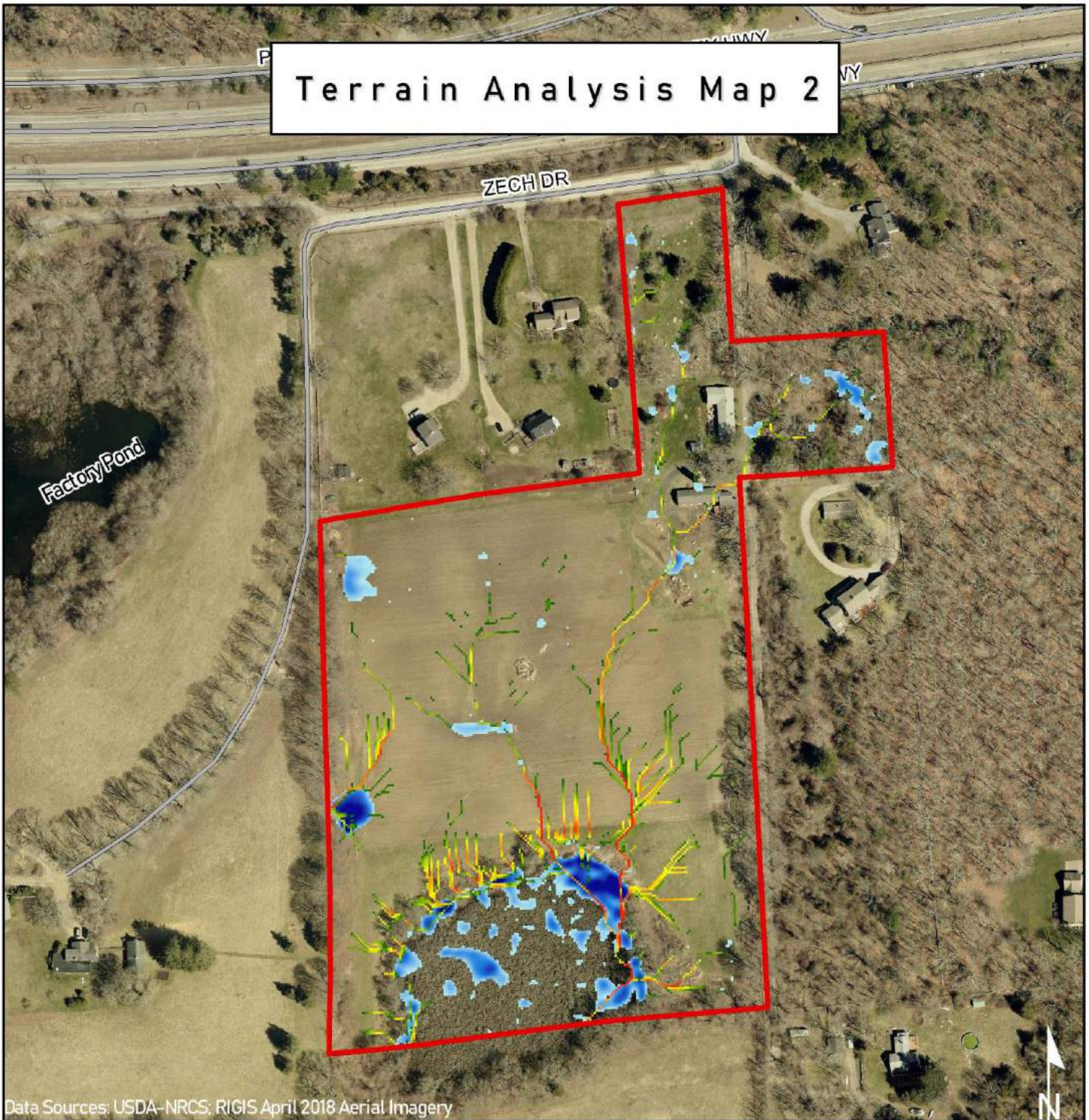


## **Terrain Analysis Map 2**

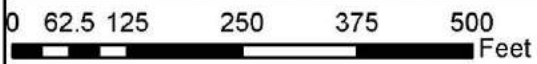
The Terrain Analysis Map 2 is comprised of the following data:

- **Stream Power Index (SPI):** The stream power index is the product of catchment area and slope and could be used to identify suitable locations for soil conservation measures to reduce the effect of concentrated surface runoff.
- **Streams:** Creates a linear stream network. This is not to be confused with a river or stream. This data layer indicates where water has the tendency to accumulate. This data is useful to indicate where runoff converges and there is the potential for concentrated flow such as an ephemeral gully.
- **Depth Grid:** Indicates areas on the landscape where water would likely migrate and pond due to the elevations derived from the DEM.

