

Horsley Witten Group

Sustainable Environmental Solutions

90 Route 6A • Sandwich, MA • 02563

Phone - 508-833-6600 • Fax - 508-833-3150 • [www.horsleywitten.com](http://www.horsleywitten.com)



# Wetland Descriptions and Observations of Habitat Suitability

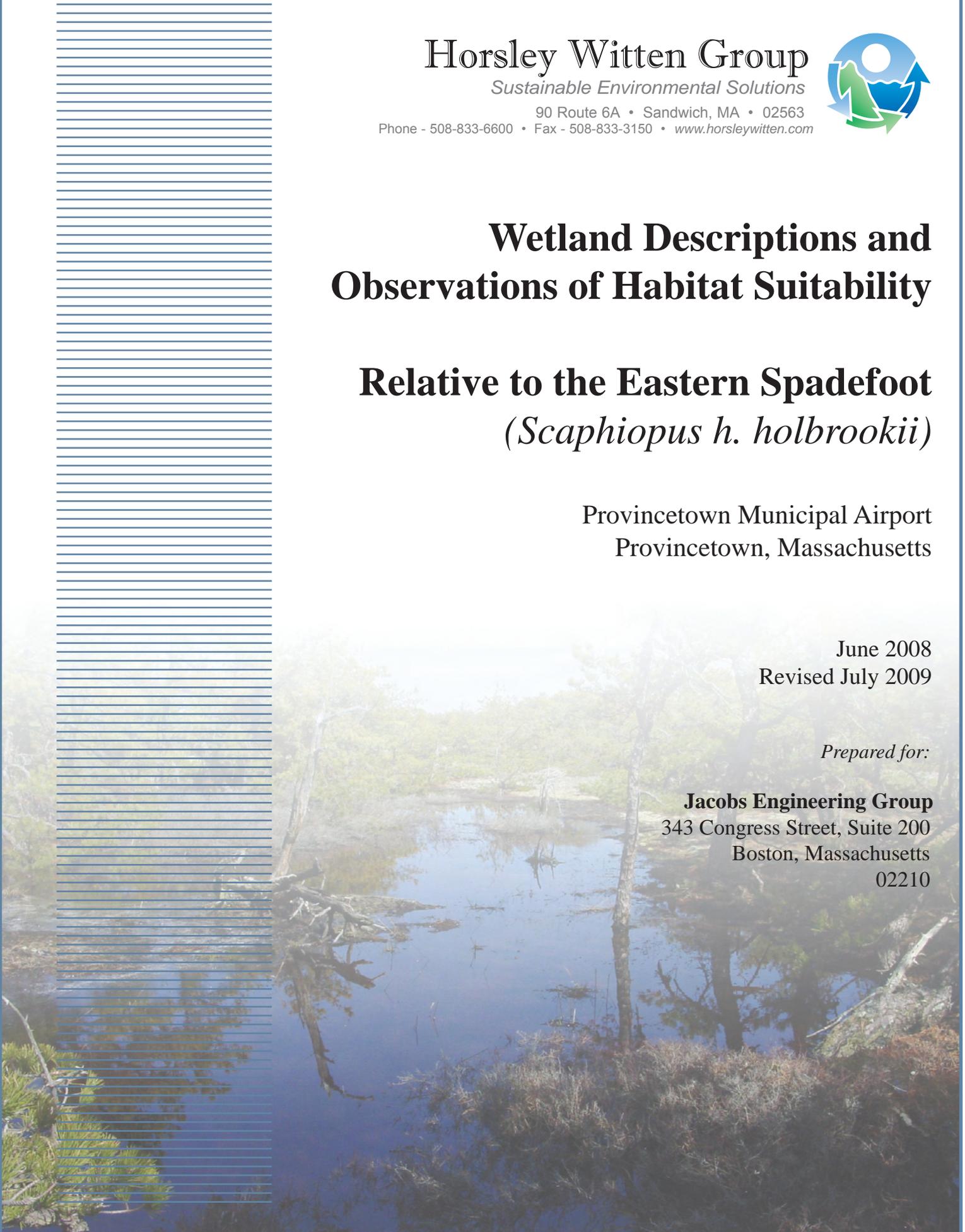
## Relative to the Eastern Spadefoot (*Scaphiopus h. holbrookii*)

Provincetown Municipal Airport  
Provincetown, Massachusetts

June 2008  
Revised July 2009

*Prepared for:*

**Jacobs Engineering Group**  
343 Congress Street, Suite 200  
Boston, Massachusetts  
02210





**Wetland Descriptions and Observations of Habitat Suitability  
Relative to the Eastern Spadefoot (*Scaphiopus h. holbrookii*)**

**Provincetown Municipal Airport  
Provincetown, Massachusetts**

**TABLE OF CONTENTS**

	<b>Page</b>
<b>INTRODUCTION AND BACKGROUND</b>	1
<b>GENERAL SITE DESCRIPTION</b>	2
<b>EASTERN SPADEFOOT LIFE HISTORY</b>	2
<b>Breeding Habitat Requirements</b>	2
<b>Non-Breeding Habitat Requirements</b>	3
<b>METHODOLOGY</b>	4
<b>OBSERVATIONS</b>	4
<b>South Side of Airport</b>	4
<b>North Side of Airport</b>	10
<b>PHOTOS</b>	16
<b>FIGURES</b>	
<b>Figure 1 – Rare Species Habitat Map</b>	
<b>Figure 2 – Potential Spadefoot Breeding Areas</b>	
<b>TABLES</b>	
<b>Table 1 – Summary of Eastern Spadefoot Breeding Habitat</b>	



**Wetland Descriptions and Observations of Habitat Suitability  
Relative to the Eastern Spadefoot (*Scaphiopus h. holbrookii*)  
At Provincetown Municipal Airport**

**Introduction and Background**

Following the issuance of the Massachusetts Environmental Policy Act (MEPA) Certificate for the Notice of Project Change/Draft Environmental Impact Report/Environmental Assessment (NPC/DEIR/EA), Airport representatives met with staff from the Massachusetts Natural Heritage and Endangered Species Program (NHESP) and the National Park Service (NPS) to discuss their specific comments regarding potential impacts to rare species habitat. Since many of the Capital Improvement Program (CIP) projects will impact isolated wetlands, NHESP and NPS will require additional input specifically regarding the Eastern Spadefoot (*Scaphiopus h. holbrookii*). These agencies indicated that to evaluate the impact on Eastern Spadefoot habitat for MESA review that there was a need for the Airport to conduct additional wildlife surveys to assess the prime and potential breeding habitat for this species within the potential project impact areas. This information has also been used to refine project siting in relation to Eastern Spadefoot habitat to minimize impacts and to avoid a Take.

The following habitat suitability report has been prepared by the Horsley Witten Group, Inc. (HW) to support the Provincetown Municipal Airport environmental review and permitting process. At the recommendation of NHESP, HW field biologists communicated frequently with Brad C. Timm, a Ph.D. student at the University of Massachusetts, Amherst, who is currently conducting studies on various aspects of the Eastern Spadefoot in the Cape Cod National Seashore (CCNS) for his Ph.D. thesis.

