Survey Plan for Pine Barrens Tree Frog
NJARNG & NJDMAVA Facilities
2019

Image provided by: Gregory Fischer

Prepared by:
Nicholas Cordivari and Laurel Klein

Stockton University Environmental Internship Program (SUEIP)
School of Natural Science and Mathematics (NAMS)
Stockton University, 101 Vera King Farris Drive
Galloway, NJ 08205

SUEIP Project Faculty Advisor: Tait Chirenje
SUEIP Project Manager: John Hallagan

Introduction

       The goal of this project is to determine Pine Barrens treefrog (PBTF, *Hyla andersonii*) presence/absence and subsequently recommend action at 48 NJARNG & NJDMAVA facilities listed below. The species population has been declining gradually. It is listed as an endangered species in New Jersey due to loss of habitat, pollution of breeding ponds, and its restricted range. It is not federally listed. The Pine Barrens Tree frog is an amphibious species that prefer herbaceous and shrubby acidic seepage bogs and draining sandy uplands such as Atlantic white cedar swamps and pitch pine lowlands. The species range consists of New Jersey counties within the Pine Barrens in Burlington, Ocean and Atlantic Counties. They also may occur outside the Pine Barrens range in Camden, Cape May, Cumberland, Gloucester, Mercer and Monmouth counties. Outside of New Jersey, the Pine Barrens Tree frog may also occur in North and South Carolina, Florida, Georgia and Alabama.

       Fieldwork will begin in the spring of 2019, coinciding with their breeding period that takes place from late April to late July. Male Pine Barrens Tree frogs are more vocally active during warm (≥70 ℉) humid or rainy nights in May and June, but can continue to call through early August. Passive survey techniques using acoustic recording devices will be used to identify Pine Barrens Tree frog presence by call. When possible, active survey methods, such as actively listening for calls, or actively searching for egg masses will also be implemented. In addition, the pH and water depth of nearby breeding habitat will be documented. This information is important for a better understanding the PBTF's habitat preferences. After acoustic recording data has been collected, it will be analyzed using Song Scope software. Recognizer settings will be developed using known PBTF recordings.

       This survey plan also identifies NJARNG facilities that are within the range of Pine Barrens Tree frog. A site is considered "High Priority" if it is located within the PBTF range and contains known wetlands within the property boundary. A site is considered "Medium Priority" if it is located within the PBTF range with wetlands located within 100 meters of the property boundary, but does not contain wetlands within the property boundary. Low priority sites are sites within range of the Pine Barrens Tree frog but do not provide suitable habitat on or within 100 meters of the site. Out of range sites are sites that are located outside of the Pine Barrens Tree frog range and will not be included in our survey effort. Site specific survey plans are described below based on collected data. Statewide maps containing range data for the Pine Barrens Tree frog can be found in Appendix B.

Pine Barrens Tree Frog Priority List

A statewide map showing sites and their priority levels can be found in Appendix B.

High Priority Facilities

The 13 sites below are located "within the range of the Pine Barrens Tree frog with wetlands present onsite or 100 meters of the property boundary" and have suitable habitat on site.

- B.G. Doyle Veteran's Cemetery
- Bridgeton
- Bordentown
- Cape May
- Fort Dix 3600
- Hammonton
- Lawrenceville
- Princeton
- Sea Girt
- Toms River
- Trenton Mercer Aviation
- Vineland
- Woodstown

Medium Priority Facilities

The 3 sites below are located "within the range of the Pine Barrens Tree frog" but do not contain wetlands that provide suitable habitat for Pine Barrens tree frogs directly onsite. However, wetlands exist within 100 meters of the property boundary.

- Lakehurst AASF
- Lakehurst CLTF
- Tuckerton

Low Priority Facilities

The 12 sites Below are located "within the range of the Pine Barrens Tree frog" but do not contain wetlands that provide suitable habitat for Pine Barrens Tree frog or provide suitable habitat within 100 meters of the site.

- Atlantic City
- Burlington
- Cherry Hill
- Freehold
- Mt. Holly
- New Egypt
- Veteran's Haven (South)
- Vietnam War Memorial

- Korean War memorial
- Lakehurst 129 & 608
- Vineland Veteran's Home
- Woodbury

Out of Range Facilities

The 20 sites below are "outside of the range of the Pine Barrens Tree frog".

- Dover
- Franklin
- Flemington
- Hackettstown
- Jersey City
- Lodi
- Menlo Park Veteran's Home
- Morristown
- Newark
- Newton
- Paramus Veteran's Home
- Picatinny
- Riverdale
- Somerset
- Teaneck
- Veteran's Haven (North)
- Washington
- West Orange
- Westfield
- Woodbridge

Sampling Order

High priority facilities will be surveyed first. Once completed, medium priority will be surveyed. Low and lowest priority sites will not be surveyed due to the absence of potential habitat or being outside the species range. Survey order my change as necessary to accommodate other NJDMAVA surveys.