# Terrain Analysis Map 2



Data Sources: USDA-NRCS; RIGIS April 2018 Aerial Imagery



### Legend

Property Boundary Roads

Stream Power Index (SPI) Towns

### Value

High : 3.37914

Low : 0.00016

### DepthGrid

High : 0.33104

Low : 2.86102e-006

Map Date: 10/10/19

County: Washington

Farm #: N/A

Tract #: N/A

Prepared by: Kyle Lemoine, SRICD

*Henry Cabrera*

*3812 Commodore Oliver Perry Hwy*

*South Kingstown, RI 02879*



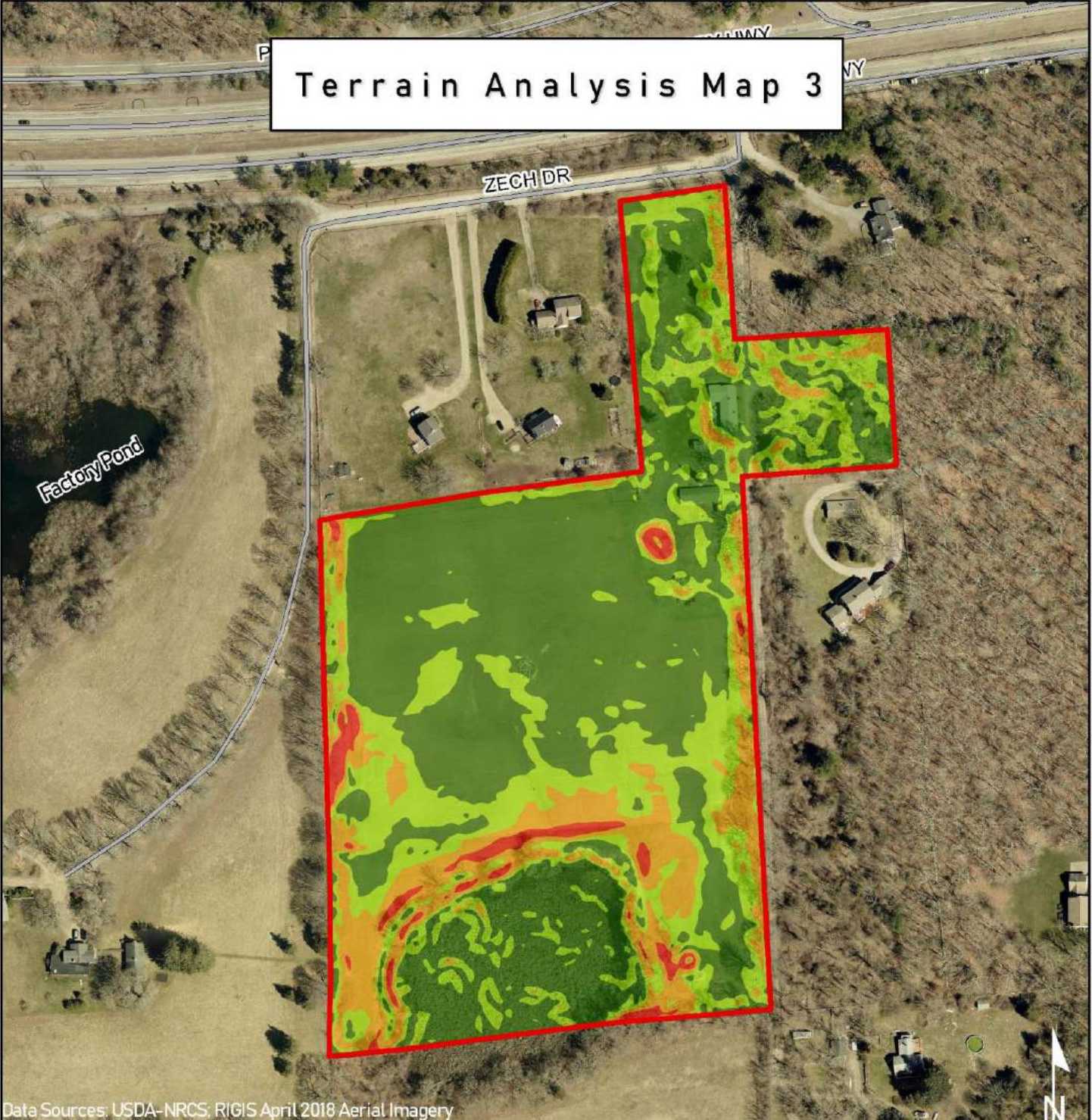
Prepared with assistance from USDA-Natural Resource Conservation Service

### **Terrain Analysis Map 3**

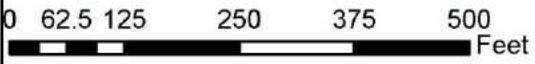
The Terrain Analysis Map 3 is comprised of the following data:

- Slope: Slope Calculation from Contour Lines in a Topographic Map. Slope is the measure of steepness or the degree of inclination of a feature relative to the horizontal plane.

# Terrain Analysis Map 3



Data Sources: USDA-NRCS; RIGIS April 2018 Aerial Imagery



Map Date: 10/10/19  
 County: Washington  
 Farm #: N/A  
 Tract #: N/A  
 Prepared by: Kyle Lemoine, SRICD

*Henry Cabrera*  
 3812 Commodore Oliver Perry Hwy  
 South Kingstown, RI 02879

### Legend

- Property Boundary
- 0 - 3%
- 3 - 6%
- 6 - 12%
- > 12%
- Roads
- Towns

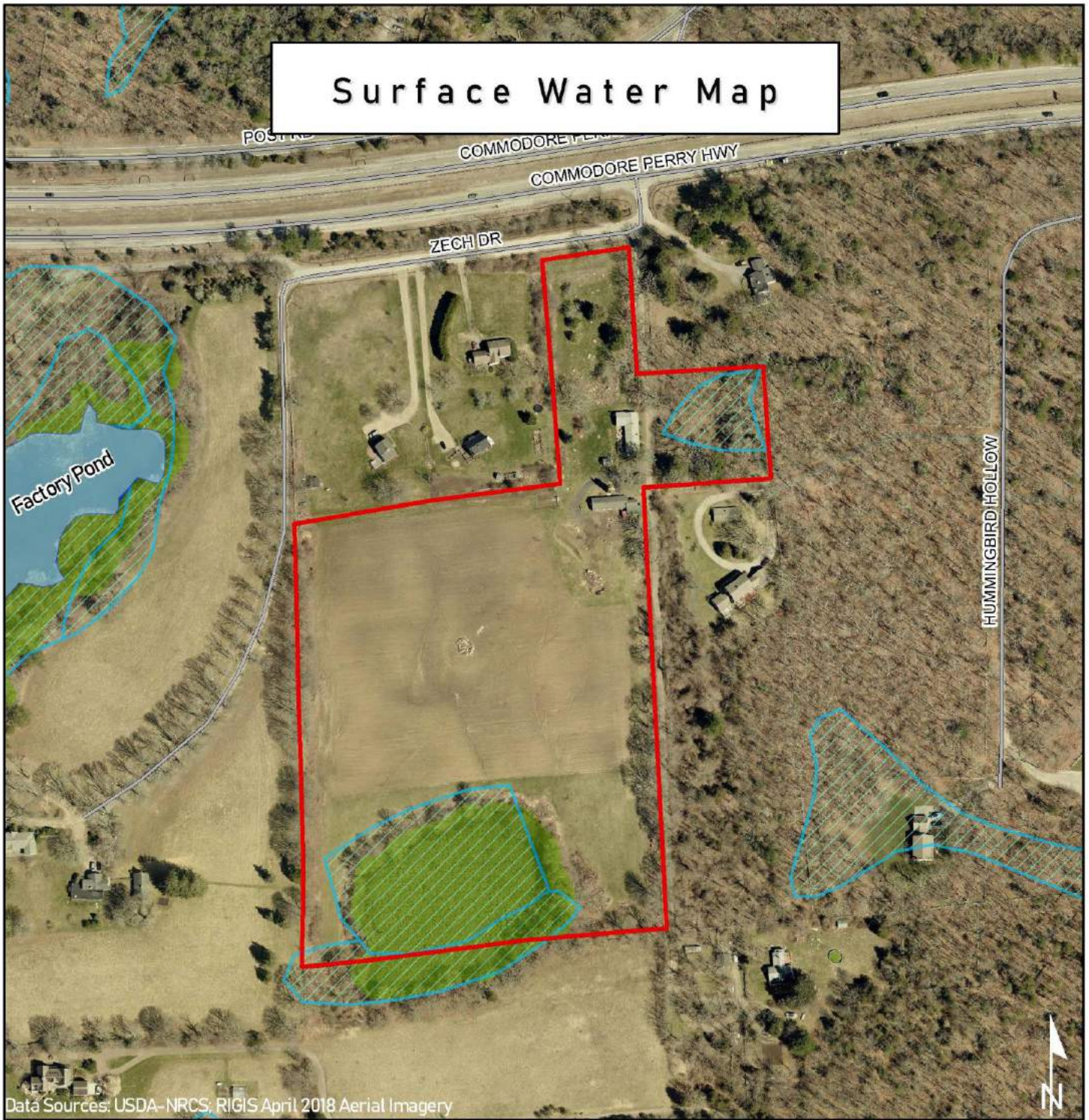


## Hydrology Map

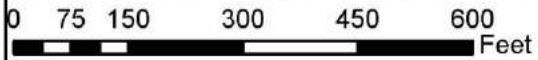
For environmental planning to proceed, an inventory of the properties for hydrology are made. Proper analysis is essential to successful planning. Planners analyze these data, evaluate the environmental impacts, and the significance of those impacts and modify their plan based on this evaluation of data and the situation. The Hydrology Map is comprised of the following data:

