

Vernal Habitat Survey Plan

NJARNG Facilities
2019



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1.0 Introduction

1.1 Goals and Objectives

The goal of this project is to determine vernal habitat presence at the 23 NJARNG listed below. Field work will begin in the Spring of 2019.

Vernal pools are confined wetland depressions, either natural or man-made, that hold water for at least two consecutive months out of the year, and are devoid of breeding fish populations. Vernal pools are considered ephemeral wetlands which are seasonally flooded, becoming dry annually, and generally isolated from stream systems. Vernal pools are fed by rain, fill with water in late fall and remain wet until mid-summer before drying up. Not only are vernal pools wet for a small portion of the year, but they also tend to be extremely small, usually only fragments of an acre in size. In New Jersey, rural portions of the Skylands, Piedmont, and Coastal Plain landscapes are home to the majority of vernal pools. These unique ecosystems provide habitat to many species of amphibians, insects, reptiles, and plants. Several state threatened and endangered species such as the Eastern tiger salamander (*Ambystoma tigrinum* [Endangered]), Blue-spotted salamander (*A. laterale* [Endangered]), Southern gray treefrog (*H. chrysoscelis* [Endangered]), Pine Barrens treefrog (*H. andersonii* [Threatened]), Long-tailed salamander (*Eurycea longicauda* [Threatened]), and Wood turtle (*Glyptemys insculpta* [Threatened]). Since 2002, the NJDEP has coordinated the Vernal Pool Project whose objective is to map vernal pools throughout the state. This information has been added to the Landscape Project to include mapping of potential presence of vernal pool habitat in addition to documented vernal pool presence (NJDEP 2016). As of 2005, 13,000 pools have been mapped (Lathrop 2005). This data was reviewed to determine the possible presence of vernal pool habitats on and adjacent to the survey sites. Determination for certification of a potential surveyed vernal habitat, the area must satisfy the four criteria that define a vernal pool according to the NJDEP. Vernal habitat criteria is defined and discussed below.

1.2 Survey Area

Installations listed in Table 1 are proposed survey sites with potential vernal habitat. Determination of the possible vernal habitat at these installations is discussed below.

Table 1- Facilities Subject to Vernal Habitat PLS

Installation Name	Municipality	County
Bordentown Armory	Bordentown Township	Burlington
Bridgeton Armory	Upper Deerfield Township	Cumberland
Cape May Armory	Middle Township	Cape May
Cherry Hill Armory	Cherry Hill Township	Camden
Dover Armory	Dover Township	Morris
Flemington Armory	Raritan Township	Hunterdon
Fort Dix JFHQ Area	Wrightstown Borough	Burlington
Franklin Armory	Franklin Borough	Sussex
Hackettstown Armory	Town of Hackettstown	Warren
Hammonton Armory	Town of Hammonton	Atlantic
Lawrenceville Complex	Lawrence Township	Mercer
Mercer Armory	Ewing Township	Mercer
Morristown Armory	Morris Township	Morris
Picatinny FMS	Rockaway Township	Morris
Princeton Warehouse	Princeton Township	Mercer
Sea Girt Armory	Sea Girt Borough	Monmouth
Somerset Armory	Franklin Township	Somerset
Toms River Armory	Dover Township	Ocean
Tuckerton	Tuckerton Borough	Ocean
Vineland Armory	Vineland City	Cumberland
Washington Armory	Washington Township	Warren
West Orange Complex	West Orange Township	Essex
Woodstown Armory	Woodstown Borough	Salem

It should be noted that the following 15 facilities will not be part of the survey effort:

- Atlantic City Armory, Burlington Armory, Freehold Armory, Jersey City Armory, Newark Armory, Lodi Armory, Mount Holly Armory, Riverdale Armory, Teaneck Armory, Woodbury Armory- These facilities lack undeveloped landscapes that would not exhibit potential vernal habitat.
- Lakehurst CLTF, New Egypt Armory, Washington Armory, Westfield Armory- These facilities lack wetland habitat according to past wetland delineation assessments and large tracts of open field that would exhibit potential vernal habitat. Therefore these facilities will not be part of the survey effort.
- Newton Armory- This facility is excluded from the survey effort due to its pending closure.

1.3 Survey Criteria Guideline

1.3.1 NJDEP Vernal Habitat Certification Criteria

Item 1: Occurs in a confined basin depression without permanent flowing outlet.

Items 2: Features evidence of breeding by one or more species of fauna adapted to reproduce in ephemeral aquatic conditions. These species are divided into two categories.