The Airport is situated within the bounds of the CCNS which is federally owned land administered by the NPS. The Airport contains diverse natural resources including freshwater wetlands, open grasslands, forested areas and a system of coastal dunes. Portions of these habitats are managed as part of routine airport operations. The Airport is also located within *Priority Habitat of Rare Species* and *Estimated Habitat of Rare Wildlife and Certified Vernal Pools* as mapped by NHESP as shown in Figure 1. The Airport is currently mapped for four State-listed rare species: Eastern Box Turtle, Eastern Spadefoot, Vesper Sparrow and Broom Crowberry. To support the MEPA and NEPA process, rare wildlife and plant surveys were previously conducted to assess the existing habitats for use in future site planning to address the Massachusetts *Endangered Species Act* (M.G.L. Ch. 131A) (MESA). These studies were completed in 2004-2005, and the results of these habitat assessments were presented in the Draft EIR/EA (EEA No. 13789).

Included within this report are a general description of the Airport property, a brief description of the ecology and life history of the Eastern Spadefoot and its habitat requirements, a discussion of field methodologies, and the results of the Eastern Spadefoot breeding habitat assessments conducted in March and April, 2008.

Additional site visits and habitat surveys were conducted on November 17 and 18, 2008, with Brad Timm with the intent of verifying all previously documented spadefoot breeding habitat and locating any potential habitat areas that were not identified during the site visits earlier in 2008. All wetland descriptions, tables, and figures have been updated to incorporate additional information that was collected during the field survey with Brad Timm.

This information is intended to supplement earlier habitat assessments for rare species conducted at the Airport.

## **General Site Description**

The Airport occupies approximately 322 acres of land within the CCNS, at the northern tip of Cape Cod (Figure 1). Race Point Road and the Coast Guard Station at Race Point are located to the immediate northeast. Areas at the Airport that are maintained for airport operations include an airport terminal, a hangar, and other buildings, a paved runway and taxiway, gravel and paved parking areas, and navigation equipment. Areas along the taxiway and runway, as well as the approach areas, include vegetative communities that are mowed to maintain aviation safety areas and navigational surfaces. Non-managed areas include isolated and bordering vegetated wetlands and coastal dune communities. South of the airfield, there is a mosaic of isolated vegetated wetlands, which range from forested to scrub-shrub to open meadow habitats which are interspersed with vegetated coastal dune communities. Additional discussions on the habitats found at the Airport were included within the appendices of the NPC/DEIR/EA.

## **Eastern Spadefoot Life History**

The Eastern Spadefoot is a medium-sized toad, protected as a Threatened Species in Massachusetts. It is also characterized as an obligate vernal pool species in the state. The Spadefoot has a squat body with short legs and a large head, and is distinguished by its vertically-elliptical pupils. The skin is fairly smooth and is covered by small, scattered warts. The Spadefoot's coloring is generally grayish to blackish-brown with olive markings. Two characteristic yellowish lines run from each eye down the dorsal surface of the toad, forming what is often called a "lyre-shaped" pattern. The Spadefoot gets its name from the single, sharp-edged spade on the inner surface of each hind foot which aids in its ability to burrow.

The Spadefoot requires dry sand or sandy loam soils that are normally associated with pitch pine barrens, coastal oak woodlands, or sparse shrub communities, all of which are interspersed by temporary ponds. This nocturnal species has been documented to burrow up to depths of eight feet below the surface. Since this species is active only at night, their activity peaks just after sundown and right before sunrise. During the summer, a Spadefoot has been documented to remain in its burrow an average of 9.5 days between feedings.

### *Breeding Habitat Requirements*

Wetland habitat quality is the most critical factor in determining the potential for an area to serve as habitat for the Eastern Spadefoot. Early successional temporary wetlands serve as optimal breeding sites for this species. More established wetlands (i.e., those wetlands with a thick canopy and shrub cover) are less ideal, since dense vegetation results in an increase in evapotranspiration and reduces available water, thus reducing the length of the hydroperiod. A shortened hydroperiod may not be able to maintain adequate water levels to sustain breeding activities and juvenile development of the Eastern Spadefoot.

A less-densely vegetated wetland that demonstrates a strong connection to the groundwater table will most likely be able to support a larger breeding population of the Eastern Spadefoot and facilitate successful reproduction. Generally, the only vegetation established in these ideal wetlands is cranberry (*Vaccinium* spp.) or scattered forbs (sedges, grasses, rushes). Cranberry often emerges above the water surface, and varying degrees of the presence of the cranberry within the water column do not appear to deter or impair breeding activities (Brad Timm, pers. comm.).

In addition, dense perimeter vegetation around a wetland may deter the Eastern Spadefoot from utilizing the wetland for breeding. For instance, if vegetation is dense and spans laterally upwards of 10 meters (about 32 feet), it is unlikely that a Spadefoot will attempt to traverse the barrier to breed in the wetland, even if open water exists beyond that vegetation, particularly if an alternative potential breeding site is available with little to no such physical barrier.

The lack of a tree canopy and shrub understory in these open wetlands allows for more sunlight penetration and higher ambient temperatures, both of which enhance the development rates of the Eastern Spadefoot. This species begins to breed in mid to late April, and the hydroperiod of the breeding site ideally should last until mid to late June. If standing water is observed in a wetland at the beginning of seasonal high groundwater, then the wetland has a greater chance of functioning as viable breeding habitat, as water levels are likely to increase as a result of subsequent storm events.

Prime (i.e., ideal or optimal) breeding habitat would contain several inches of standing water in an openly vegetated wetland, where areas of open water occupy between five meters by five meters (270 SF), to 10 meters by 10 meters (about 1,000 SF) or more, of the wetland surface; smaller pockets of water are less likely to sustain proper water levels to support breeding, although may provide potential breeding habitat for the Eastern Spadefoot.

### *Non-breeding Habitat Requirements*

The quality of available upland habitat is a secondary determinant of prime or optimal versus potential Eastern Spadefoot habitat. The home range of this toad species extends from 5 meters up to 450 meters. This extensive home range indicates that burrowing and foraging activities

may not occur immediately upgradient from the breeding habitat, and that quality upland habitat does not necessarily need to be in close proximity to a given breeding pool.

Preferred upland is generally characterized by open sandy areas colonized by scattered, low-lying pitch pine with a lichen edge. The low-lying pitch pine with a low, 'weeping' branch morphology provides substantial ground cover without high root density that would otherwise impair this species' ability to burrow. Thus upland areas with dense vegetation and root mass are less suitable as burrowing sites, although these areas may provide cover for nocturnal foraging.

## **Methodology**

HW conducted site visits on March 4 and 6, and April 3, 10, and 15, 2008, to re-examine previously delineated wetland areas and assess their potential suitability as Eastern Spadefoot habitat. All wetland areas surrounding the airfield within the potential impact area of the preferred alternatives of the proposed projects as identified in the Draft EIR/EA were observed (Figure 2). The HW survey was specifically conducted during a period of seasonal high groundwater at the recommendation of Brad Timm.