Survey Materials

Materials required for sampling include:
- Recorders - Wildlife Acoustic SM3 and SM3Bat
  - External microphones with cords
- Recorder Mounting Equipment
  - Lag bolts
  - Cable locks
  - Cable ties / zip ties
  - Custom-built stands
- Camera

- Whiteboard
- GPS
- Laptop
- Wildlife Acoustics- Song Scope Software
- Clipboard
- Pens / Pencils / Dry Erase Markers
- Pre-work Safety Meeting Datasheet
- PBTF Recorder Deployment Sheet
- SD Cards - 32 GB
- pH meter
- Thermometer
- Meter Stick

Survey Methods

Preliminary Research

Site Assessment

Each site was assessed based on its proximity to the PBTF range and the presence/absence of wetlands on-site or within 100 meters of the property boundary. A statewide map showing PBTF range can be found in Appendix B. If a site was within the PBTF range, it was further assessed to determine site specific features such as wetlands, streams, and vernal ponds. These features can promote PBTF presence and activity. Wetland information was provided by the NJDMAVA 2013 Wetlands PLS report and USFWS National Wetlands Inventory. Preliminary vernal pond surveys (as documented in the 2019 Vernal Pond Survey Report) were also used to identify potential PBTF breeding locations.

Passive Survey Methods

Recorder Deployment Methods

Recorder deployment data such as facility information, weather conditions, location, and habitat notes will be documented on a PBTF Recorder Deployment Sheet. An example of this datasheet can be found in Appendix A. Recorders will be as close to the center of the potential habitat as possible, or in a spot where breeding habitat is most dense. The exact location will be decided upon arrival at each site. Each recorder will be secured to a tree at approximately head height and locked using lag bolts, cable locks, and zip ties. After the deployment, pictures and GPS coordinates will be taken of the exact location

that the recorder was deployed. The following will also be documented at the time of deployment:

> ❏ Weather Conditions (Temperature, wind, humidity, number days since
>   last precipitation)
> ❏ Wetland or Vernal Pond name
> ❏ Recorder I.D.
> ❏ Deployment time

Recorder Programming

Recorder Programming Methods

Recorders will be programmed to start 1 hour before sunset and stop one hour before sunrise. They will record for 5 minutes each hour, and pause for 55 minutes. An example of the SM3 configuration setup can be found below. After installing recorders on-site, surveyors will return to the site after approximately one week to visually inspect the recording site. Visual inspections include assessing lost, stolen or damaged recorders and file sizes compiled on the device. A Songscope-equipped laptop and a memory card reader will be brought to the field. This laptop will be used for surveyors to inspect the recordings on-site.
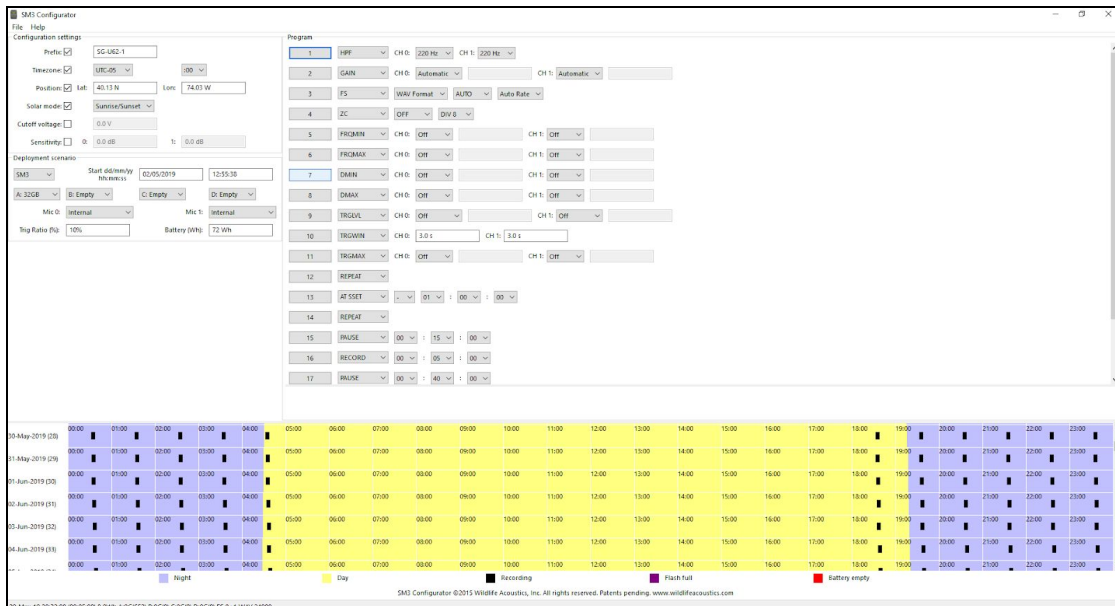
SM3 Configurator Setup for Unit 62 in Sea Girt

Active Survey Methods

Observational Data

When possible, active survey techniques such as actively listening for calls or searching for egg masses will be implemented. The call of the Pine Barrens Tree frog is easily distinguishable from the 15 other anuran species native to New Jersey. A list of these 15 species can be found below. If frogs or egg masses are located during the survey period, they will be recorded on the deployment datasheet. An example of this datasheet can be found in appendix A. Characteristics of the potential habitat will be recorded such as pH level, water temperature, and water depth. If a vernal pond is located, it will be meticulously searched to determine if treefrog activity is being supported.