- 1) Obligate species- vernal species for which vernal habitats are the only type of habitat used for breeding. The following will constitute evidence of breeding by a species listed as an obligate species:
 - a) The following types of evidence of breeding adults:
 - i) Frog breeding chorus;
 - ii) Mated pairs of frogs;
 - iii) Salamander courting individuals; and/or
 - iv) Salamander spermatophores;
 - b) Two or more egg masses of any obligate species;
 - c) Frog tadpoles;
 - d) Mole salamander larvae; and/or
 - e) The following types of evidence of transforming juveniles;
 - i) Wood frogs with tail stubs evident; and/or
 - ii) Salamanders with gill remnants evident.

- 2) Facultative species- species that will use vernal habitat for various activities, for example breeding or foraging, but can use other types of habitats.

Item 3: Maintains ponded water for at least two continuous months between March and September of a normal rainfall year.

Item 4: Is fish free throughout the year, or dries up at some time during the year.

It should be presumed that Items 3 and 4 are satisfied if an area satisfies Item 2 by showing evidence of breeding obligate species. This presumption does not apply if an area satisfies Item 2 solely by showing evidence of breeding by facultative species. Obligate species depend almost exclusively on vernal habitat for breeding, and cannot breed in other types of habitat. Facultative species do not depend solely on vernal habitat and therefore cannot be seen as satisfying Items 3 and 4.

1.4 Survey Methods

1.4.1 Background Research

Several sources were consulted prior to planning field work activities:

- 1) “2015 Wetland Delineation Report 21 NJARNG”
- 2) Analysis of NJARNG GIS system for land cover and vernal pool layer data that would confirm 2013 wetland report findings.
- 3) Research on obligate and facultative species that are characteristic of vernal habitat in New Jersey.

1.4.2 Survey Order

Southern facilities may be prioritized or surveyed first to help develop survey plans for the Pine Barrens Tree Frog Survey Plan. Remaining facilities will be surveyed alphabetically.

1.4.3 Survey Plan Field Methods

Active Survey:

Visit 1: Conducted between mid March to the beginning of May in 2019.

During the first visit the forested areas/open fields of the target facility will be surveyed for potential vernal ponds (PVP). Location of potential vernal pond will be mapped using GPS and marked in the field with a flag, labeled with a unique ID number. A vernal pond data sheet will be filled out for every potential vernal pond that is come across in the field. The data sheet is provided by Michigan Natural Features Inventory. See attached data form and detailed instructions for filling out the form. See below for step by step procedure of locating and documenting potential vernal habitat and species found within approximately 50 feet of its radius:

1. Walk facility grounds in 100-200 ft. transects that are spaced approximately 50 feet apart, focusing in forested areas and open fields in search of isolated water basins not connected to any stream systems.
2. Stake potential vernal pond with flag along transect and come back to GPS once entire area has been surveyed.
3. GPS location of potential vernal habitat and label with unique ID number (eg. facility abbreviation LV (Lawrenceville)-PVP (potential vernal pond)-# (numbered in consecutive order) LV-PVP-#).
4. Hang flag with the potential vernal habitat unique ID number written on it once GPS location recorded.
5. Mark approximate PVP location on printed aerial photo of facility using its number (eg. 1, 2, 3, etc.)
6. Take photos of the entire vernal pool and the surrounding habitat from outside the pool in all four cardinal directions (5 photos total), if possible, during each survey visit so that we can see the entire pool and all the vegetation and habitat conditions within and around the pool. Please make sure to take photos from the same locations during each visit.
7. Keep track of all vernal pool pictures, by labeling photos in the field by including a small whiteboard, or sheet of paper in the photo with the following information: Unique ID number, Date (mm/dd/yyyy), Description of what photo is being taken of and/or cardinal direction of photo.
8. GPS all photo locations and label with unique ID corresponding with the potential vernal pool ID (eg. potential vernal pool ID: LV-PVP-1, potential vernal pool picture ID: LV-PVP-1 Pic 1 Facing North).
9. Fill in Data Sheet before moving to next staked PVP along transect.
10. Actively look for reptile and amphibian egg masses within the potential vernal ponds.
11. Take photos of egg masses to document and GPS location (include in GPS label it is of an egg mass).
12. Actively look for species off the obligate and facultative list by turning over logs and other features species could be under, approximately in a 50 foot radius of PVP.

13. Take photos of ALL species to document and identify.
14. Only GPS location of species that identify as potential vernal pool indicator species (include in GPS label the species name).
15. Actively listen for frog chorus and record (if possible) to identify species.
16. Create a GPS area polygon ONLY if PVP's look as if they could be one if flooded. Otherwise each PVP should have ONE location point after the first visit. PVP's from first visit will be revisited later in the season to verify PVP as a vernal pond. During Visit 2 the verified vernal habitat boundary will be delineated using GPS.