The selected wetlands were surveyed for their potential to support the breeding activities of the Eastern Spadefoot. A wetland's degree of potential as breeding habitat was based upon observations of standing water (at a period of typical seasonal high groundwater), vegetation within the wetland and vegetation surrounding the wetland. Areas of potential habitat within each wetland were located with a GPS unit with sub-meter accuracy and mapped on the existing wetland plans (Figure 2). Data points were collected from the center of each potential breeding area. The square footage of each area was also estimated while in the field and depth of standing water was measured (in inches) with a standard tape measure. Photographs were taken of all wetlands to document standing water, vegetation, and overall wetland characteristics.

The following observations of each wetland are based upon the March and April site visits as well as the November site visits with Brad Timm and are intended to serve as an assessment of prime and potential Eastern Spadefoot habitat.

## **Observations**

A description of observations made in each wetland area is presented below (in alphabetical order). Table 1 summarizes the potential of each wetland area to provide suitable breeding habitat for this species. Figure 2 presents areas with prime (ideal) or high potential to provide breeding habitat based upon our observations. Where appropriate comments are made regarding the adjacent upland community to certain wetland areas.

## Wetland Observations and Breeding Habitat Assessment

### SOUTH SIDE OF AIRPORT

**Wetland A** is characterized by a well-established plant community and has high stem density. Pockets of standing water are present during periods of high groundwater prior to the growing season and are, on average, three inches deep. Upland immediately adjacent to Wetland A has thick vegetation/groundcover. While there are small pockets of open water that may hold minimum potential for Spadefoot breeding, it is unlikely that the water levels could be sustained at appropriate levels, due to the amount of evapotranspiration that would occur from the vegetative community. This wetland has low potential to serve as breeding habitat.

**Wetland B** possesses areas that have prime and potential areas Spadefoot breeding. A few open patches of standing water with cranberry may serve as breeding areas. Approximate depth of standing water in the eastern region of the wetland ranges from two to four inches and is an average of six to eight inches in the western region, which is vegetated by patches of *Phragmites*. This portion of the wetland is less densely vegetated than other regions of the wetland. The majority of the wetland, however, has thick plant growth and moderate canopy cover. Pitch pine creates a significant amount of shade over the wetland, and meadowsweet occurs in dense patches throughout the wetlands, rendering those areas less than ideal breeding habitat. The upland surrounding Wetland B provides some suitable burrowing and foraging habitat, but is still not what could be characterized as ideal upland. The upland has clumps of various grasses, some pitch pine, and some lichen cover. There are few areas of open sand to the south and southwest of Wetland B.

**Wetland BA** has approximately two inches of standing open water. Vegetation includes pitch pine and cranberry. Adjacent upland areas are suitable as non-breeding habitat. This wetland holds potential as breeding habitat.

**Wetland BB** has no standing water and is an open area of sedges and black rush (*Juncus gerardii*). It is unlikely that this wetland would serve as breeding habitat.

**Wetland BC** has areas with an open canopy, sunlight exposure, cranberry growth, and standing water, which comprise the ideal characters for Spadefoot breeding habitat. The remainder of the wetland is colonized by dense populations of sheep laurel (*Kalmia angustifolia*) and mature pitch pines. Nearby (but not immediately adjacent) open sandy patches with scattered pitch pine provide suitable upland habitat for all non-breeding activities. There are several areas within this wetland that provide near optimal breeding habitat, with standing water ranging from two to five inches.

**Wetland CA** has very dense plant growth in the center. Sparse clumps of twig-rush (*Cladium mariscoides*) and woolgrass (*Scirpus cyperinus*) occupy the perimeter of the wetland. The canopy is thin and sunlight penetrates through to the understory and water surface. The pitch pine density may be characterized as moderate. Approximately three to four inches of standing

water were present during initial site visits. Contiguous upland habitat is suitable for burrowing and foraging activities. The open area of water in this wetland that is closest to the CCNS bike path may serve as optimal breeding habitat.

**Wetland CB** has an average of three to four inches of standing water during seasonal high groundwater, however, the majority of the wetland has a moderate amount of established vegetation, including twig-rush (*Cladium mariscoides*) and dwarf huckleberry (*Gaylussacia dumosa*). Open patches of water within Wetland CB with intermediate exposure to sunlight may provide potential breeding habitat for the Eastern Spadefoot.

**Wetland CC** supported almost no standing water during site observations in 2008. In addition, this wetland is densely vegetated with a canopy of pitch pine and a dense understory of dwarf huckleberry, grasses, and sedges. This wetland will not likely serve as breeding habitat for the Eastern Spadefoot.

**Wetland CD** has dense vegetation, comprised primarily by pitch pine, dwarf huckleberry and cranberry. The pitch pine forms a closed canopy, minimizing the wetland's exposure to sunlight. Standing water averaged two to three inches, however, once the growing season commences water drawdown is anticipated to be substantial from the established plant community. The wetland itself does not appear to be ideal for Spadefoot breeding, but does hold slight potential. The surrounding upland provides suitable non-breeding habitat.

**Wetland C/J/FK** contains some discrete areas that have potential to support breeding populations of the Eastern Spadefoot along with large uninterrupted swaths of prime breeding habitat. The northeastern section of C/J/FK, specifically near flag J-60 (see Figure 2), is a large open area of cranberry where HW observed as much as 10 to 12 inches of standing water which would provide high potential as breeding habitat. In addition, this portion of Wetland C/J/FK does not have a pitch pine canopy and there is very little shrub growth (small clumps of dwarf huckleberry and woolgrass). Adjacent upland "islands" of dune habitat provide ideal burrowing and foraging areas and would ultimately provide optimal interplay between upland and wetland for the Eastern Spadefoot.

More interior portions of wetland C/J/FK have areas of open water that have some/average potential to host Spadefoot breeding. Small areas of upland in the interior of this wetland possess the characteristics of ideal Spadefoot upland habitat.

**Wetland D** has one to two inches of standing water during seasonal high groundwater. However, like Wetland DF (below), the pitch pine is very dense and the wetland has a very thick canopy with little sunlight exposure. This wetland would not provide ideal breeding habitat, but may hold low potential in some years.

**Wetland DA** has two to three inches of standing water during seasonal high groundwater. Pitch pine forms moderate canopy cover. Twig-rush occurs in scattered clumps. Some open patches

of water are present within the wetland in conjunction with canopy openings. This wetland does not have potential to support Spadefoot breeding.

**Wetland DB** is a large wetland with several open pockets of water. A portion of DB that is near the “connector channel” to FG has an open canopy, substantial sunlight exposure, and significant amounts standing water in some areas totals seven to eight inches and has potential to support breeding populations of the Eastern Spadefoot. Vegetation throughout the wetland consists of sparse pitch pine, patches of cranberry, and scattered twig-rush around the perimeter. Several other large open pockets of water, approximately 600 SF to 800 SF each, quite similar to aforementioned area are present throughout Wetland DB and have potential to host breeding activities. Some areas of this have been categorized as prime/optimal breeding habitat. Nearby upland is also optimal in most areas.

**Wetland DC** supported no standing water during 2008 site visits and vegetation was limited to black rush. This area is not believed to have potential as Eastern Spadefoot breeding habitat.