- Freshwater Rivers and Streams (1:5,000) (aka – Streams\_5k) - This data represents Rhode Island Statewide inventory and mapping of freshwater Rivers and Streams.
- BIO\_NWI\_Wetlands\_2014 - National Wetland Inventory (NWI) for Rhode Island Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service. This data set represents the extent, approximate location and type of wetlands and deepwater habitats in Rhode Island. These data delineate the areal extent of wetlands and surface waters as defined by Cowardin et al. (1979).
- Wetlands – RIGIS, 1993. This layer portrays mapped wetlands as interpreted from the 1988 aerial photography to one quarter acre polygon resolution by Cowardin 16 classification scheme, for the use in natural resource inventory and land use planning.
- Rivers & Lakes IWQMA(2012) – This data represents two datasets for rivers/streams and lakes/ponds which are included in the State’s Integrated Water Quality and Assessment Report required under provisions of the US Clean Water Act. The RI Department of Environmental Management, Office of Water Resources has developed this document to provide information on RI water quality. Special resource protection waters have also been portrayed separately from these datasets.

# Surface Water Map



Data Sources: USDA-NRCS; RIGIS April 2018 Aerial Imagery



Map Date: 10/10/19  
 County: Washington  
 Farm #: N/A  
 Tract #: N/A  
 Prepared by: Kyle Lemoine, SRICD

*Henry Cabrera*  
 3812 Commodore Oliver Perry Hwy  
 South Kingstown, RI 02879

### Legend

#### NWI (2014)

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

- RIGIS Wetlands (1993)
- Roads
- Streams5k
- Property Boundary
- Towns



## Groundwater Resources Map

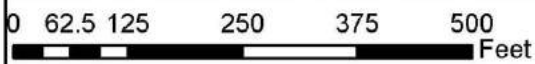
The Groundwater Resources Map is comprised of the following data:

- **Watershed of a Public Drinking Water Supply:** This layer is based upon RIGIS Surface Water Protection Area data and shows whether the property is located in a watershed of drinking water supply reservoir including tributaries. These are drainage areas that contribute to drinking water.
- **1000 ft. Buffer 303D Listed Waters:** This layer is based upon the 2014 list of impaired waters in Rhode Island. This information shows whether the farming operation is located within 1000 feet of an impaired waterbody.
- **Community Wellhead Protection Area:** This layer was delineated based on input from the Wellhead Protection Program Advisory Committee, analytic modeling, hydrogeologic mapping, and by using the US Geological Survey quadrangle maps at a scale of 1:24,000. This information shows an overview of areas intended to be protected for the safety of public wells sourced by groundwater in Rhode Island.
- **Groundwater Recharge Areas:** This dataset is intended to provide an overview of areas to be protected drinking water sources in Rhode Island. These areas hold high value for surface water to be recharged to a well or aquifer.

# Groundwater Map



Data Sources: USDA-NRCS; RIGIS April 2018 Aerial Imagery



Map Date: 10/10/19  
 County: Washington  
 Farm #: N/A  
 Tract #: N/A  
 Prepared by: Kyle Lemoine, SRICD

*Henry Cabrera*  
 3812 Commodore Oliver Perry Hwy  
 South Kingstown, RI 02879

- Legend**
- Property Boundary
  - GW Recharge**
  - Positive
  - Wellhead Protection Area
  - Groundwater Reservoirs
  - 303D Drinking Water Reservoirs (1000)
  - Roads
  - Towns



## 6.2 Assessment Documents

## Resource Concerns Checklist

Client <u>Henry Cabrera</u>	Land Units <u>Fields 1, 2, 3, 4</u>
Location <u>3812 Commodore Oliver Perry Hwy, South Kingstown, RI</u>	<input checked="" type="checkbox"/> Land Uses <input checked="" type="checkbox"/> Crop <input type="checkbox"/> Pasture <input type="checkbox"/> Range <input type="checkbox"/> Forest <input type="checkbox"/> Farmstead <input type="checkbox"/> Assoc Ag Land <input type="checkbox"/> Designated Protected Area <input type="checkbox"/> Developed Land <input type="checkbox"/> Water <input type="checkbox"/> Other Rural Land

This check sheet is designed to assist planners and clients in identifying resource concerns during the planning process. The planning criteria outlined in Section III of the FOTG sets the minimum level of treatment. If a screening question is TRUE, this indicates no resource concern exists and no assessment is required. If a screening question is FALSE, the assessment must be completed to evaluate if there is a resource concern. If the Assessment is TRUE, Planning Criteria is met. If the Assessment is FALSE, the Planning Criteria is not met and a Resource Concern exists.

If there is no screening question, go directly to assessment. If the Resource Concern is a Client Identified Objective (in effect the client wishes to exceed planning criteria), the concern will be required to be evaluated in the planning process.

Resource Concern	Land Use *Required	Component	Screening True not a concern, False or no question go to assessment	<input checked="" type="checkbox"/> T	<input checked="" type="checkbox"/> F	Assessment Level True not a concern, False is a resource concern	<input checked="" type="checkbox"/> T	<input checked="" type="checkbox"/> F	Resource Concern?	Client Objective?	Tract/Land Unit with concern
SOIL EROSION - Sheet, rill, & wind erosion	• Crop* • Developed Land* • Farmsteads* • Associated Ag Land* • Designated Protected Area* • Other Rural Land* • Pasture*	Sheet & Rill	Permanent ground cover > 90% and slope < 10%	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Water erosion rate ≤ T	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Wind				Wind erosion rate ≤ T	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Forest*	Sheet & Rill	Soil surface organic residue cover > 80%	<input type="checkbox"/>	<input type="checkbox"/>	Site is stable and without visible signs of erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Wind	Meets State established criteria.	<input type="checkbox"/>	<input type="checkbox"/>	RHA - soil site stability - slight to moderate or less OR Rangeland Planned Trend is positive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
SOIL EROSION - Concentrated flow erosion	• Crop*	Ephemeral gullies		Ephemeral gullies are not occurring	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Conservation practices and managements are in place to prevent or control ephemeral gullies	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Classic gullies	Classic gullies are not present	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Classic gully management is adequate to stop the progression of head cutting and widening and are offsite impacts are minimized by vegetation and/or structures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Forest* • Farmsteads* • Pasture* • Range* • Developed Land* • Associated Ag Land* • Designated Protected Area* • Other Rural Land*	Classic gullies	Classic gullies are not present	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Classic gully management is adequate to stop the progression of head cutting and widening and are offsite impacts are minimized by vegetation and/or structures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
SOIL EROSION - Excessive bank erosion from streams shorelines or water conveyance channels	• Crop* • Forest • Range* • Developed Land* • Associated Ag Land* • Designated Protected Area* • Water* • Other Rural Land* • Farmsteads*		Streams, shoreline or channels are not on or adjacent to site	<input checked="" type="checkbox"/>	<input type="checkbox"/>	For shorelines and water conveyance channels; banks are stable or commensurate with normal geomorphological processes AND If bank erosion is present, it is beyond the client's control or commensurate with normal geomorphological processes AND For streambanks; SVAP2 bank condition element score >=5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Pasture*					Bank erosion is beyond the client's control or commensurate with normal geomorphological processes AND PCS - streambank / shoreline erosion element score ≥ 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
SOIL QUALITY DEGRADATION - Subsidence	• Crop • Forest • Associated Ag Land • Designated Protected Area • Pasture		Histisol soils are not present OR Histisols soils are not exhibiting subsidence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Subsidence is adequately managed to meet client's objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
SOIL QUALITY DEGRADATION - Compaction	• Crop • Forest • Associated Ag Land • Designated Protected Area • Other Rural Land		Soil compaction is not a problem	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Compaction is managed to meet Client's production and management objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Pasture		AND	PCS - compaction element score ≥ 4	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Range		Activities do not cause soil compaction problems	<input type="checkbox"/>	<input type="checkbox"/>	RHA - soil site stability - slight to moderate or less OR Compaction is managed to meet Client's production and management objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