Visit 2: Conducted between May and beginning of July 2019.

During the second visit all PVPs that were marked using GPS during the initial survey will be revisited to verify that water has held. If water is still present and/or area still classifies as vernal habitat, the area will be delineated using GPS around its maximum boundary. Take photos in the same photo locations from initial survey that were marked using GPS. Conduct another active survey for obligate and facultative species ONLY if indicator species and/or two facultative species were not documented during the first visit.

Passive Survey:

Passive level surveys will be conducted at facilities that do not exhibit obligate vernal species or two breeding facultative species in potential vernal habitat, but do however meet the NJDEP's protocol criteria for Item 1 & 4. A game camera will be deployed at sites that meet the aforementioned criteria to determine if the potential vernal habitat maintains ponded water for at least two continuous months between March and September. Cameras will be programmed to take one still photo everyday for two months. After one month cameras will be checked to make sure batteries have not malfunctioned. During this time another visual active survey of the target area will be conducted for any possible obligate or facultative vernal species, in the event that the initial survey of the site was too early in the season for breeding obligate species.

Below is the listed criteria to properly document vernal habitat during field surveys, according to the NJDEP Protocol. For the effort of this Vernal Habitat Planning Level Survey (PLS) the criteria will be implemented during field surveys at the 23 proposed survey sites, listed in Table 1.

Required Field Observations for Certifying a Vernal Habitat:

- 1) **Item 1-** Document survey area with clear photographs taken from outside the pool in four cardinal directions and a clear photograph of pool, confirming as a confined basin

depression without a permanent flowing outlet. Whiteboard will be displayed in photos, detailing the PVPs unique ID number, date, and photo description. GPS ALL photo locations. When revisiting a site, take photos in the same GPS locations as the first visit.

- 2) **Item 2-** Photograph each observation of a vernal habitat species; and/or a taped audio recording of a frog breeding chorus. GPS location of a identified vernal indicator species.
- 3) **Item 3-** If a survey area does not exhibit obligate vernal species during the initial survey field reconnaissance, resulting in Item 2 not being satisfied (and therefore presume Item 3 and 4 be satisfied) evidence is required to support observations that an area maintains ponded water for at least two contiguous months between March and September. A game camera will be deployed for a two month period at survey sites that satisfy Item 1 definition of a vernal habitat. The game camera will be situated to record a daily still photograph in lapse time. At the end of the two month period it will be determined from the photographs if Item 3 was satisfied.
- 4) **Item 4-** Clear photographs and statement of direct observation that the area is dried up and therefore would not support fish populations. However, if Item 2 has been satisfied it is presumed that fish populations do not exist in the survey area and therefore no action is required.

Required Documentation to Identify Vernal Habitat Location:

- 1) Delineate GPS coordinates of potential vernal habitat survey area boundary (Do this during second visit to verify PVPs as vernal habitat).
- 2) A photocopy of an 8.5” by 11” section of the appropriate United States Geological Survey quadrangle map with the approximate site of the vernal habitat clearly marked.
- 3) Detailed description of features in the immediate vicinity (within 1000 feet) of the vernal habitat.

1.4.4 Field Work Survey Documents

In conjunction with the NJDEP Protocol, the following documents will be used to support survey efforts:

- 1) The Volunteer Vernal Pool Monitoring Form, supplied by Michigan Natural Features Inventory: Michigan Vernal Pools Project. This data sheet will be used to document survey area characteristics, potential obligate and facultative herpetofauna and unique ID numbers for all PVPs and photos.
- 2) Field Guide to Vernal Habitat Fauna and Flora.
- 3) Game Camera Deployment Data Sheet.

1.4.5 Survey Materials

- 1) GPS
- 2) Camera
- 3) Game Camera and Mounting Equipment
 - a) 14" cable/zip ties
 - b) custom built stands/stakes
 - c) cable cutters
 - d) batteries
 - e) SD cards
- 4) Rubber Mallet
- 5) Measuring Tape
- 6) Numbered Card Markers
- 7) Flagging Stakes
- 8) Clipboard
- 9) Whiteboard
- 10) Pens/Pencils/Dry Erase Markers
- 11) Backpack
- 12) Facility Map
- 13) Vernal Habitat Fauna and Flora Field Guide
- 14) Do Not Disturb Game Camera Signs
- 15) Datasheets
 - a) The Volunteer Vernal Pool Monitoring Form
 - b) Game Camera Deployment Data Sheet



1a) Observer Information Visit 1 Visit 2 Visit 3 Time: from _____ AM PM to _____ AM PM

Name(s): _____ Date: _____

1b) Property Information Ownership? Public Private Landowner/Manager Name: _____

Site name: _____ Address: _____

Plot # _____ City: _____ State: _____ Zip: _____

2a) Vernal Pool Location Was pool mapped as a Potential Vernal Pool (PVP)? Yes No

Pool ID #: _____ New Pool ID #: _____ Enter coordinates in Decimal Degrees (e.g. Latitude: 44.764322 Longitude: -72.654222)

Township/Range/Section/1/4 info: _____ Latitude: _____ Longitude: _____

County: _____ For verification of PVP's location please enter names and coordinates for the nearest crossroads. Record as Decimal Degrees as shown above.