15 Anuran Species Native to New Jersey

American Toad (*Anaxyrus americanus*)
    https://www.state.nj.us/dep/fgw/ensp/audio/american_toad.wav
Bullfrog (*Rana catesbeiana*)
    https://www.state.nj.us/dep/fgw/ensp/audio/bullfrog.wav
Carpenter Frog (*Rana virgatipes*)
    https://www.state.nj.us/dep/fgw/ensp/audio/carpenter_frog.wav
Eastern Spadefoot (*Scaphiopus h. holbrooki*)
    https://www.state.nj.us/dep/fgw/ensp/audio/spadefoot_toad.wav
Fowler's Toad (*Anaxyrus fowleri*)
    https://www.state.nj.us/dep/fgw/ensp/audio/fowlers_toad.wav
Green Frog (*Rana clamitans melanota*)
    https://www.state.nj.us/dep/fgw/ensp/audio/green_frog.wav
New Jersey Chorus Frog (*Pseudacris triseriata kalmi*)
    https://www.state.nj.us/dep/fgw/ensp/audio/nj_chorus_frog.wav
Northern Cricket Frog (*Acris C. crepitans*)
    https://www.state.nj.us/dep/fgw/ensp/audio/no_cricket_frog.wav
Northern Gray Treefrog (*Hyla versicolor*)
    https://www.state.nj.us/dep/fgw/ensp/audio/no_gray_frog.wav
Northern Spring Peeper (*Pseudacris c. crucifer*)
    https://www.state.nj.us/dep/fgw/ensp/audio/spring_peeper.wav
Pickerel Frog (*Rana palustris*)
    https://www.state.nj.us/dep/fgw/ensp/audio/pickerel_frog.wav

Pine Barrens Treefrog (*Hyla andersonii*)

https://www.state.nj.us/dep/fgw/ensp/audio/pine_barrens_treefrog.wav

Southern Gray Treefrog (*Hyla chysoscelis*)

https://www.state.nj.us/dep/fgw/ensp/audio/so_gray_treefrog.wav

Southern Leopard Frog (*Rana utricularia*)

https://www.state.nj.us/dep/fgw/ensp/audio/so_leopard_frog.wav

Upland Chorus Frog (*Pseudacris triseriata feriarum*)

https://www.state.nj.us/dep/fgw/ensp/audio/upland_chorus_frog.wav

Wood Frog (*Rana sylvatica*)

https://www.state.nj.us/dep/fgw/ensp/audio/wood_frog.wav

Data Analysis

Recorder Data Analysis Using Songscope Software

Recorder Data will be analyzed using Songscope software. The unique call signature of the Pine Barrens Tree frog will allow researchers to differentiate the PBTF call from other frog species. MP3 call files supplied by HerpMapper were used to build our call library and recognizer settings. MP3 files were converted to WAV files using Audacity software. Individual PBTF calls in the WAV files will be annotated to construct recognizer files. These recognizers will be used to analyze the acoustic data collected at NJARNG & NJDMAVA facilities to identify PBTF calls. Any recordings identified by the software as potential PBTF calls will listened to and verified by researchers. An acoustic analysis datasheet containing filename, date analyzed, researcher's initials, and positive or negative PBTF identification will be used for all analyzation. An example of this datasheet can be found in Appendix A. Once analyzed, the data will be compiled into a formal report with detailed site specific survey results.
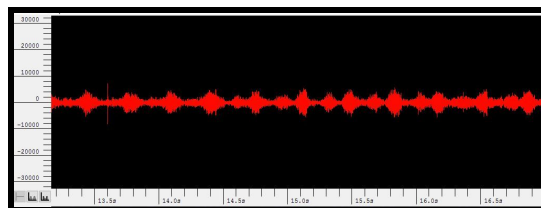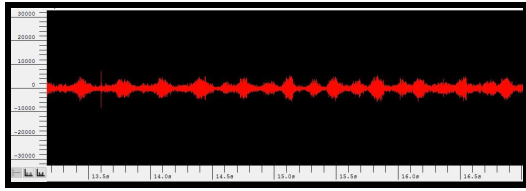

Pine Barrens Tree Frog audio graph

Call Identifications of Common New Jersey Frog Species:

Pine Barrens Treefrog (*Hyla andersonii*)