**Wetland DD** has large open areas of standing water (averaging three inches in depth) within the wetland with little to no canopy cover. Pitch pine is only moderately dense in certain areas, not throughout the entirety of the wetland. Cranberry is the primary plant in these open areas with scattered patches of twig-rush. In the southern central portion of Wetland DD there is a large open area with significant standing water that has high potential to serve as ideal breeding habitat. Adjacent upland areas characterized by low-lying pitch pine, lichen and open sands are also suitable for non-breeding activities. This wetland has potential to serve as breeding habitat.

**Wetland DE** has an average of three inches standing water during seasonal high groundwater. There is no canopy cover and this wetland receives maximum exposure to sunlight. Scattered pitch pine seedlings are also present throughout the wetland and contiguous upland. This wetland is believed to have potential as Eastern Spadefoot breeding habitat.

**Wetland DF** has one to two inches of standing water. Pitch pine in this wetland is extremely dense and the wetland is heavily shaded. This wetland would not provide potential breeding habitat.

**Wetland DG** has no standing water and holds no potential as a breeding site.

**Wetland DH** has a well-established population of pitch pine and thick canopy cover. The wetland has one to two inches of standing water but is well shaded and may not have great potential as a breeding site for the Eastern Spadefoot. Some suitable upland is present around the wetland, however.

**Wetland DI** has one to two inches of standing water and moderately dense pitch pine cover. There is no cranberry. The wetland is partially shaded. The wetland is not ideal for breeding, but may hold some potential. Portions of the adjacent upland are good burrowing and foraging habitat.

**Wetland DJ** has one inch of standing water, dense pitch pine cover, and does not hold potential as breeding habitat.

**Wetland DK** has portions with the potential to host breeding activities of the Eastern Spadefoot, specifically the areas that are closest to the airfield, as well as patches along the northern boundary of the wetland. Depth of standing water averages two inches. Pitch pine is present in the wetland, but does not form a closed canopy. Standing water is present at seasonal high groundwater. Cranberry is present in well established mats among several open areas of standing water. Low lying pitch pine surrounded by open sand and lichen cover provides an ideal upland habitat contiguous with Wetland DK. Overall, breeding habitat potential can be characterized as moderate.

**Wetland DL** has minimal amounts of standing water (totaling no more than one inch) during seasonal high groundwater and the wetland has a thick canopy of established pitch pine. This wetland has little potential as breeding habitat.

**Wetland DM** does not have standing water during seasonal high groundwater. It has no potential to serve as breeding habitat for the Eastern Spadefoot.

**Wetland E**, especially the portion abutting the airfield, possesses areas that function as prime and potential breeding habitat. There is a significant amount of standing water about three to four inches deep. Thick mats of cranberry are also present. There are dense clumps of flat-top goldenrod. Large pitch pines are also scattered throughout the area. Water levels and vegetation indicate that this wetland will be able to maintain sufficient water levels for the duration of the breeding season.

**Wetland EA** has minimal amounts of standing water, totaling no more than one inch. Vegetation is very dense in this wetland. This wetland does not have potential to support Eastern Spadefoot breeding activities.

**Wetland EB** has pockets of shallow standing water in many areas and the soil is highly saturated throughout the rest of the wetland. Water depth is approximately two inches in areas of standing water. Vegetation is limited to clumps of woolgrass and black rush. This wetland has potential to serve as breeding habitat.

**Wetland F** has an area that may serve as a prime breeding site. There is almost one foot of standing water in an open area at the edge of a stand of pitch pine that comprises the northern portion closest to the airfield. Vegetation is primarily black rush, twig-rush and soft rush. The water depth and exposure to sunlight suggest that this wetland has high potential to maintain water levels and support breeding. Suitable upland habitat is also nearby.

**Wetland FA** has only a slight amount of standing water, totaling no more than one inch. Pitch pine is very dense and there is no cranberry present. It is unlikely that this wetland will serve as breeding habitat.

**Wetland FB** has only a slight amount of standing water, and is approximately half an inch deep. Pitch pine is very dense and there is no cranberry present. It is unlikely that this wetland will serve as breeding habitat.

**Wetland FC** does not have standing water. Vegetation is minimal. Some pitch pine is present, but remains sparsely scattered throughout the wetland. This wetland is unlikely habitat for the breeding activities of the Eastern Spadefoot.

**Wetland FD** does not have standing water. Vegetation is minimal. Some pitch pine is present, but remains sparsely scattered throughout the wetland. This wetland is unlikely habitat for the breeding activities of the Eastern Spadefoot.

**Wetland FE** has minimal standing water (less than one inch deep) during seasonal high groundwater. Small clusters of cranberry exist. Although this wetland is not suitable for breeding, the adjacent upland has great potential to support the burrowing and foraging activities of the Spadefoot.

**Wetland FF** has less than one inch of standing water and is unlikely habitat for the breeding activities of the Eastern Spadefoot. Vegetation is primarily pitch pine, which occurs at a moderate density.

**Wetland FG** has an open canopy with substantial sunlight exposure. There is very little standing water, which is approximately one to two inches deep. Vegetation consists mostly of twig-rush and scattered cranberry. Due to the minimal amount of water present, Wetland FG may not be suitable for Spadefoot breeding and is not ideal habitat.

**Wetland FH** has no more than two inches of standing water during seasonal high groundwater. Vegetation is primarily pitch pine, which occurs at a moderate density. This wetland has little potential to serve as prime Spadefoot breeding habitat.

**Wetland FI** has no standing water. Vegetation is limited to patches of black rush. This wetland will not serve as Eastern Spadefoot breeding habitat.

**Wetland FJ** has no standing water. Vegetation is primarily scattered pitch pine and black rush. This wetland does not have potential to serve as breeding habitat.

**Wetland H** is confined by the runway and taxiway. Vegetation consists primarily of red chokeberry, winterberry, steplebush, highbush blueberry, cranberry, bayberry, and poison ivy, along with large sphagnum mats found throughout the wetland. Large pockets of standing water persist in this wetland throughout the year, providing potential breeding areas for the spadefoot.

The isolated location of this wetland (i.e., inside the runway and taxiway) may greatly deter the Spadefoot from utilizing this wetland for breeding. If this wetland was not quite as isolated, it would hold potential to provide prime breeding areas, due to the large amounts of standing water that are present year-round, regardless of the moderately dense vegetation.

**Wetland I**, also confined by the runway and taxiway, possesses several areas of potential breeding habitat. Vegetation is consistent with vegetation observed within Wetland H. Large sphagnum mats occur throughout this wetland as well. Standing water persists in this wetland throughout the year, providing multiple potential breeding areas for the spadefoot. However, as with Wetland H, the isolated location of this wetland (i.e., inside the runway and taxiway) may greatly deter this species from utilizing this wetland for breeding. If this wetland was not as isolated from the surrounding natural landscape, it would otherwise serve as prime breeding habitat, due to the large amounts of standing water that are present year-round, regardless of the moderately dense vegetation.