Method for locating pool? Latitude: _____ Longitude: _____

GPS Topo Map Google Earth Air Photo Crossroad names: _____

2b) Brief Site Directions to Pool **

Empty box for site directions.

** Written site directions to pool (This should include: (1) description of a logical starting point; (2) the distance from the starting point to pool; (3) the direction of travel; and (4) distinctive landmarks and water bodies.): For example 'Enter Robinhood Park on the trailhead at Jordan Road. Follow the trail west approximately 1/2 mi. This is the first pool on your left, just behind a low stone wall.'

3a) Pool Type Is this a Vernal Pool? Yes No Not Sure Pool Photo Numbers: _____

Open Pool Sparsely Vegetated Pool Shrubby Pool

Forested Pool Marsh Pool Other (describe): _____

3b) Presence of Inlet or Outlet

Is this pool connected to or part of another water feature? culvert lake open/emergent/shrubby wetland

No, pool is isolated Yes, pool is connected to: (check ALL that apply) stream ditch forested wetland vernal pool

If inlet/outlet is present, indicate type: permanent temporary do not know none

3c) Surrounding Habitat (within 100 feet of pool) (check ALL that apply)

Upland Deciduous Forest Lowland Deciduous Forest Disturbances: Powerline right-of-way Other: _____

Upland Coniferous Forest Lowland Coniferous Forest Agriculture Light development (<25%) No disturbances

Upland Mixed Forest Lowland Mixed Forest Road/driveway Intensive development (>25%)

Floodplain Grassland or open paved Minor logging (> or = 70% canopy remaining)

Emergent Wetland (marsh, bog) dirt/gravel Major logging (< or = 70% canopy remaining)

4a) Approximate Maximum Pool Depth 4d) Approximate Size of Pool (at maximum capacity - at widest and longest points)

Ankle-deep (<6") Hip-deep (2-3 ft) Width: _____ feet

Shin-deep (6-12") Chest-deep (3-4 ft) Length: _____ feet

Knee-deep (12-24") Deeper than 4 ft Size determined by: Pacing Measuring Using GPS

4b) Water Level at Time of Survey (check one)

Full/Nearly full 75-100% Less than half 25-49% Leaf litter Sand - Gravel Unknown

Partially full 50-74% Dry/mostly dry 0-24% Bedrock Muck - Peat Other: _____

4c) Water temperature (*F): _____ Loam Silt - Clay

4f) Vegetation in Pool

Are trees (trees = or > 4" in diameter) present in the basin? (check one)

- No Yes, within pool basin Yes, but only at the edge

of trees only within the pool basin? _____ live and/or dead/snags

% Cover within the pool (check one):

Floating vegetation: 0% 1 to 9% 10 to 25% 26 to 50% >50%

Emergent vegetation: 0% 1 to 9% 10 to 25% 26 to 50% >50%

Shrubs: 0% 1 to 9% 10 to 25% 26 to 50% >50%

Tree canopy over pool basin (when leaves are fully out): 0% 1 to 9% 10 to 25% 26 to 50% >50%

4g) Pool Disturbance (in pool, immediately adjacent or along shore of pool - check all that apply)

- Dumping - Refuse Filling Invasive Species Present
 Ditching - Draining Sediment Purple loosestrife Garlic mustard
 Agricultural runoff Vehicle ruts Reed canary grass Other: _____
 Cultivation - Livestock Presence of rock pile or other anthropogenic disturbance No disturbances

4h) Cover (Any material in the pool that can provide egg attachment sites and offer concealment to adults and/or larvae; check all that apply):

- Shrubs Submergent vegetation
 Branches, twigs Logs or large woody debris
 Sphagnum moss Emergent vegetation (grasses, cattails)
 Algae Other: _____
 Leaf litter

5) Indicator Species and Additional Species (if other species are observed please list below in blank fields under Fingernail Clams)

Provide a photograph of each indicator species (adults, juveniles/larvae, or egg masses) observed. **Photos of species observed are required.**