Eastern Gray Treefrog (*Hyla versicolor*)
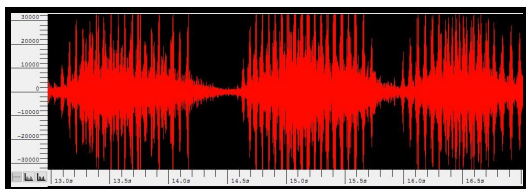
American Bullfrog (*Lithobates catesbeianus*)
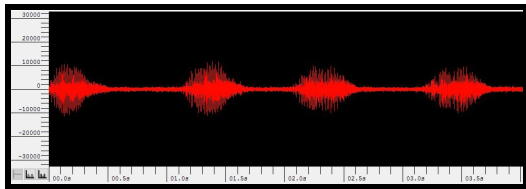
Northern Spring Peeper (*Pseudacris crucifer*)
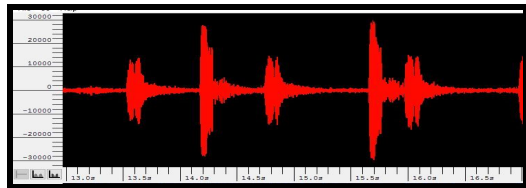
Action Plan

In each of the following scenarios, these actions should be taken.

1. No Pine Barrens Tree frog are present on-site.
   a. Take no action.

2. Pine Barrens Tree frog are present on-site. The NJDEP would likely assign exceptional resource value to all potential breeding habitat on site, as these

wetlands meet criteria 2 of 13:9B-7 of the Freshwater Wetlands Protection Act. This classification would place additional restrictions on the assigned areas, including a 150 foot buffer around all wetlands classified as potential breeding habitat. These restrictions require any person proposing to engage in regulated activities to obtain a freshwater wetland permit, in accordance with N.J.S.A 13:9B-9.

    a. Continue to monitor the trees for evidence of Pine Barrens Tree frog presence.
    b. Submit observations to HerpMapper
    c. Submit calls, spatial data, or observations to the NJ Department of Environmental Protection (NJDEP)

Site Level Features
Facilities with On-Site Habitat

Figure 1 also displays site level features for each property. These figures can be found in Appendix C.

Bridgeton Armory

Wetlands

Freshwater Forested/Shrub Wetland- According to USFWS National Wetlands Inventory and the 2013 NJDMAVA Wetlands PLS Report, this is the only wetland type present at this site. This wetland series add up to approximately 3.2 acres of total land. These wetlands were dominated by white oak (*Quercus alba,* FACU), multiflora rose (*Rosa multiflora,* FACU), sweet pepperbush (*Clethra alnifolia,* FAC), Japanese honeysuckle (*Lonicera japonica,* FAC), poison ivy (*Toxicodendron radicans,* FAC), American red raspberry (*Rubus idaeus,* FACU), common greenbrier (*Smilax rotundifolia,* FAC), jewelweed (*Impatiens capensis,* FACW), American pokeweed (*Phytolacca americana,* FACU), water smartweed (*Persicaria amphibian,* OBL), and false nettle (*Boehmeria cylindrica,* FACW) (NJARNG, 2015).

Vernal Ponds

According to a vernal pond survey conducted by NJDMAVA EMB in 2019, there are no vernal ponds at this site.

Built Infrastructure

Terrestrial System, Landscapes – Two buildings, parking lots, a pallet company's operating area, and mowed landscape areas occupy approximately 5.75 acres of built infrastructure.

Forest Assessment

Terrestrial System, Dry Oak-Pine forest, and Open Field

1. Canopy layer – white ash and scarlet oak. The white ash had a DBH of 19 inches and scarlet oak had two individuals with DBHs of 32-52 inches.

2. Shrub Layer – lowbush blueberry

3. Herbaceous layer – moss species and grass species

Bordentown Armory

Wetlands

Freshwater Forested/Shrub Wetland- According to USFWS National Wetlands Inventory and the 2013 NJDMAVA Wetlands PLS Report, this is the only wetland type present at this site. This wetland series is approximately 2.1 acres of total land.

Vernal Ponds

According to a vernal pond survey conducted by NJDMAVA EMB in 2019, 4 vernal ponds were identified on this site.

Built Infrastructure

Terrestrial System, Landscapes- Three buildings and a parking lot occupies approximately 2.6 acres of built infrastructure.

B.G. Doyle's Cemetery

Wetlands

Freshwater Forested/Shrub Wetland- According to USFWS National Wetlands Inventory, this wetland type is present at this site. This type of wetland is located throughout the property and is approximately 16.51 acres in total.

Freshwater Emergent Wetland- According to USFWS National Wetlands Inventory, this wetland type is present at this site. This type of wetland is approximately 1.29 acres in total.

Vernal Ponds

B.G. Doyle's Cemetery was not assessed during the vernal pond survey conducted by NJDMAVA EMB in 2019.

Freshwater Pond- According to USFWS National Wetlands Inventory, a freshwater pond exists and includes 0.5 acres in total.

Cape May Armory

Wetlands

<u>Estuarine and Marine Wetland</u>- According to USFWS National Wetlands Inventory and 2013 NJDMAVA Wetlands PLS Report, this wetland type is the only wetland type present at this site. This wetland series add up to approximately 10.4 acres of total land.

Vernal Ponds

According to a vernal pond survey conducted by NJDMAVA EMB in 2019, 1 vernal pond was identified on this site.