**Wetland K** consists primarily of an open expanse of water, the majority of which abuts an open dune/pitch pine area. While Wetland K had originally been delineated (during the Airport Master Plan Update process) as just the submarine-shaped wetland area, it should be noted that further field investigations revealed that Wetland K is hydrologically connected with Wetland L just beyond the treeline to the north (see Photo 4). Standing water is approximately eight inches deep (or more) throughout the wetland. Cranberry is the dominant plant in this wetland and is abundant. The depth of the water column would be able to support the entire breeding season of the Spadefoot. According to HW observations since 2004 during all seasons, standing water is present in this wetland year round. The immediate upland is characterized by low lying pitch pine, open sand, and scattered lichen ground cover; these are the ideal upland characteristics for Eastern Spadefoot foraging and burrowing habitat. The amount of standing water and lack of canopy cover result in ideal Spadefoot breeding habitat. Due to this combination of ideal characteristics, Wetland K possesses the most ideal breeding habitat area, as well as the most optimal overall habitat. The northeastern portions of Wetland K, however, are less ideal due to moderate pitch pine cover and shading.

**Wetland L** is generally characterized by dense stands of pitch pine with substantial shading. Standing water (three to four inches deep, on average) is present and patches of cranberry can be found throughout. The dense canopy cover, however, detracts from the potential of this wetland to host Eastern Spadefoot breeding due to the lack of sunlight. It should be noted that Wetland L is hydrologically connected to Wetland K.

The central region of Wetland L is considered prime breeding habitat. There is no canopy cover and patches of black rush, twig-rush and cranberry comprise the groundcover. There is a significant amount of standing water which may be able to support breeding and larval development. Patches of adjacent upland may also provide suitable habitat. Overall, this wetland has optimal/high potential to serve as habitat.

**Wetland C** was also observed. Upland habitat in the area is not consistent with the characteristics of preferred upland of the Spadefoot. Thus, there may not be ideal foraging and burrowing areas on the northern side of the airport. This wetland has standing water, averaging five inches or more in depth in certain areas, but exhibited extremely dense vegetation, especially around the perimeter, which would deter Spadefoot passage and utilization of the wetland for breeding. However, due to the large volume of water sustained by the wetland, it holds moderate potential as breeding habitat. Areas within the large expanse of Wetland C exhibiting potential breeding habitat characteristics were GPS-located as potential breeding habitat.

## **NORTH SIDE OF AIRPORT**

**Wetland AA** possesses a vegetative community that consists of clumps of woolgrass, twig rush and black rush. There is no standing water in this wetland. It is unlikely that Wetland AA would serve as potential habitat.

**Wetland AB** is a small isolated wetland consisting of clumps of woolgrass, twig rush, soft rush and black rush. Some sedimentation has also occurred in this wetland; sand has been blown in from the surrounding dunes. There was minimal standing water in this wetland at the time of the November site visits. It is possible that this wetland holds potential to serve as breeding habitat.

**Wetland AC** has no standing water. Dominant vegetation in the wetland includes clumps of woolgrass, pilewort (*Erechtites hieracifolia*), and slender-leaf goldenrod (*Euthamia tenuifolia*) interspersed with patches of bayberry and willow. This wetland does not have potential to support a breeding population of the Spadefoot.

**Wetland AE** has no standing water. This densely vegetated wetland consists of a large, central patch of common reed (*Phragmites australis*) with clumps of willow, woolgrass, Gray's Flatsedge (*Cyperus grayii*), hyssop-leaved boneset (*Eupatorium hyssopifolium*), bayberry, pilewort and black rush. This wetland does not have potential to host the breeding activities of the Eastern Spadefoot.

**Wetland AF** has pockets of standing water, but the water is no more than one to two inches deep. Vegetation within Wetland AF consists of large clumps of willow dominating the wetland interior with large clumps and patches of cranberry, bayberry, hyssop-leaved boneset, slender-leaf goldenrod, common reed, poison ivy, twig-rush, black rush and woolgrass. The northwestern portion of the wetland has a larger pocket of open water with minimal canopy cover and dense patches of cranberry. The remainder of the wetland has very thick vegetation that may very well deter breeding. A small portion of this wetland holds potential to serve as breeding habitat for the Spadefoot; however, adjacent uplands are not ideal for burrowing and foraging.

**Wetland AG** has groundwater at the soil surface, but no standing water is present. The vegetation within this wetland includes bayberry, twig-rush, woolgrass, black rush, pitch pine

seedlings and hyssop-leaved boneset. This wetland is unlikely to serve as potential Spadefoot breeding habitat.

**Wetland AI** does not have standing water. The vegetation is dominated by bayberry and poison ivy, both species extending beyond the boundary of the wetland itself. Additional vegetation includes willow, twig-rush, woolgrass, black rush and patches of hyssop-leaved boneset. This wetland does not hold potential as Spadefoot breeding habitat.

**Wetland AJ** has no standing water. The vegetation is limited to black rush and twig-rush. This wetland would not be able to support the breeding activities of the Eastern Spadefoot.

**Wetland AK** has damp soil but no standing water during seasonal high groundwater. This wetland area displays two different types of dense vegetative communities: the western half of the wetland is dominated by pussy willow and dwarf huckleberry with the remaining areas dominated by Virginia rose, bayberry, poison ivy, spotted Joe-Pye weed, meadowsweet, woolgrass, twig-rush and steeplebush. This wetland does not have potential to serve as breeding habitat for the Eastern Spadefoot.

**Wetland AL** has pockets of standing water, most of which are concentrated in the interior. These areas have an average depth of two inches. Dense vegetation forms a thick perimeter around the wetland. There is a dense low shrub community of Virginia rose, bayberry and poison ivy interspersed with clumps and patches of woolgrass, marsh fern, twig-rush and black rush. Dense patches of cranberry were observed in the wetland interior. This wetland is unlikely to serve as potential breeding habitat for the Eastern Spadefoot, primarily due to the thick perimeter vegetation.

**Wetland AM** has a significant amount of standing water during seasonal high groundwater, averaging three to four inches. This densely vegetated wetland is dominated by bayberry, winterberry, woolgrass, slender-leaf goldenrod, twig-rush, poison ivy, reed canary-grass, sea myrtle, Virginia rose, marsh St. Johns wort and New England aster. A dense open patch of cranberry is present in the center of the wetland. The thick vegetation encountered in this wetland makes it less than ideal breeding habitat.

Of note, upland area encountered on the northern side of the airport is generally not ideal habitat for Eastern Spadefoot burrowing and foraging activities. No low-lying pitch pine is present with a sandy edge. The upland consists mostly of upland dunes with thick grass, sedge and rush cover, or is characterized by open sandy dunes with little to no vegetation or groundcover. Ideal upland habitat seems to be more frequently encountered throughout the southern portion of the airport property.

The wetlands on the southwestern tail of the property were also not observed during this site visit and Spadefoot habitat assessment, for they fall outside of proposed project impact areas. A description of this wetland series is provided below. These descriptions are based upon previous site visits outside of seasonal high groundwater.

**Wetland CE** is a larger isolated wetland marked by 81 flagging stations. The vegetative community of this wetland is similar to that found within Wetlands CC and CD with the addition of clumps and patches of inkberry (*Ilex glabra*).

**Wetland CF** is an isolated shrub swamp with a vegetative community dominated by highbush blueberry along with clumps and patches of black grass, sphagnum moss and cinnamon fern (*Osmunda cinnamomea*). Flags CF1 through CF19 mark the boundary of this wetland.