Species Observed	Adults	Tadpoles/Larvae	Egg Masses			Photo? Yes	Notes/Photo ID#
			Number	Estimated	Counted		
Wood Frog				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Spotted Salamander				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Blue-spotted Salamander				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fairy Shrimp							
Fingernail Clams							
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Were any of the following observed? (check ALL that apply)

- Fish: (indicate all lengths observed) ≤ 3" > 3" Green frogs: tadpoles adults
 Bullfrogs: tadpoles adults Other: _____

Comments:

Draw diagram of pool (include landmarks, location of indicated species, north arrow and area surveyed if entire pool was not surveyed):

Instructions—Volunteer Vernal Pool Monitoring Form

The goals of the field sampling are to 1) determine whether or not a remotely mapped “potential” vernal pool is indeed a vernal pool, 2) identify and map additional vernal pools encountered in the field that were not remotely mapped, and 3) collect biological and physical data about vernal pools in Michigan. This information will be used to develop and implement an effective approach for mapping, assessing, and classifying vernal pools in Michigan. It is important to note that this protocol and form may be revised in the future. Please make sure you are using the latest versions. Fields that are highlighted in gray on the form only need to be filled out during the first visit of each year that the pool is monitored unless the information needs to be revised or updated during subsequent visits.

1. Observer and Property Information

1a) Observer Information

Visit # - Please check the appropriate visit number for each survey visit to the pool.

Name(s) - Write the first and last names of all surveyors for that visit (and on each visit).

Date - Please indicate month, date, and year (mm/dd/yyyy) of the survey visit.

Time - Please write in the time you started the survey (from) and the time you ended the survey (to), noting AM or PM for both.

1b) Property Information

Ownership – Please check whether the vernal pool you are visiting is located on publicly owned land or privately-owned land.

Site name – Please write in the name of the site in which the pool is located if it has a formally designated name (e.g., Waterloo State Recreation Area). If the site is privately owned and/or does not have a designated name, please write in a specific name for the site based on local geographic landmark(s) (e.g., Mill Lake Southeast) or ownership (e.g., Chelsea Hunt Club).

Plot # - Please indicate the pre-assigned identification # for the sample plot/test cell in which the vernal pools is located, if applicable and available.

Landowner/Manager - Please write in the name, address, city, state, and zip code for the owner or manager of the site/property in which the vernal pool is located (e.g., Michigan DNR and address of park headquarters or local office; or John Smith and property address).

2) Vernal Pool Location Information

2a) Vernal Pool Location

Was pool mapped as a Potential Vernal Pool (PVP)? – Please indicate whether the pool you are visiting or surveying was mapped as a potential vernal pool (PVP).

Pool ID # - If the pool you are visiting or surveying was mapped as a potential vernal pool (PVP), please write in the pre-assigned unique identification number (Pool ID #) of the PVP. If the pool was not mapped as a PVP, please leave this blank.

New VP ID # - If you encounter a vernal pool (VP) in the field that was not remotely mapped as a potential vernal pool (PVP), please document and map it as well. You will need to assign the new vernal pool a unique identification (ID) number and write the ID # you assigned to the pool in this space.

To assign unique ID numbers to new pools encountered in the field, please add letters in alphabetical order to the ID # of the closest mapped potential vernal pool. For example, if new vernal pool is located closest to MNF11-228, please assign it a temporary Pool ID # of MNF11-228A. If there are three new pools found closest to MNF11-228, please assign the three new pools Pool ID #'s of MNF11-228A, -228B, and -228C.

Please make sure to locate each new vernal pool found in the field with a GPS point, if possible and indicate each new pool on maps and/or air photos with assigned Pool ID #'s.

County – Please indicate the county in which the vernal pool or survey site is located.

Township/Range/Section/1/4 Info - Please write in the township (T), range (R), section (S), and quarter section for the location of the vernal pool found or site surveyed (e.g., T2S R4E Sec. 25 SE1/4). The following link provides additional information about the township, range, section mapping system:

http://nationalatlas.gov/articles/boundaries/a_plss.html.

You can find the township, range, and section for your vernal pool location on a topographic map, county map, and online. The following is a link to one website that provides township, range, and section information for specific locations:

<http://www.earthpoint.us/Townships.aspx>.

Method for locating pool – Please indicate the method(s) used for locating and mapping the vernal pool or survey site in the field by checking whether you used a GPS unit, a topo or topographic map, Google Earth, and/or an air photo. Please check all that apply.

Latitude/Longitude – Please write in the latitude and longitude coordinates for the location of the vernal pool or site surveyed in the field. Please enter coordinates in the decimal degree format. Most GPS units will default to this format. If your GPS unit is showing UTM or some other coordinates, you can change the display, typically in the settings menu. UTM coordinates will be two numbers like decimal degrees but will not have a decimal point or a “0” symbol after them.