Built Infrastructure

<u>Terrestrial System, Landscapes</u> – The limits of the mowed lawn and developed land have not changed since the Parson's 2005 survey. Three buildings, surrounding parking lots, and mowed landscaped areas occupy approximately 11 acres.

Forest Assessment

<u>Terrestrial System, coastal plain hardwood forest</u>

1. Canopy layer – Red maple, sweetgum, and black willow trees.

2. Shrub layer– Dense understory of Atlantic white cedar (2), red cedar (3), southern arrow wood (4), and sweetgum (1).

3. Herb layer– Tartarian honeysuckle, poison ivy, raspberry, wild rose, virginia creeper, sweetgum, and blackjack oak.

4. Vine layer– Dense growth of Greenbrier, japanese honeysuckle and southern arrow wood.

Fort Dix 3600

Wetlands

<u>Palustrine forested broad-leaved deciduous wetland (PFO1)</u> – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland type includes a total of 1.54 acres. This wetland type was dominated by red maple (*Acer rubrum*, FAC), scrub oak (*Quercus berberidifolia,* N/L), spicebush (*Lindera benzoin*, FACW), Virginia creeper (*Parthenocissus quinquefolia*, FACU), common greenbrier (*Smilax rotundifolia*, FAC), and Japanese stilt grass (*Microstegium vimineum*, FAC) (wetland sample point B4) and

black willow (*Salix nigra*, OBL), American sycamore (*Platanus occidentalis*, FACW), red birch (*Betula occidentalis*, FACW), red maple (*Acer rubrum*, FAC), purple chokeberry (*Aronia prunifolia*, FACW), wool grass (*Anthephora pubescens*, OBL), and soft rush (*Juncus effusus*, OBL) (NJARNG 2013).

Palustrine emergent persistent wetland (PEM1) – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland type includes 0.92 acres total. These wetlands were dominated by black willow (*Salix nigra*, OBL), common cattail (*Typha latifolia*, OBL), soft rush (*Juncus effusus*, OBL), phragmites (*Phragmites australis*, FACW), wool grass (*Anthephora pubescens*, OBL) and goldenrod sp. and dominated by black walnut (*Juglans nigra*, UPL), tussock sedge (*Carex stricta*, OBL), American red raspberry (*Rubus idaeus*, FACU), Japanese stilt grass (*Microstegium vimineum,* FAC), and jewelweed (*Impatiens capensis*, FACW).

Riverine- According to USFWS National Wetlands Inventory, a riverine systems flows across the southern property boundary with an area of approximately 0.19 acres.

Vernal Ponds

Fort Dix HQ was not assessed during the vernal pond survey conducted by NJDMAVA EMB in 2019.

Freshwater Pond- According to USFWS National Wetlands Inventory, a freshwater pond is present on site. This pond is approximately 0.39 acres in area.

Built Infrastructure

Terrestrial System, Landscapes – No additional structures have been built on the property since the Parsons's 2007 survey. Four buildings, surrounding parking lots, a baseball field, and mowed landscaped areas occupy approximately 48.2 acres (Parsons 2007).

Forest Assessment
Terrestrial System, perennial herbaceous woody plant community / old field
1. Canopy Layer - Red maples (*Acer rubrum*), and sassafras (*Sassafras*) were found in this layer.

2. Shrub Layer – Sassafras (*sassafras*)*,* white snakeroot (*Ageratina altissima*), and blackjack oak (*Quercus marilandica*), *are* present in the shrub layer.

3. Vegetative Layer – Japanese stiltgrass (*Microstegium vimineum*), Japanese honeysuckle (*Lonicera japonica*), greenbrier (*Smilax*), Virginia creeper

(*Parthenocissus quinquefolia*), American red raspberry (*Rubus strigosus*), and fescue (*Festuca*), are in the vegetative layer.

Hammonton Armory

Wetlands

Palustrine forested broad-leaved deciduous wetland (PFO1) – According to the 2013 NJDMAVA Wetlands PLS Report, this ~4.47 acre wetland type is the dominant community on this site. This wetland was dominated by eastern red cedar (*Juniperus virginiana*, FACU), tulip poplar (*Liriodendron tulipifera*, FACU), red maple (*Acer rubrum*, FAC), American white birch (*Betula papyrifera*, N/L), pitch pine (*Pinus rigida*, FACU), Atlantic white cedar (*Chamaecyparis thyoides*, OBL), sassafras (*Sassafras albidium*, FACU), coastal sweet pepperbush (*Clethra alnifolia*, FACW), horsebrier (*Smilax rotundifolia*, FAC), poison ivy (*Toxicodendron radicans*, FAC), Japanese honeysuckle (*Lonicera japonica*, FAC), Virginia creeper (*Parthenocissus quinquefolia*, FACU), ostrich fern (*Matteuccia struthiopteris*, FACW), purple pitcher plant (*Sarracenia purpurea*, OBL), sensitive fern (*Onoclea sensibilis*, FACW), blueberry sp., and goldenrod sp, as well as a monoculture of Atlantic white cedar (*Chamaecyparis thyoides*, OBL).