## Resource Concerns Checklist

This check sheet is designed to assist planners and clients in identifying resource concerns during the planning process. The planning criteria outlined in Section III of the FOTG sets the minimum level of treatment. If a screening question is TRUE, this indicates no resource concern exists and no assessment is required. If a screening question is FALSE, the assessment must be completed to evaluate if there is a resource concern. If the Assessment is TRUE, Planning Criteria is met. If the Assessment is FALSE, the Planning Criteria is not met and a Resource Concern exists.

If there is no screening question, go directly to assessment. If the Resource Concern is a Client Identified Objective (in effect the client wishes to exceed planning criteria), the concern will be required to be evaluated in the planning process.

Resource Concern	Land Use *Required	Component	Screening True not a concern, False or no question go to assessment	<input type="checkbox"/> T <input type="checkbox"/> F	<input type="checkbox"/> T <input type="checkbox"/> F	Assessment Level True not a concern, False is a resource concern	<input type="checkbox"/> T <input type="checkbox"/> F	<input type="checkbox"/> T <input type="checkbox"/> F	Resource Concern?	Client Objective?	Tract/Land Unit with concern
SOIL QUALITY DEGRADATION – Organic matter depletion	• Crop*		Permanent ground cover > 80%	<input type="checkbox"/>	<input type="checkbox"/>	SCI > 0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Pasture			<input type="checkbox"/>	<input type="checkbox"/>	SCI > 0 OR [PCS - plant cover element score ≥ 4 AND PCS - plant residue element score ≥ 4 ]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Range			<input type="checkbox"/>	<input type="checkbox"/>	[RHA - soil site stability slight to moderate or less AND RHA – biotic integrity attribute rating slight to moderate departure or less] OR Rangeland Planned Trend positive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Forest			<input type="checkbox"/>	<input type="checkbox"/>	Ground cover meets state criteria specific to ecological site OR Soil organic matter is managed to meet Client objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
SOIL QUALITY DEGRADATION – Concentration of salts or other chemicals	• Crop • Pasture • Range • Associated Ag Land • Farmsteads		Activities do not cause salinity/sodicity problems	<input type="checkbox"/>	<input type="checkbox"/>	Conservation practices and managements are in place to mitigate on-site effects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
EXCESS WATER – Ponding, flooding, seasonal high water table, seeps, and drifted snow	• Crop • Forest • Farmsteads • Pasture • Range • Developed Land • Associated Ag Land • Designated Protected Area • Other Rural Land	Ponding and Flooding	Ponding or flooding not a problem AND Activities do not cause ponding/flooding problems	<input type="checkbox"/>	<input type="checkbox"/>	Excess water is managed to meet Client's objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Seasonal High Water Table	Seasonal high water table does not cause a problem	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Seeps	Excess water from seeps does not cause a problem	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Drifted Snow	Drifted snow does not cause a problem	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
INSUFFICIENT WATER – Inefficient moisture management	• Crop • Developed Land • Forest • Associated Ag Land • Designated Protected Area		Moisture management is not a problem AND Activities do not cause inefficient moisture management problems	<input type="checkbox"/>	<input type="checkbox"/>	Runoff and evapotranspiration levels are minimized to meet Client's management objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Range*		<input type="checkbox"/>	<input type="checkbox"/>	RHA - hydrologic function attributes slight to moderate or less	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	• Pasture		<input type="checkbox"/>	<input type="checkbox"/>	PCS – compaction element score ≥ 4 AND PCS - plant cover element score ≥ 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
INSUFFICIENT WATER – Inefficient use of irrigation water	• All*		PLU is not irrigated	<input type="checkbox"/>	<input type="checkbox"/>	The irrigation system components and management meet state specific efficiency criteria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2

Notes:

-  
-  
-

## Resource Concerns Checklist

This check sheet is designed to assist planners and clients in identifying resource concerns during the planning process. The planning criteria outlined in Section III of the FOTG sets the minimum level of treatment. If a screening question is TRUE, this indicates no resource concern exists and no assessment is required. If a screening question is FALSE, the assessment must be completed to evaluate if there is a resource concern. If the Assessment is TRUE, Planning Criteria is met. If the Assessment is FALSE, the Planning Criteria is not met and a Resource Concern exists.

If there is no screening question, go directly to assessment. If the Resource Concern is a Client Identified Objective (in effect the client wishes to exceed planning criteria), the concern will be required to be evaluated in the planning process.