Latitude and longitude in the non-decimal degree will show degrees (°), minutes (′), and seconds (″) symbols. Your coordinate reading format should match that shown in the example on the field form:

Latitude: 44.764322 Longitude: -72.654222.

If you do not have a GPS unit, you can also get latitude and longitude coordinates for a specific location online. Here is a link to a website where you can find the latitude and longitude coordinates for a specific location using Google Maps - <http://itouchmap.com/latlong.html>. Also, many smartphones have GPS capabilities and can take GPS points or provide coordinates using an application. Please remember to record the latitude and longitude for where you visited/surveyed even if the potential vernal pool turns out to not be a vernal pool.

Verification Latitude/Longitude – If you are using a GPS unit, for verification of the GPS unit’s accuracy and vernal pool location, please take a GPS point at the nearest crossroad intersection. Please record the names of the crossroads and the latitude and longitude coordinates for the crossroad intersection. If you are not using a GPS unit, you can leave this blank.

2b) Brief Site Directions to Pool

Please provide brief written directions for how to locate and get to the pool in the field. Please include the following: 1) description of a logical starting point; 2) distances from the starting point and other landmarks along the way to the pool; 3) direction of travel; and 4) distinctive landmarks and water bodies. For example, “Enter Robinhood Park on the trailhead at Jordan Road. Follow the trail west approximately ½ mi. The pool is the first pool on your left, just behind a low stone wall.”

3. Vernal Pool Field Verification Information

3a) Pool Type

Open Pool – Check this box for the “classic” vernal pool

- Less than 10% of the pool basin (when filled with water) is covered with vegetation (live trees, shrubs and/or non-woody herbaceous or persistent emergent plants).

Sparsely Vegetated Pool – Check this box if:

- Between 10% and 30% of the pool basin (when filled with water) is comprised of vegetation (live trees, shrubs and/or non-woody herbaceous or persistent emergent plants) .

Forested Pool – Check this box if:

- More than 30% of the pool basin (when filled with water) is comprised of vegetation (live trees, shrubs or and/or non-woody herbaceous or persistent emergent plants)

AND

- Rooted/live trees comprise 30% or greater of the uppermost vegetation layer within the pool

Shrubby Pool – Check this box if:

- More than 30% of the pool basin (when filled with water) is comprised of vegetation (trees, shrubs or and/or non-woody herbaceous or emergent plants)

AND

- Shrubs comprise 30% or greater of the uppermost vegetation layer within the pool.
- If trees are present they comprise less than 30% of the uppermost vegetation layer within the pool basin.

Marshy Pool – Check this box if:

- Herbaceous and/or emergent vegetation comprise between 30-50% of the uppermost vegetation layer within the pool basin when the pool is filled with water.

- If trees and shrubs present they cover less than 30% of the uppermost vegetation layer within the pool basin.
- If tree and/or shrubs cover less than 30% and emergent plants comprise over 50% of the pool basin, the wetland will be classified as an emergent wetland and **NOT** a vernal pool for purposes of this project.

Other – Check this box if the vernal pool does not fit one of the other pool types. Please provide description of the pool in space provided, particularly how pool differs from other pool types.

3b) Presence of Inlet or Outlet

Is this pool connected to or part of another water feature? – Check “No, pool is isolated” if there is no evidence of any channelized water above ground entering or exiting the pool or any above ground connection to another wetland or water body. Check “Yes” if the pool has evidence of channelized water entering or exiting the pool or a surface water connection to another wetland or water body, or if the pool is part of another wetland (e.g., pool within a forested swamp or connected to a bog or marsh). If yes, please check ALL the different types of wetlands or water bodies to which the pool is connected.

If an inlet/outlet is present, indicate type – Check “permanent” if there is channelized water continuously or permanently running into or out of the pool. These sites are typically not vernal pools. Check “temporary” if there is evidence of channelized water entering or exiting the pool, but it doesn’t appear to run continuously or be permanent. Many vernal pools, for example, have an outlet that functions if the water level in the pool reaches a certain level. Check “do not know” if unsure whether the channelized water running into or out of the pool is permanent or temporary.

3c) Surrounding Habitat

Check the box/boxes that best describe the surrounding forest or habitat that occurs within 100 feet of the vernal pool. If multiple types of forest or habitats occur within 100 feet of the pool, you can check multiple boxes. Please check **ALL** that apply.