Freshwater Forested/Shrub Wetland- According to USFWS National Wetlands Inventory, this wetland is present on-site, ~3.15 acres. A Riverine also runs through this wetland type with an area of 0.35 acres.

Vernal Ponds

According to a vernal pond survey conducted by NJDMAVA EMB in 2019, no vernal ponds were found on this site.

Built Infrastructure

Terrestrial System, Landscapes - Two buildings, surrounding parking lots, and mowed landscaped areas occupy approximately 4 acres.

Forest Assessment

Terrestrial System, Northern Hardwood Forest

1. Canopy Layer – Blackjack (Quercus marilandica) and white oak (Quercus alba), red maple (Acer rubrum), sweetgum (Liquidambar styraciflua) and pitch pine (Pinus rigida) trees.

2. Shrub Layer – Blackjack (Quercus marilandica) and white oak (Quercus alba), red maple (Acer rubrum), black cherry (Prunus serotine), American holly (Ilex opaca) and sassafras are present in the shrub layer.

3. Vine Layer – Virginia creeper (Parthenocissus quinquefolia), greenbrier (S. rotundi) and Japanese honeysuckle (Lonicera japonica) are present in the vine layer.

Lawrenceville Armory

Wetlands

<u>Palustrine forested broad-leaved deciduous wetland (PFO1)</u> – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland type is located on-site. In total, this wetland community type is 1.95 acres, however, only 0.7 acres of this wetland community type are within the site boundary. Identified plant species identified within Wetland Series A include red maple (Acer rubrum, FAC), black cherry (Prunus serotina, FACU), red osier dogwood (Cornus sericea, FACW), multiflora rose (Rosa multiflora, FACU), northern spicebush (Lindera benzoin, FACW), poison ivy (Toxicodendron radicans, FAC), common red raspberry (Rubus idaeus, FAC), and wild onion (Allium, NA) dominated. In addition, sweet gum (Liquidambar styraciflua, FAC), American beech (Fagus grandifolia, FACU), red osier dogwood (Cornus sericea, FACW), skunk cabbage (Symplocarpus foetidus, OBL), tussock sedge (Carex stricta, OBL), water smartweed (Persicaria amphibia, OBL), and clearweed (Pilea pumila, FACW). (NJARNG 2013)

<u>Palustrine scrub-shrub broad-leaved deciduous (PSS1)</u> – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland type is 0.22 acres in size. This wetland is dominated by sweet gum (Liquidambar styraciflua, FAC), southern arrowwood (Viburnum dentatum, FAC), red maple (Acer rubrum, FAC), Russian olive (Elaeagnus angustifolia, FACU), red osier dogwood (Cornus sericea, FACW), northern arrowheart (Sagittaria cuneata, OBL), soft rush (Juncus effusus, OBL), tussock sedge (Carex stricta, OBL), arrow-leaved tearthumb (Traucalon sagittatum, OBL), wool grass (Scirpus cyperinus, OBL), sensitive fern (Onoclea sensibilis, FACW), and jewelweed (Impatiens capensis, FACW). Milkweed and goldenrod species were also present. (NJARNG 2013)

<u>Palustrine emergent persistent wetland (PEM1)</u> – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland type is located on-site and is 0.35 acres in size. Skunk cabbage (Symplocarpus foetidus, OBL) and water smartweed (Persicaria amphibia, OBL) were the most common vegetative species in this wetland community.

<u>Freshwater forested/Shrub Wetland</u>- According to USFWS National Wetlands Inventory, this type of wetland covers ~11.9 acres along the southern part of the property.

Vernal Ponds

According to a vernal pond survey conducted by NJDMAVA EMB in 2019, 28 vernal ponds were found on this site.

Built Infrastructure

<u>Terrestrial System, Landscapes</u> – The buildings, surrounding parking lots, and maintained grass landscaped areas occupy approximately 50.1 acres (70%) of the property.

Forest Assessment

<u>Terrestrial System, northern swamp forest</u>

1. Canopy Layer – Black oak (quercus velutina) and sweetgum (liquidambar styraciflua) were found in this layer.

2. Shrub Layer – American beech (fagus grandifolia), black cherry (prunus serotine), and shellbark hickory (carya laciniosa) trees are found in this layer.

3. Vegetative Layer – cinnamon fern (osmundastrum cinnamomeum), mayapple (podophyllum), and jack-in-the-pulpits (arisaema triphyllum) are in the vegetative layer.

Princeton Warehouse

Wetlands

<u>Palustrine forested broad-leaved deciduous wetland</u> – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland type is the dominant community on this site and is approximately 3.33 acres in size. This wetland community was dominated by green ash (*Fraxinus pennsylvanica*, FACW), red maple (*Acer rubrum,* FAC), pin oak (*Quercus palustris*, FACW), multiflora rose (*Rosa multiflora*, FACU), tartarian honeysuckle (*Lonicera tatarica*, FACU), Japanese honeysuckle (*Lonicera japonica,* FAC), poison ivy (*Toxicodendron radicans*, FAC), Virginia creeper (*Parthenocissus quinquefolia,* FACU), sensitive fern (*Onoclea sensibilis,* FACW), soft rush (*Juncus effusus*, FACW), and polygonum sp.