Resource Concern	Land Use *Required	Component	Screening True not a concern, False or no question go to assessment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Assessment Level True not a concern, False is a resource concern	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Resource Concern?	Client Objective?	Tract/Land Unit with concern
				T	F		T	F			
WATER QUALITY DEGRADATION: Excess nutrients in surface and ground waters	• Crop*	Excess nutrients in surface water	Organic or inorganic nutrients are not applied AND PLU is not grazed	<input type="checkbox"/>	<input type="checkbox"/>	Nutrient and amendment applications are based on soil or tissue tests and nutrient budgets for realistic yields AND Conservation practices and managements are in place to minimize surface water impacts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Excess nutrients in groundwater		<input type="checkbox"/>	<input type="checkbox"/>	Nutrient and amendment applications are based on soil or tissue tests and nutrient budgets for realistic yields AND Conservation practices and managements are in place to minimize groundwater impacts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Pasture*	Excess nutrients in surface water				PCS - streambank / shoreline erosion element score $\geq 4$ AND PCS - livestock concentration areas element score $\geq 4$ AND Nutrients are applied and based on a soil test, tissue tests or nutrient budget	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Excess nutrients in groundwater					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Developed Land	Excess nutrients in surface water	Organic or inorganic nutrients are not applied			Nutrients if applied, are based on a soil test, tissue tests or nutrient budget AND Conservation practices and managements are in place to minimize surface water impacts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Excess nutrients in groundwater					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Other Rural Land • Associated Ag Land • Designated Protected Area • Water • Forest • Range	Excess nutrients in surface water	Organic or inorganic nutrients are not applied AND PLU is not grazed			Nutrients if applied, are based on a soil test, tissue tests or nutrient budget AND Conservation practices and managements are in place to minimize surface water impacts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Excess nutrients in groundwater					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Farmsteads*	Excess nutrients in surface water	Organic or inorganic nutrients are not applied AND PLU is not grazed AND There are no confined livestock areas			Conservation practices and managements are in place to minimize surface water impacts AND Surface waters are protected from contamination due to runoff and leaching from storage sites, spill and other concentrated sources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Excess nutrients in groundwater					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
WATER QUALITY DEGRADATION: Pesticides transported to surface and ground waters	• All	Pesticides transported to surface water	Pest control chemicals are not applied	<input type="checkbox"/>	<input type="checkbox"/>	Pesticides are stored, handled, disposed and managed to prevent runoff, spills, leaks and leaching AND Conservation practices and managements are in place to minimize surface water impacts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Pesticides transported to groundwater	Pest control chemicals are not applied	<input type="checkbox"/>	<input type="checkbox"/>	Pesticides are stored, handled, disposed and managed to prevent runoff, spills, leaks and leaching AND Conservation practices and managements are in place to minimize groundwater impacts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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WATER QUALITY DEGRADATION – Excess pathogens and chemicals from manure, bio-solids or compost applications	<ul style="list-style-type: none"> <li>• Crop* • Farmsteads*</li> <li>• Forest</li> <li>• Developed Land</li> <li>• Associated Ag Land</li> <li>• Other Rural Land</li> <li>• Designated Protected Area</li> <li>• Water</li> <li>• Pasture* • Range</li> </ul>	Pathogens and chemicals from manure, bio-solids, or compost applications transported to surface water	Potential sources of pathogens or pharmaceuticals are not applied on the land	<input type="checkbox"/>	<input type="checkbox"/>	Organic materials are applied, stored, and/or handled to mitigate negative impacts to surface water sources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Pathogens and chemicals from manure, bio-solids, or compost applications transported to groundwater	Potential sources of pathogens or pharmaceuticals are not applied on the land	<input type="checkbox"/>	<input type="checkbox"/>	Organic materials are applied, stored, and/or handled to mitigate negative impacts to groundwater sources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
WATER QUALITY DEGRADATION – Excessive salts in surface and ground waters	• All	Excessive salts in surface water	Excess salt is not a problem AND Activities do not contribute to excess salt problem	<input type="checkbox"/>	<input type="checkbox"/>	Salt concentrations are managed to mitigate off-site transport to surface waters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Excessive salts in groundwater	Activities do not contribute to excess salt problem	<input type="checkbox"/>	<input type="checkbox"/>	Salt concentrations are managed to mitigate off-site transport to groundwater	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
WATER QUALITY DEGRADATION – Petroleum, heavy metals and other pollutants transported to receiving waters	• All	Petroleum, heavy metals, and other pollutants transported to surface water	Activities do not present the potential for contamination by petroleum, heavy metals and other pollutants	<input type="checkbox"/>	<input type="checkbox"/>	Petroleum, heavy metals or other potential pollutants are stored and handled to avoid runoff to surface water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Petroleum, heavy metals, and other pollutants transported to groundwater	Activities do not present the potential for contamination by petroleum, heavy metals and other pollutants	<input type="checkbox"/>	<input type="checkbox"/>	Petroleum, heavy metals or other potential pollutants are stored and handled to avoid leaching to groundwater	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
WATER QUALITY DEGRADATION – Excessive sediment in surface waters	<ul style="list-style-type: none"> <li>• Crop*</li> <li>• Developed Land*</li> <li>• Farmsteads*</li> <li>• Other Rural Land</li> <li>• Associated Ag Land</li> <li>• Designated Protected Area</li> <li>• Water</li> <li>• Pasture*</li> </ul>		Permanent ground cover > 90% and slope < 10% AND Classic gullies are not present AND Streams or shoreline are not on or adjacent to site	<input type="checkbox"/>	<input type="checkbox"/>	Upslope treatment and buffer practices address concentrated flows to water bodies AND SVAP2 - bank condition ≥ 5 AND Livestock and vehicle water crossings are stable AND Water erosion rate ≤ T AND Wind erosion rate ≤ T	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Forest*		There are no untreated sources of erosion AND Streams or shoreline are not on or adjacent to site	<input type="checkbox"/>	<input type="checkbox"/>	Upslope treatment and buffer practices address concentrated flows to water bodies AND Heavy use areas are stable AND SVAP2 - bank condition ≥ 5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Range*			<input type="checkbox"/>	<input type="checkbox"/>	RHA - hydrologic function attribute - slight to moderate or less AND SVAP2 - bank condition ≥ 5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
WATER QUALITY DEGRADATION – Elevated water temperature	• All		Water courses on or adjacent to the site are not designated by a State Agency as a temperature impairment OR Water course temperature is not a client concern	<input type="checkbox"/>	<input type="checkbox"/>	[SVAP2 - riparian area quality element score ≥ 5 AND SVAP2 - riparian area quantity quality element score ≥ 5 AND SVAP2 - canopy cover element score ≥ 6 ] OR Existing conservation practices are in place to address water temperature	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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DEGRADED PLANT CONDITION – Undesirable plant productivity and health	• Crop • Farmsteads • Developed Land • Designated Protected Area • Associated Ag Land • Other Rural Land		Plant production and health is not a client concern	<input type="checkbox"/>	<input type="checkbox"/>	Plants are adapted to the site, meet production goals and do not negatively impact other resources AND Plant damage from wind erosion is below Crop Damage Tolerance levels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Range*		Vegetation meet similarity index or range condition score of 60 or greater for desired plant community and has a positive trend OR RHA – biotic integrity attribute rating - slight to moderate departure or less	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	• Pasture*		PCS - 30 or above AND Plants are adapted to the site, meet production goals and do not negatively impact other resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	• Forest		Plant production and health is not a client concern	<input type="checkbox"/>	<input type="checkbox"/>	Forest species are adapted to site AND Composition and stand density meets the Client's objectives and production goals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