Upland Deciduous Forest – Check this box if the forest surrounding the pool occurs in the uplands (i.e., high ground or elevated land) where drainage is sufficient so that the soils do not become saturated (soil moisture ranges from dry to moist), and the forest primarily consists of or is dominated by deciduous or hardwood trees. Trees often found in upland deciduous or hardwood forests include black oak, white oak, red oak, hickories, cherries, beech, aspen, and sugar maple.

Upland Coniferous Forest – Check this box if the forest surrounding the pool occurs in the uplands where drainage is sufficient so that the soils do not become saturated, and the forest primarily consists of or is dominated by coniferous or evergreen trees. Trees often found in upland coniferous forests include jack pine, red pine, white pine, white spruce, balsam fir, hemlock, and cedar.

Upland Mixed Forest - Check this box if the forest surrounding the pool occurs in the uplands where drainage is sufficient so that the soils do not become saturated, and the forest consists of a mix of or dominated by both deciduous/hardwood and coniferous/evergreen trees.

Lowland Deciduous Forest - Check this box if the forest surrounding the pool occurs in the lowlands (i.e., low ground, usually level land or depression) where drainage is poor so that the soils are wet or saturated, or standing water is present, and the forest primarily consists of or is dominated by deciduous or hardwood trees. Trees often found in lowland deciduous or hardwood forests include black ash, green ash, silver maple, red maple, basswood, sycamore, cottonwood, American elm, swamp white oak, pin oak, and yellow birch.

Lowland Coniferous Forest - Check this box if the forest surrounding the pool occurs in the lowlands where drainage is poor so that the soils are wet or saturated, or standing water is present, and the forest primarily consists of or is dominated by coniferous or evergreen trees. Trees often found in lowland coniferous forests include tamarack, northern white cedar, black spruce, white spruce, hemlock, balsam fir, and white pine.

Lowland Mixed Forest - Check this box if the forest surrounding the pool occurs in the lowlands where drainage is poor so that the soils are wet or saturated, or standing water is present, and the forest consists of a mix of deciduous/hardwood and coniferous/evergreen trees.

Floodplain - Check this box if the pool occurs in a floodplain along or near a stream/river.

Emergent Wetland - Check this box if the surrounding habitat within 100 ft of the pool contains open or emergent wetlands (e.g., marsh, wet meadow, wet prairie, bog).

Grassland or Open - Check this box if the surrounding habitat within 100 ft of the pool contains grassland or open habitats in upland settings (e.g., old field, prairie).

Disturbances - Check the box/boxes that best describe any disturbances in the surrounding habitat within 100 feet of the vernal pool. Please check **ALL** that apply.

4) Pool Characteristics

4a) Approximate Maximum Pool Depth

This is an approximate depth at the deepest part of the pool (typically the center). Feel free to use a stick or other measuring device if you would like, or estimate from the pool edge if you cannot wade into the deepest part. Please check the appropriate box, and only **ONE** box.

4b) Water Level at Time of Survey

This is an estimate of the percent of the entire pool basin that is filled with water (i.e., combination of water level and percent of basin filled with water relative to high water mark). In order to estimate this and 4d, examine the edges of the pool for signs of high water. Signs include water-stained leaves, sediment deposits on the leaf litter, water marks or moss on tree trunks, and mucky/squishy soil. Please check appropriate box, and only **ONE** box. If water level varies across the basin, please average for entire basin and provide explanation.

4c) Water Temperature

Take three water temperature readings along the length of the pool (two at either end and one in or close to the center of the pool). Record the average of the three water temperature readings. If the pool is dry or too shallow, leave this blank.

4d) Approximate Size of Pool

Record the width and length of the pool when it is completely full or at maximum capacity at its widest and longest points. You can measure the width and length of the pool using a measuring tape or rangefinder, or by pacing. If you have a GPS unit and can record tracks, you can walk along and GPS the perimeter of the pool, which can be used to calculate the area of the pool. Please check how the pool dimensions were determined – either by pacing, measuring, or using GPS. To obtain these measurements when the pool is not completely full, examine the pool basin for evidence of high water (see 4b), and take measurements at the high water mark. We need the approximate width and length of the pool to estimate pool area. While the length of the pool perimeter is useful information, it does not provide enough information to estimate pool area.

4e) Substrate

Please check the type(s) of substrate or soil in the pool basin. It will be easiest to determine this when the pool is dry. To determine the soil texture (defined below), take a small sample of soil (below the leaf litter if present, 1-2 inches deep if possible), add some water, and rub it between your fingers to feel the soil texture. Please check **ALL** that apply.

Leaf Litter – Check this box if leaf litter is present on the ground in the pool basin.