Palustrine emergent persistent wetland – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland type is located on-site with an estimated area size of 0.08 acres. The wetland at this site captures the typical plants and soil types in the wetland community, detailed within the palustrine forested broad-leaved deciduous wetland section above.

Vernal Ponds
According to a vernal pond survey conducted by NJDMAVA EMB in 2019, no vernal ponds were found on this site.

Built Infrastructure
Terrestrial System, Landscapes - No additional structures have been built on the property since the Parson's 1999 survey. One building, surrounding parking lots and an impound gravel lot is surrounded by dry oak-pine forest. Forested acreage encompasses 6.2 acres of the approximate 8 acres of land onsite.

Forest Assessment
Terrestrial System, Dry Oak-Pine Forest
1. Canopy Layer- Green ash (Fraxinus pennsylvanica), Sassafras (Lauraceae), Red maple (Acer rubrum)

2. Shrub Layer- Tartarian Honeysuckle (Lonicera tatarcia), Common Raspberry (Rubus idaeus), Blueberry (Cyanococcus), Multiflora rose (Rosa multiflora)

3. Vegetative Layer- Spurry knotweed (Polygonum spergulariiforme), Japanese stiltgrass (Microstegium vimineum), Japanese Honeysuckle (Lonicera japonica), Poison Ivy (Toxicodendron radicans), Virginia Creeper (Parthenocissus quinquefolia)

Sea Girt National Guard Training Center

Wetlands
Freshwater Emergent Wetland- According to USFWS National Wetlands Inventory and 2013 NJDMAVA Wetlands PLS Report, this wetland type is present at this site. This wetland series add up to approximately 1.6 acres of total land.

Estuarine and Marine Wetland- According to USFWS National Wetlands Inventory, this wetland exists on site approximately 0.39 acres in area.

Vernal Ponds
The Sea Girt Armory was not assessed during the vernal pond survey conducted by NJDMAVA EMB in 2019.

Toms River Armory

Wetlands
Palustrine forested broad-leaved deciduous wetland – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland type is located on-site and includes 9.7 total acres. This wetland type includes several land vegetation areas, including coastal plain atlantic white cedar swamp, red maple swamp, scrub shrub land, and dry oak-pine forest, and was dominated by red maple (*Acer rubrum*, FAC), coastal sweet pepperbush (*Clethra alnifolia*, FACW), bog fern (*Parathelypteris simulata*, OBL), tussock sedge (*Carex stricta*, OBL), highbush blueberry (*Vaccinium corymbosum*, FACW), pitch pine (*Pinus rigida*, FACU), sweetgum (*Liquidambar styraciflua*, FAC), and mountain laurel (*Kalmia latifolia*, FACU).

Palustrine emergent persistent wetland – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland type is located on-site and includes 0.55 total acres. The land vegetation area for this wetland is not documented.

Riverine lower perennial emergent wetland – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland type is located on-site with 1.23 total acres, and includes a dry oak-pine forest.

Freshwater Forested/Shrub Wetland- According to USFWS National Wetlands Inventory, this wetland exists on-site and includes 9.9 total acres.

Freshwater Emergent Wetland- According to USFWS National Wetlands Inventory, this wetland exists on-site and includes 0.9 total acres.

Vernal Ponds
According to a vernal pond survey conducted by NJDMAVA EMB in 2019, 1 vernal pond was found on this site.

Built Infrastructure
Terrestrial System, Landscapes – No additional structures have been built on the property since the Parsons's 1999 survey. Three buildings, surrounding parking lots, and mowed landscaped areas occupy approximately 4 acres.

Forest Assessment

Terrestrial System, Northern Pine-Oak Forest

1. Canopy Layer - Red oak (*Quercus rubra*), pitch pine (*Pinus rigida*) and white oak (*Quercus alba*) trees.

2. Shrub Layer – Highbush blueberry (*Vaccinium corymbosum*) and white oak are present in the shrub layer, and

3. Vegetative Layer –Highbush blueberry is in the vegetative layer.

Trenton Mercer Aviation

Wetlands

Palustrine forested broad-leaved deciduous wetland (PFO1) – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland type is located within on site. This wetland community was dominated by red maple (*Acer rubrum,* FAC), great lobelia (*Lobelia siphilitica,* FACW), water smartweed (*Persicaria amphibia*, OBL), and white snakeroot (*Ageratina altissima,* FACU). In addition, the wetland was dominated by silver maple (*Acer saccharinum*, FACW), red maple (*Acer rubrum*, FAC), black willow (*Salix nigra*, FACW), American elm (*Ulmus americana*, FACW), southern arrowwood (*Viburnum dentatum*, FAC), Japanese honeysuckle (*Lonicera japonica*, FAC-), Virginia creeper (*Parthenocissus quinquefolia*, FACU), Asiatic bittersweet (*Celastrus orbiculatus*, FACU), jewelweed (*Impatiens capensis*, FACW), and common cattails (*Typha latifolia*, OBL).