DEGRADED PLANT CONDITION – Inadequate structure and composition	• Forest • Designated Protected Area • Associated Ag Land • Water • Pasture		Plant communities support the intended land use and desired ecological functions	<input type="checkbox"/>	<input type="checkbox"/>	Plant communities contain adequate diversity, composition and structure to support desired ecological functions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	• Range*		Plant communities support the intended land use and desired ecological functions	<input type="checkbox"/>	<input type="checkbox"/>	Plant communities contain adequate diversity, composition and structure to support desired ecological functions OR RHA – biotic integrity attribute rating slight to moderate departure or less OR Vegetation meet similarity index of 60 or greater for desired plant community and has a positive trend	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
DEGRADED PLANT CONDITION – Excessive plant pest pressure	• Crop • Forest* • Farmsteads • Range* • Developed Land • Associated Ag Land • Designated Protected Area • Water • Other Rural Land		Plant productivity is not limited from pest pressure	<input type="checkbox"/>	<input type="checkbox"/>	Pest damage to plants are below economic or environmental thresholds or client-identified criteria AND Plant pests, including noxious and invasive species are managed to meet client objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1, 2, 4
	• Pasture*		Plant productivity is not limited from pest pressure	<input type="checkbox"/>	<input type="checkbox"/>	PCS - insect and disease pressure element score ≥ 4 AND PCS - site adaptation element score ≥ 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
DEGRADED PLANT CONDITION– Wildfire hazard, excessive biomass accumulation	• All		Wildfire hazard is not a concern	<input type="checkbox"/>	<input type="checkbox"/>	Fuel loads and fuel ladders are managed to provide defensible space and meet client objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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INADEQUATE HABITAT FOR FISH AND WILDLIFE – Habitat degradation	• All	Quantity, quality of food is inadequate to meet requirements of identified fish, wildlife or invertebrate species	Managing for wildlife is not a client objective.	<input type="checkbox"/>	<input type="checkbox"/>	WHSI rating $\geq 0.5$ AND (when surface stream present) [SVAP2 – fish habitat complexity element score $\geq 7$ AND SVAP2 – aquatic invertebrate habitat element score $\geq 7$ ] OR Conservation practices and management are in place that meet or exceed species or guild-specific habitat model thresholds OR Food is available in quality and extent to support habitat requirements for the species of interest	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Quantity, quality of water is inadequate to meet requirements of identified fish, wildlife or invertebrate species	Managing for wildlife is not a client objective.	<input type="checkbox"/>	<input type="checkbox"/>	WHSI rating $\geq 0.5$ AND (when surface stream present) SVAP2 – aquatic invertebrate habitat element score $\geq 7$ OR Conservation practices and management are in place that meet or exceed species or guild-specific habitat model thresholds OR Water is available in quality and extent to support habitat requirements for the species of interest	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Quantity, quality or cover/shelter is inadequate to meet requirements of identified fish, wildlife or invertebrate species	Managing for wildlife is not a client objective.	<input type="checkbox"/>	<input type="checkbox"/>	WHSI rating $\geq 0.5$ AND (when surface stream present) [SVAP2 – barriers to movement element score $\geq 7$ AND SVAP2 – fish habitat complexity element score $\geq 7$ ] OR Conservation practices and management are in place that meet or exceed species or guild-specific habitat model thresholds OR Cover is of available quality and extent to support habitat requirements for the species of interest	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		Habitat continuity and/or space is inadequate to meet requirements of identified fish, wildlife or invertebrate species	Managing for wildlife is not a client objective.	<input type="checkbox"/>	<input type="checkbox"/>	WHSI rating $\geq 0.5$ AND (when surface stream present) [SVAP2 – barriers to movement element score $\geq 7$ AND SVAP2 – aquatic invertebrate habitat element score $\geq 7$ ] OR Conservation practices and management are in place that meet or exceed species or guild-specific habitat model thresholds OR The connectivity of habitat components are adequate to support stable populations of targeted species	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
LIVESTOCK PRODUCTION LIMITATION – Inadeq feed and forage	• All		Land is not grazed.	<input type="checkbox"/>	<input type="checkbox"/>	Livestock forage, roughage and supplemental nutritional requirements addressed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
LIVESTOCK PRODUCTION LIMITATION – Inadeq livestock shelter	• All		Land is not grazed.	<input type="checkbox"/>	<input type="checkbox"/>	Artificial or natural shelters meet animal health needs and client objectives.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
LIVESTOCK PRODUCTION LIMITATION – Inadeq livestock water	• All		Land is not grazed.	<input type="checkbox"/>	<input type="checkbox"/>	Water of acceptable quality and quantity adequately distributed to meet animal needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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INEFFICIENT ENERGY USE – Equipment and facilities	• All		Client is not interested in improving equipment and facilities energy efficiency	<input type="checkbox"/>	<input type="checkbox"/>	A USDA approved energy audit been implemented that address equipment and facilities to meet client objectives OR On-farm renewable energy and/or energy conserving practices have been implemented to meet client objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
INEFFICIENT ENERGY USE – Farming/ranching practices and field operations	• All		Client is not interested in improving energy use in farm and ranch field operations	<input type="checkbox"/>	<input type="checkbox"/>	A USDA approved energy audit been implemented that address field operations to meet client objectives OR On-farm renewable energy and/or energy conserving practices have been implemented to meet client objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
AIR QUALITY IMPACTS - Emissions of Particulate Matter - PM - and PM Precursors	• Crop • Pasture • Range • Forest • Other Rural Land • Associated Ag Land • Designated Protected Areas • Developed Land • Farmsteads		Activities are not present that contribute to agricultural source PM or PM precursor emissions such as Prescribed Burn, Travel ways unpaved or untreated with binding agents, Engines (combustion source), Tillage, Pesticide applications, Fertilization manure/ commercial), CAFO/manure management) AND Episodes or complaints of emissions of PM (dust, smoke, exhaust, etc.), or chemical drift have not occurred	<input type="checkbox"/>	<input type="checkbox"/>	PM and PM Precursor emissions are managed to meet client objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
AIR QUALITY IMPACTS - Emissions of Greenhouse Gases - GHGs	• All		Activities are not present that produce GHGs emissions such as Fertilization, CAFO/manure management, Engines (combustion source), Tillage AND GHGs are not regulated in this planning area	<input type="checkbox"/>	<input type="checkbox"/>	Greenhouse gas emissions are managed to meet client objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
AIR QUALITY IMPACTS - Emissions of Ozone Precursors	• All		Operations are not present that produce ozone precursor emissions such as: Engines (combustion source), Pesticide application, Burning, CAFO/manure management, Fertilization (manure /commercial)	<input type="checkbox"/>	<input type="checkbox"/>	Ozone precursor emissions are managed to meet client objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
AIR QUALITY IMPACTS - Objectionable odors	• Crop • Pasture • Farmsteads • Other Rural Land		Activities are not present that contribute to odor nuisance air quality conditions such as: Pesticide applications, CAFO / manure management, Composting is conducted AND Odor sources are not regulated in this planning area AND Episodes or complaints of odor nuisance have not occurred	<input type="checkbox"/>	<input type="checkbox"/>	Odors are managed to meet client objectives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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## 6.3 Additional Resources