**Wetland CG** is an extensive isolated wetland located along the lease line that extends well beyond this boundary. As a result, HW delineated only a portion of this wetland (175 flags). The vegetation within this wetland includes expansive patches of cranberry, patches and clumps of sphagnum moss, twig-rush, black grass, fireweed (*Epilobium angustifolium*) and woolgrass. Shrub species encountered include sweet pepperbush (*Clethra alnifolia*) and highbush blueberry, with a canopy of pitch pine and swamp tupelo.

**Wetland CH** is a large open isolated wetland consisting of 142 flags that was delineated in several non-contiguous flagging series due to its proximity to the lease corner. Several linear-shaped islands of coastal dune were encountered within the interior of this wetland area. The vegetation of this wetland includes expansive areas of cranberry interspersed with clumps and patches of sheep laurel (*Kalmia angustifolia*), highbush blueberry, individual pitch pine (in forested portions of this wetland), dwarf huckleberry, patches of sphagnum moss, twig-rush, woolgrass and small entanglements of common greenbrier (*Smilax rotundifolia*).

**Wetland CI** is an isolated wetland that was only partially delineated due to its location along the lease line (40 flags in two series). Vegetation in this wetland includes pitch pine, woolgrass, black grass, twig-rush, winterberry, cranberry and highbush blueberry.

**Wetland CJ** is a very small triangular isolated wetland consisting of only three flags. The vegetative community within this open area is limited to black grass and twig-rush.

**Wetland CK** is a somewhat larger isolated wetland consisting of 21 flags. As with Wetland CJ, the vegetation is limited to twig-rush and black grass with a pitch pine canopy.

**Wetland CL** is a small isolated wetland, and the only wetland located among the secondary dune system in the southern “tail” of the Airport property. As with Wetland CK, the vegetation within this wetland is limited to pitch pine and black grass, along with obvious surficial indicators of hydrology (soil staining). Flags CL1 through CL13 mark the boundary of this wetland.

**Wetland CM** is an isolated wetland located just off-site of the southernmost lease corner. Flagging stations CM1 through CM12 mark a portion of this large wetland area. Vegetation within this shrub swamp included large patches of cranberry, with clumps and patches of sphagnum moss, woolgrass, dwarf huckleberry, sheep laurel, highbush blueberry, bayberry,

poison ivy, inkberry and twig-rush. A large patch of common reed and scattered pitch pine cover the wetland periphery.

**Wetland CN** is a small isolated wetland consisting of only four flags. The wetland is composed of black grass with surficial evidence of hydrology (soil staining) and subsurface hydric soils.

**Wetland CO** is an expansive linear wetland consisting of 107 flags, often with narrow (three to four foot wide) connections between lobes. Several upland islands of secondary coastal dune habitat were encountered within the interior of Wetland CO. The vegetation of this transitional shrub swamp/forested wetland includes a pitch pine canopy with a diverse shrub community of swamp azalea (*Rhododendron viscosum*), bayberry, sheep laurel and highbush blueberry. Additional vegetation consists of soft rush, sphagnum moss, common greenbrier, royal fern, cinnamon fern, twig-rush, black grass, poison ivy and dense, scattered patches of cranberry.

**Wetland CP** is an isolated wetland consisting of 41 flags with a large upland island of coastal dune. The vegetation of this wetland is forested with a canopy of pitch pine including highbush blueberry, bayberry, swamp dewberry (*Rubus hispidus*), cranberry, black grass, soft rush, woolgrass, broom sedge (*Andropogon virginicus*), twig-rush, dwarf huckleberry, New England aster, scattered common reed, occasional black cherry (*Prunus serotina*), slender-leaf goldenrod and poison ivy.

**Wetland CQ** is a smaller isolated wetland consisting of 16 flags. The vegetation includes bayberry, twig-rush, black grass, woolgrass, pitch pine, swamp dewberry and poison ivy.

**Wetland CR** is a small isolated wetland consisting of only six flags. The vegetation of this open emergent marsh community is composed of woolgrass, twig-rush and black grass.

**Wetland CS** represents a portion of the larger BVW along Hatches Harbor, and is marked by 18 flags. The vegetation within this wetland area consists of woolgrass, bayberry, twig-rush, black grass and occasional pitch pine.

**Wetland CT/J** is a BVW associated with the Hatches Harbor wetland system. Flagging stations represent the southwestern boundary of Wetland J, which abuts managed areas near the runway. While the wetland boundary is representative of a freshwater wetland (BVW), the vegetative community transitions from freshwater to brackish to saline, and contains a large diversity of wetland indicator species. Species encountered include black grass, slender-leaf goldenrod, St. John's wort, marsh fern, twig-rush, swamp dewberry, cranberry, poison ivy and common greenbrier. Interior sections contain a large area dominated by common reed, while the upper edge of the brackish community is composed of several shrub species, including highbush blueberry, bayberry, winterberry, meadowsweet and scattered eastern red cedar (*Juniperus virginiana*).

**Wetland CU** is a small isolated wetland consisting of eight flags. The vegetation is mainly scattered clumps of woolgrass, bayberry, slender-leaf goldenrod and swamp dewberry vines.

**Wetland CV** is another small isolated wetland delineated by only three flags, encompassing clumps and patches of woolgrass, twig-rush, and slender-leaf goldenrod, with scattered bayberry and swamp dewberry vines.





Photo 1. Suitable upland habitat for Eastern Spadefoot adults. Photo taken at the Provincetown Municipal Airport, March 2008.



Photo 2. A creeping pitch pine edge meeting an area of open sand. This is an example of preferred upland habitat for adult Eastern Spadefoots. Photo taken at Provincetown Municipal Airport, March 2008.



Photo 3. Low-lying pitch pine branches that form ideal upland habitat for the Eastern Spadefoot. Photo taken at Provincetown Municipal Airport, March 2008.



Photo 4. Wetland K at Provincetown Municipal Airport. This is ideal (prime) Eastern Spadefoot breeding habitat. Photo taken March 2008.



Photo 5. Wetland BC is a high-quality to ideal area for Eastern Spadefoot breeding at Provincetown Municipal Airport. Photo taken March 2008.



Photo 6. Wetland DD is also a high-potential to ideal quality habitat for Eastern Spadefoot breeding. Photo taken at Provincetown Municipal Airport, March 2008.