Lacustrine littoral unconsolidated bottom mud wetland (L2UB3) – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland type is located on-site and includes ~0.5 total acres.

Riverine- According to USFWS National Wetlands Inventory, a riverine flows through the property approximately 0.47 total acres.

Vernal Ponds

According to a vernal pond survey conducted by NJDMAVA EMB in 2019, no vernal ponds were found on this site.

Built Infrastructure

Terrestrial System, Landscapes – Three buildings, surrounding parking lots, and mowed landscaped areas occupy approximately 4 acres.

Vineland Armory

Wetlands
Palustrine emergent persistent wetland (PEM1) – According to the 2013 NJDMAVA Wetlands PLS Report, the wetland areas on this site were observed to be palustrine emergent persistent wetlands. This wetland was dominated by multiflora rose (*Rosa multiflora*, FACU), Allegheny blackberry (*Rubus allegheniensis*, UPL), highbush blueberry (*Vaccinium corymbosum*, FACW), water smartweed (*Persicaria amphibian*, OBL), false nettle (*Boehmeria cylindrica*, FACW), common threesquare (*Schoenoplectus pungens*, OBL), pokeweed (*Phytolacca americana*, FACU), Japanese stiltgrass (*Microstegium vimineum*, FAC), and spotted water hemlock (*Cicuta maculata*, OBL).

Freshwater Forested/Shrub Wetland- According to USFWS National Wetlands Inventory, this wetland exists on-site along the northern property boundary and includes 2.7 acres in total.

Vernal Ponds

According to a vernal pond survey conducted by NJDMAVA EMB in 2019, no vernal ponds were found on this site.

Built Infrastructure
Terrestrial System, Landscapes – Approximately 17.7 acres are developed, containing two main buildings, parking lot and driveway, mowed grass and bare ground.

Forest Assessment
Terrestrial System, Northern Pine Oak Forest –
1. Canopy Layer – Scrub pine (*Pinus virginiana*) and white oak (*Quercus alba*).

2. Shrub Layer – Pitch pine (*Pinus rigida*), scrub pine (*Pinus virginiana*), eastern red cedar (*Juniperus virginiana*), and red oak (*Quercus rubra*) are present in the shrub layer.

3. Vegetative Layer – Trumpet vine (*Campsis radicans*), white oak (*Quercus alba*), and sassafras (*Sassafras*) are in the vegetative layer.

Terrestrial System, Oak Hickory Forest
1. Canopy Layer – Pitch pine (*Pinus rigida*), white oak (*Quercus alba*), sassafras (*Sassafras*) and pignut hickory (*Carya glabra*).

2. Understory – Sassafras (*Sassafras*), white oak (*Quercus alba*), pignut hickory (*Carya glabra*), blackjack oak (*Quercus marilandica*), blueberry and dogwood are present in the understory layer.

3. Vegetative Layer – Sassafras (*Sassafras*), white oak (*Quercus alba*), blackjack oak (*Quercus marilandica*), and greenbrier (*Smilax glauca*) are in the vegetative layer.

Woodstown Armory

Wetlands

<u>Palustrine forested broad-leaved deciduous wetland (PFO1)</u> – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland type is located on-site ~0.06 acres. This wetland was dominated by silver maple (*Acer saccharinum*, FACW), eastern red cedar (*Juniperus virginiana*, FACU), sweetgum (*Liquidambar styraciflua*, FAC), ashleaf maple (*Acer negundo*, FAC), Atlantic white cedar (*Chamaecyparis thyoides*, OBL), winged sumac (*Rhus copallina*, FACU), steeplebush (*Spiraea tomentosa*, FACW), poison ivy (*Toxicodendron radicans*, FAC), American bittersweet (*Celastrus scandens*, FACU), Virginia creeper (*Parthenocissus quinquefolia*, FACU), multiflora rose (*Rosa multiflora*, FACU), southern arrowwood (*Viburnum dentatum*, FAC), phragmites (*Phragmites australis*, FACW), and common three square (*Schoenoplectus pungens,* OBL). (NJARNG 2015).

<u>Palustrine emergent persistent wetland (PEM1)</u> – According to the 2013 NJDMAVA Wetlands PLS Report, this wetland was dominated by poison ivy (*Toxicodendron radicans*, FAC), Virginia creeper (*Parthenocissus quinquefolia*, FACU), ground ivy

(*Glechoma hederacea*, FACU), sensitive fern (*Onoclea sensibilis,* OBL), soft rush (*Juncus effusus,* OBL), and phragmites (*Phragmites australis*, FACW).

Vernal Ponds
According to a vernal pond survey conducted by NJDMAVA EMB in 2019, one vernal pond was identified on this site.

Built Infrastructure
Terrestrial System, Landscapes – Two buildings, surrounding parking lots, and mowed landscaped areas occupy approximately 7.6 acres (Parsons 1999).