Muck-Peat – Check this box if the substrate contains muck and/or peat. Muck is an organic soil consisting of highly decomposed materials (i.e., altered beyond recognition/can't see any plant fibers or material). Muck has a "greasy" feel. Peat is an organic soil consisting of materials that are only slightly or partially decomposed (i.e., plant residues are recognizable/can see plant fibers). Both are very dark or black in color, especially muck. To determine if muck and/or peat is present, first remove loose leaves, needles, bark, and other easily identified plant remains.

Sand-Gravel – Check this box if substrate primarily contains sand and/or gravel (coarse-grained). Soil feels very gritty, and would not remain in a ball when wet and squeezed.

Silt-Clay – Check this box if substrate primarily contains silt and/or clay (fine-grained sediments). Soil does not feel gritty or feels smooth and/or sticky. Soil sample when wet is able to be squeezed into forming a strong ribbon (>2 inches long).

Loam – Check this box if soil is made up of sand, silt, and clay in relatively even concentrations. Soil feels a little gritty and a little sticky. Soil sample when wet is able to be squeezed into forming a weak or medium ribbon (<2 inches long).

Bedrock – Check this box if the substrate in the pool basin contains exposed rock on the surface.

Unknown – Check this box if you are not sure of the substrate type.

Other – Check this box and indicate other substrate types not listed here.

4f) Vegetation in Pool

Check if trees (> 4 inches in diameter) are present within the pool basin or only along the edge of the pool. If trees are present within the pool basin, please count or estimate the number of trees within the pool basin. Also indicate if live and/or dead trees/snags are present in the pool.

Estimate and check box for percent cover or percent of pool that is occupied by the different types of vegetation – i.e., floating/submergent vegetation (e.g., duckweed), emergent vegetation (plants that are rooted in soil, grow in water, and extend above the surface – e.g., grasses, sedges, reeds, bulrushes, cattails), shrubs, and tree canopy over the pool basin. Some vegetation is only present or most visible in the spring when the pool is wet or has water (i.e., floating/submergent vegetation, emergent vegetation), while some vegetation is most visible later in the summer (e.g., shrubs and tree canopy). Please estimate different types of vegetation when they are most visible (e.g., tree canopy when leaves are fully out). Also, vegetation in the pools can change within a year when the pool is wet and when the pool is dry. Please note significant changes in vegetation within and between years.

4g) Pool Disturbance

Check **ALL** forms of disturbance that have affected the pool.

4h) Cover

Check any and **ALL** materials in the pool that can provide egg attachment sites and cover for adults, larvae, and/or eggs of indicator species and other amphibians and invertebrates.

5) Indicator Species and Additional Species

Table

Species observed – Identify vernal pool indicator species using the pool. Presence of other amphibian and invertebrate species and other wildlife species also should be recorded in this column below the indicator species listed.

Adults – Please enter the approximate number of adults observed for the amphibian indicator species and other vertebrate species present in the pool. For invertebrates such as fairy shrimp and fingernail clams, counting individuals is not necessary. Indicating presence of these species with an “X” in this column is sufficient.

Tadpoles/Larvae – Mark an “X” in this column to indicate the presence of tadpoles or larvae of each amphibian species present.

Egg Masses – Please enter the number of egg masses (not individual eggs) of each species present in the pool. Use the check boxes to indicate if the number of egg masses was based on an actual count or an estimate. If you observe spermatophores, you may be a little early and will need to return to the pool a little later to observe egg masses.

Photo? – Please take a photograph documenting the presence of each indicator species and other species in the pool (egg masses, tadpoles/larvae, metamorphs, and/or adults). Put a check if a photo was taken of a particular species. Please label photos using naming conventions provided earlier. Photo-documentation of indicator species is required.

Notes/Photo ID# - Use this column to enter any comments on the species present and/or the photo numbers on your camera. Photos will be renamed later using the recommended protocol.

Were any of the following observed? – Please check whether any fish were observed in the pool and their estimated lengths in terms of less than or equal to 3 inches long and greater than 3 inches long. Note: Fish of multiple sizes/lengths could be observed in a pool.

Please also record if bullfrog tadpoles and/or adults, green frog tadpoles and/or adults, and other wildlife species were observed in the pool.

6) Comments

Please record here any additional information, comments, problems or issues regarding about the survey, the vernal pool, the data collected, and/or the plant and animal species observed in the pool or in the surrounding habitat.

7) Draw Diagram of Pool

Please draw general diagram or sketch of the vernal pool showing the shape of the vernal pool, any landmarks in or around the pool basin, area surveyed for indicator species if entire pool was not surveyed, locations of indicator species or other wildlife species observed, locations of any rare species observed, and other interesting things to note. Please indicate North in the diagram by including a north arrow.