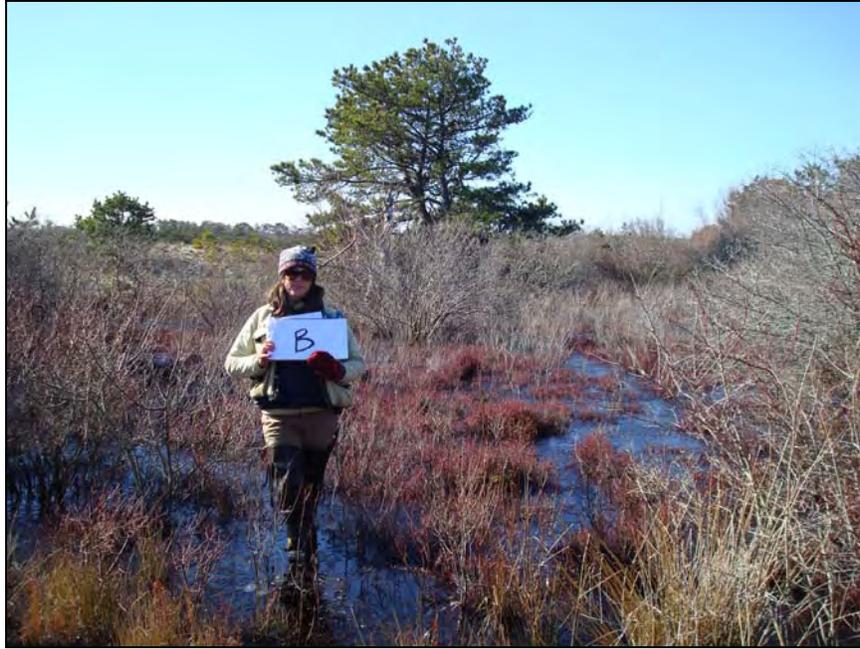


Photo 7. Wetland B has moderate to high potential to serve as Eastern Spadefoot breeding habitat at Provincetown Municipal Airport. Photo taken March 2008.



Photo 8. Wetland DE has moderate potential to serve as Eastern Spadefoot breeding habitat. Photo taken at Provincetown Municipal Airport, March 2008.

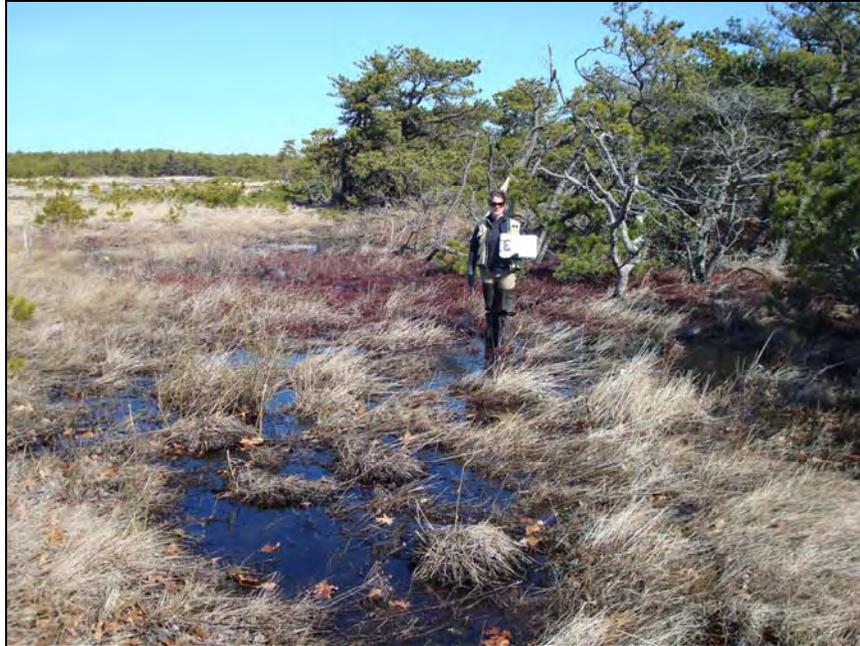


Photo 9. Wetland E has moderate potential to serve as Eastern Spadefoot breeding habitat at Provincetown Municipal Airport. Photo taken March 2008.



Photo 10. Wetland F has moderate to high potential to serve as Eastern Spadefoot breeding habitat at Provincetown Municipal Airport. Photo taken March 2008.



Photo 11. Wetland BA is an example of a wetland with low to moderate potential to serve as Eastern Spadefoot breeding habitat. Photo taken at Provincetown Municipal Airport, March 2008.

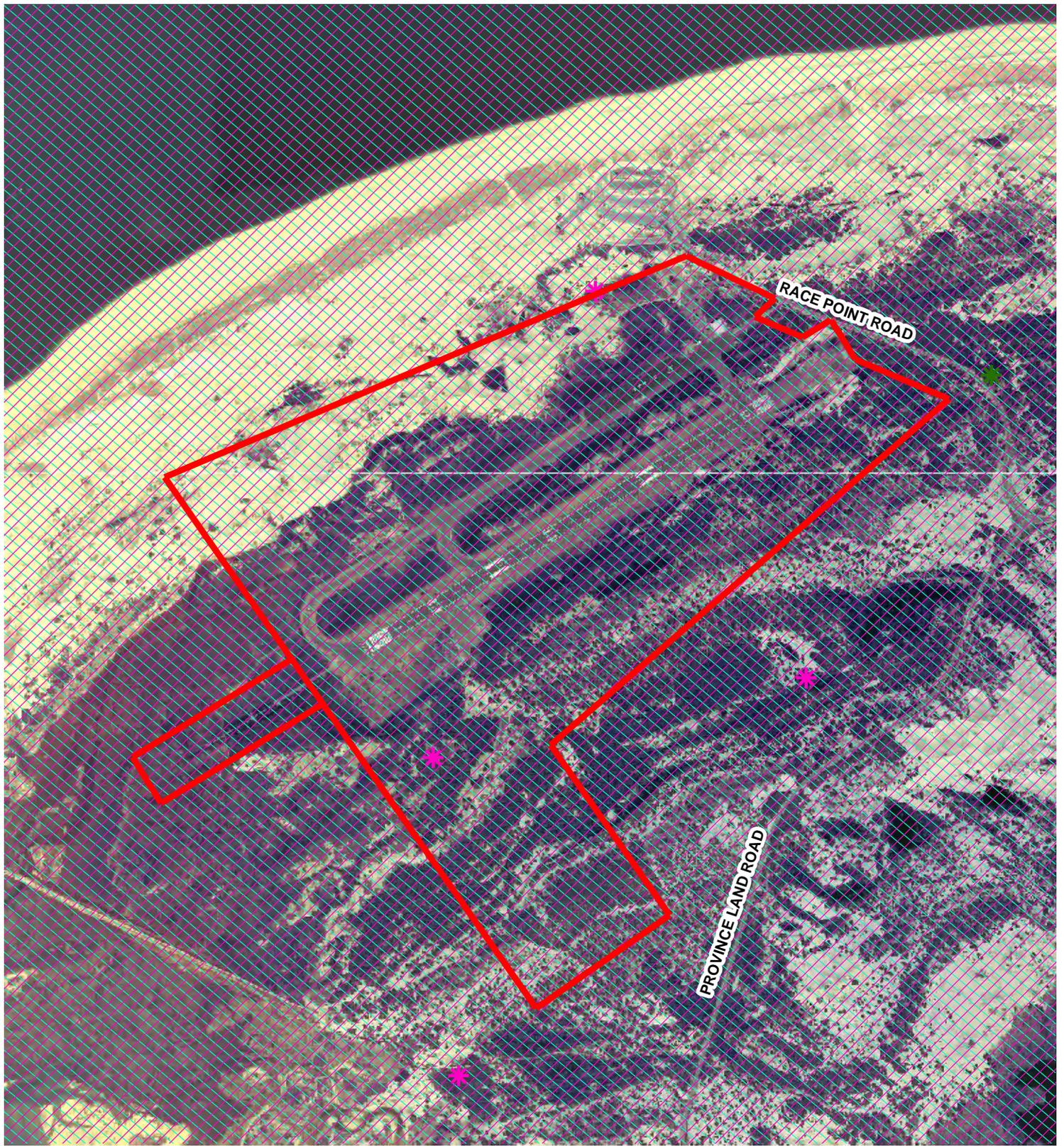


Photo 12. Wetland C is an example of a wetland with low potential to serve as Eastern Spadefoot breeding habitat. Photo taken March 2008, at Provincetown Municipal Airport.