## Brush Management – Invasive Plant Control

### Autumn Olive – *Elaeagnus umbellata*

#### Conservation Practice Job Sheet

**RI-314**



**Autumn Olive (*Elaeagnus umbellata*)**

#### Autumn Olive

Autumn olive is native to eastern Asia and was introduced to the United States for ornamental cultivation in the 1800s. It now grows in most northeastern and upper Midwest states.

Autumn olive grows well on a variety of soils including sandy, loamy, and somewhat clayey textures with a pH range of 4.8-6.5. It does not grow as well on very wet or dry sites, but is tolerant to drought. It does well on infertile soils because its root nodules house nitrogen-fixing actinomycetes. Mature trees tolerate light shade, but produce more fruits in full sun, and seedlings may be shade intolerant.

In New England, autumn olive has escaped from cultivation and is progressively invading natural areas. It is a threat to open and semi-open areas. It has the potential of becoming one of the most troublesome invasive shrubs in the area. It exhibits prolific fruiting, rapid growth, is widely disseminated by birds, and can easily adapt to many sites. It is vigorous and competitive against native species, and resprouts after cutting. Due to its nitrogen-fixing capabilities, it has the capacity to adversely affect the nitrogen cycle of native communities.



**Autumn Olive, leaves**

#### Description

Autumn olive is a large deciduous shrub that can grow up to 20 feet tall. Leaves are alternately arranged, elliptic to lanceolate (shaped like a lance head), and smooth-edged. Mature leaves have a dense covering of lustrous silvery scales on the lower surface. Stems and buds also have silvery scales. Flowers are small, creamy white to yellow and tubular in shape; they grow in small clusters. The abundant fruits look like small pink berries, also with silvery scales.

#### Similar Natives

Autumn olive has no similar native plants, but is easily confused with Russian olive, which is a less common invader. Unlike autumn olive, Russian olive often has stiff peg-like thorns, and has silvery scales coating both sides of its mature leaves.

#### Control

The best method of controlling these species is to prevent them from becoming established. Plants should be removed as soon as possible if they are found newly colonizing an area. Small plants and seedlings can be hand-pulled, especially when the soil is moist. Herbicide treatment is probably the best method for eradicating larger, well-established plants, as cutting only stimulates sprouting and leads to thicker growth.

## Biological Control

No biological options are currently known.

## Mechanical Control

Seedlings and sprouts can be pulled by hand when the soil is moist enough to insure removal of the root system. Root fragments may resprout if left in the ground.

Cut trees at ground level with power or manual saw. Cutting is most effective after trees have begun to flower, but before they produce seeds. Because autumn olive spreads by suckering, re-sprouts are common after cutting. Cutting is an initial control measure and success will require either herbicide application or repeated cutting.

## Prescribed Burning

Burning is not a viable option by itself for autumn olive control. It stimulates growth, resulting in vigorous production of new shoots.

## Chemical Control

**CAUTION:** ALWAYS READ THE ENTIRE HERBICIDE LABEL. HERBICIDES ARE REGULATED AND MAY ONLY BE USED UNDER SPECIFIC CONDITIONS. CONTACT YOUR STATE DEPARTMENT OF AGRICULTURE FOR USE REQUIREMENTS, RESTRICTIONS OR RECOMMENDATIONS.

**Foliar treatment:** Foliar applications may be adequate for small patches; glyphosate and triclopyr have been used with positive results. The recommended dilution of glyphosate in this case is a 1-2% solution<sup>1</sup>. Research has shown that the best time for this application is in late August or September when the plant is actively translocating materials to the roots.

**Cut stem treatment:** Cut stem treatment is accomplished by cutting the main stem of the plant and then painting the herbicide on the stump. Glyphosate is effective and commonly used. A 10-20% dilution is recommended for painting on stumps<sup>1</sup>.

**Basal treatment:** Reports have demonstrated that basal applications (stem injections) in the growing season, of triclopyr alone or in combination with 2,4-D provided excellent control of autumn olive even at very low concentrations (down to 1% triclopyr in diesel oil)<sup>1</sup>.

<sup>1</sup>- Kuhns, L. J. 1986. "Controlling autumn olive with herbicides." Proc. 40th Ann. Meet. N. E. Weed Sci. Soc.

## Important Note

Mention of specific pesticide products in this document does not constitute an endorsement. These products are mentioned specifically in control literature used to create this document.

## Disposal

There are a few general rules of thumb that will ensure proper disposal. Be sure the plant is dead before placing in a mulch or compost pile. Either dry it out in the sun, or bag it in a heavy duty black plastic bag. If you have flowers and/or seeds on the plant, put the flowers and seed heads into the bag head first so that there is minimal risk in dispersing seed.

## Information and Recommendations compiled from:

- "Invasive Plant Management Guide." Stewardship Subcommittee of the Connecticut Invasive Plant Working Group. [http://www.hort.uconn.edu/cipwg/art\\_pubs/GUIDE/guideframe.htm](http://www.hort.uconn.edu/cipwg/art_pubs/GUIDE/guideframe.htm)
- Kuhns, L. J. 1986. "Controlling autumn olive with herbicides." Proc. 40th Ann. Meet. N. E. Weed Sci. Soc.
- "Maine Invasive Plants." Maine Natural Areas Program. <http://www.umext.maine.edu/onlinepubs/htmlpubs/2525.htm>
- Rhoads, Ann F. and Timothy A. Block. 2002. "Invasive Species Fact Sheet." Morris Arboretum of the University of Pennsylvania. <http://www.paflora.org/Elaeagnus%20spp.pdf>
- The Nature Conservancy - Element Stewardship Abstract (and references therein)

## Pest Management – Invasive Plant Control

### Asian Bittersweet – *Celastrus orbiculatus*

#### **Conservation Practice Job Sheet RI-314 October 2016**



**Asian Bittersweet, *Celastrus orbiculatus***



**Asian Bittersweet blanketing native plants**

#### **Asian Bittersweet**

*Celastrus orbiculatus* is native to temperate East Asia and has been considered weedy in all of New England and most of the Atlantic Coast States since 1971. Asian bittersweet is a vigorously growing vine that climbs over and smothers vegetation which may die from excessive shading or breakage. When bittersweet climbs high up on trees the increased weight can lead to uprooting and blow-over during high winds and heavy snowfalls.

In addition, Asian bittersweet is displacing our native American bittersweet through competition and hybridization. Upland meadows, thickets, young forests, and beaches are most vulnerable to Asian Bittersweet invasion and dominance. Similar to most invasive plants, *C. orbiculatus* has a high reproductive rate, long range dispersal, ability to root sucker, and rapid growth rates.

#### **Description**

Asian bittersweet is a deciduous woody perennial plant which grows as a climbing vine and a trailing shrub. The leaves are alternate, glossy, nearly as wide as they are long (round), with finely toothed margins. There are separate female (fruiting) and male (non-fruiting) plants. Female plants produce clusters of

small greenish flowers, and each plant can produce large numbers of fruits and seeds.

The fruits are three-valved, yellow, globular capsules that at maturity split open to reveal three red-orange, fleshy arils each containing one or two seeds. The abundance of showy fruits has made Asian bittersweet extremely popular for use in floral arrangements.

#### **Similar Natives**

American bittersweet (*Celastrus scandens*) is a very similar native that may be distinguished from *C. orbiculatus* by the location of its fruit - *C. orbiculatus* has small clusters in the leaf axils while *C. scandens* has clusters at its branch tips. The two species may be capable of hybridizing and since the native is relatively rare it is possible that its distinct genetic identity is threatened.

#### **Control**

Manual, mechanical and chemical control methods are all effective in removing and killing Asian bittersweet. Employing a combination of methods often yields the best results and may reduce potential impacts to native plants, animals and people. The method you select depends on the extent and type of infestation, the amount of native vegetation on the

site, and the time, labor and other resources available to you. Whenever possible and especially for vines climbing up trees or buildings, a combination of cutting followed by application of concentrated systemic herbicide to rooted, living cut surfaces is likely to be the most effective approach. For large infestations spanning extensive areas of ground, a foliar herbicide may be the best choice rather than manual or mechanical means which could result in soil disturbance.

Recovery of natural areas highly infested with *C. orbiculatus* is unpredictable. Previous natural vegetation structure and function are often severely altered, although remnants of the flora may persist. Removal methods often further disrupt remnants of previous plant communities. A number of workers report that even with complete removal and rootkill of *C. orbiculatus*, substantial seedling regeneration occurs in following years, due to a persistent soil seed bank.

### **Biological Control**

There are no known biological controls of bittersweet.

### **Mechanical Control**

Small infestations can be hand-pulled but the entire plant should be removed including all the root portions. For climbing vines, first cut the vines near the ground at a comfortable height to kill upper portions and relieve the tree canopy. Try to minimize damage to the bark of the host tree. Rooted portions will remain alive and should be pulled, repeatedly cut to the ground or treated with herbicide. Cutting without herbicide treatment will require vigilance and repeated cutting because plants will resprout from the base.

### **Prescribed Burning**

Prescribed burning for Asian Bittersweet is not a viable option for control. It is likely that Asian Bittersweet is actually favored by fire due to rapid growth in response to opening the canopy and the large nutrient flushes that usually occur after fires.

### **Chemical Control**

**CAUTION: ALWAYS READ THE ENTIRE HERBICIDE LABEL. HERBICIDES ARE REGULATED AND MAY ONLY BE USED UNDER SPECIFIC CONDITIONS. CONTACT YOUR STATE DEPARTMENT OF AGRICULTURE FOR USE REQUIREMENTS, RESTRICTIONS OR RECOMMENDATIONS.**

Systemic herbicides like triclopyr (i.e., Garlon 3A and Garlon 4) and glyphosate (i.e., Accord, Glypro, Rodeo) are absorbed into plant tissues and carried to the roots, killing the entire plant within about a week<sup>1</sup>. Garlon 4 is soluble in oil or water, is highly volatile and can be extremely toxic to fish and aquatic invertebrates<sup>1</sup>. It should not be used in or near water sources or wetlands and should only be applied under cool, calm conditions. Chemical control is most effective if the stems are first cut by hand or mowed and herbicide is applied immediately to cut stem tissue.

Fall and winter applications will avoid or minimize impacts to native plants and animals. Repeated treatments are likely to be needed. In areas where spring wildflowers or other native plants occur, application of herbicides should be conducted prior to their emergence, delayed until late summer or autumn, after the last killing frost occurs, or carefully targeted. If native grasses are intermingled with the bittersweet, triclopyr should be used because it is selective for broad-leaved plants and will not harm grasses. Follow-up monitoring should be conducted to ensure effective control.

**Foliar Treatment:** Use this method to control extensive patches of solid Bittersweet. Apply a 2% solution (8 oz per 3 gal. mix) triclopyr ester (Garlon 4) or triclopyr amine (Garlon 3A) mixed in water with a non-ionic surfactant to the leaves<sup>1</sup>. In Rhode Island, concentrations as low as 1% in mid-summer and 0.05% in September have been very effective. Thoroughly wet the foliage but not to the point of runoff. The ideal time to spray is after much of the native vegetation has become dormant (October-November) to avoid affecting non-target species. A 0.5% concentration of a non-ionic surfactant is recommended in order to penetrate leaf cuticle. If the 2% rate is not effective try an increased rate of 3-5%. Ambient air temperature should be above 65°F.

For dense, low patches of bittersweet another alternative is to cut the entire patch to the ground early in the growing season. About one month later, apply

1-2% solution of triclopyr ester (Garlon 4) or triclopyr salt (Garlon 3A) in water to the previously cut patch using a backpack sprayer<sup>2</sup>. This method has resulted in complete rootkill of the bittersweet and no off-target damage or root uptake by adjacent plants.

**Cut Stem Treatments:** Use this method in areas where vines are established within or around non-target plants or where vines have grown into the canopy. Cut each vine stem close to the ground (about 2 in. above ground) and immediately apply a 25% solution of glyphosate (e.g., Accord) or triclopyr (e.g., Garlon 3A) mixed with water to the cut surface of the stem<sup>1</sup>. The glyphosate application is effective at temperatures as low as 40°F and the triclopyr application remains effective at temperatures <60°F as long as the ground is not frozen. A subsequent foliar application may be necessary to control new seedlings. Homeowners can apply products like Brush-B-Gone, Brush Killer and Roundup Pro Concentrate undiluted to cut surface using a paint brush or a plastic spray bottle.

**Basal Bark Method:** Use a string trimmer or hand saw to remove some of the foliage in a band a few feet from the ground at comfortable height. To the exposed stems, apply a 20% solution of triclopyr ester (Garlon 4) (2.5 quarts per 3-gallon mix) in commercially available basal oil with a penetrant (check with herbicide distributor) to vine stems<sup>1</sup>. As much as possible, avoid application of herbicide to the bark of the host tree. This can be done year-round although efficacy may vary seasonally; temperatures should be above 50°F for several days.

<sup>1</sup> – Plant Conservation Alliance (PCA) Alien Plant Working Group

<sup>2</sup> – Dreyer, G. 1988. “Efficacy of triclopyr in rootkilling Asian Bittersweet and certain other woody weeds.” Proceedings of the Northeastern Weed Science Society.

### **Important Note**

Mention of specific pesticide products in this document does not constitute an endorsement. These products are mentioned specifically in control literature used to create this document.

### **Disposal**

There are a few general rules of thumb that will ensure proper disposal. Be sure the plant is dead before placing in a mulch or compost pile. Either dry it out in the sun, or bag it in a heavy duty black plastic

bag. If you have flowers and/or seeds on the plant, put the flowers and seed heads into the bag head first so that there is minimal risk in dispersing seed.

### **Information and Recommendations compiled from:**

- Dreyer, G. 1988. “Efficacy of triclopyr in rootkilling Asian Bittersweet and certain other woody weeds.” Proceedings of the Northeastern Weed Science Society.
- Howard, Janet L. 2005. “Celastrus orbiculatus. In: Fire Effects Information System.” U.S. Department of Agriculture, Forest Service. <http://www.fs.fed.us/database/feis/>
- Invasive Plant Atlas of New England (IPANE)
- Plant Conservation Alliance (PCA) Alien Plant Working Group
- The Nature Conservancy - Element Stewardship Abstract (and references therein)