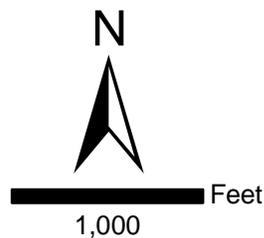
Photo 13. Wetland AE is an example of a wetland with little to no potential to serve as Eastern Spadefoot breeding habitat. Photo taken at Provincetown Municipal Airport, March 2008.





**Legend**

-  Lease Line
-  NHESP Potential Vernal Pools - December 2000
-  NHESP Certified Vernal Pools - September 2006
-  NHESP Priority Habitats of Rare Species  
September 2006
-  NHESP Estimated Habitats of Rare Wildlife  
September 2006



Horsley Witten Group  
 phone: 508-833-8800  
 www.horsleywitten.com 

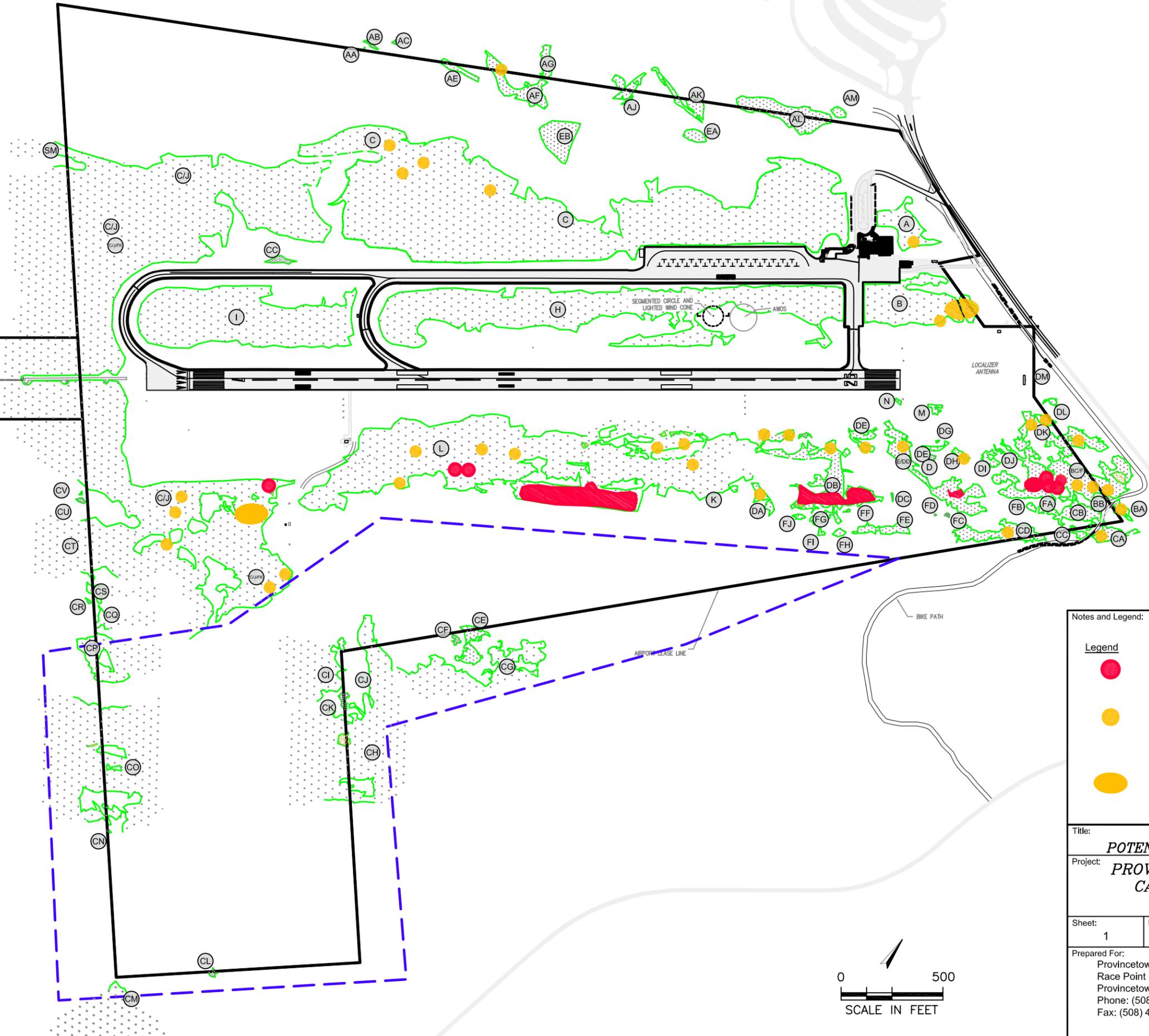
Natural Heritage & Endangered  
 Species Program  
 Provincetown Municipal Airport  
 Provincetown, MA

12/13/06 ec  
 J:\4027 E&K-PTown Airport\GIS

Figure 1



last modified: 06/23/08 printed: 06/23/08 by bk J:\4027 E&K-PTown Airport\Drawings-4027\dwg\4027 SPADEFOOT (with xrefs).dwg



Notes and Legend:

	Eastern Spadefoot (Breeding) Prime		Area not in Assessment
	Eastern Spadefoot (Breeding) Potential less than 1000 S.F. (less than 10m X 10m)		Wetland Areas
	Eastern Spadefoot (Breeding) Potential more than 1000 S.F. more than (10m X 10m)		Lease Line

Title: **FIGURE 2**  
**POTENTIAL SPADEFOOT BREEDING AREAS**

Project: **PROVINCETOWN MUNICIPAL AIRPORT  
CAPITAL IMPROVEMENTS PLAN  
PROVINCETOWN, MASSACHUSETTS**

Sheet: 1	Date: 06/02/08	Design By: AMB/ACS	Drawn By: DWM/ERK	Checked By: JL
----------	----------------	--------------------	-------------------	----------------

Prepared For: Provincetown Municipal Airport Race Point Road, P.O. Box 657 Provincetown, Massachusetts Phone: (508) 487-0241 Fax: (508) 487-4110	Design By: <b>Horsley Witten Group Environmental Services</b> 90 Route 6A Sandwich, MA 02563 508-833-6600 voice 508-833-3150 fax	
---	---	--

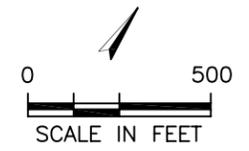




Table 1. Summary of Eastern Spadefoot breeding habitat identified at the Provincetown Municipal Airport, Provincetown, Massachusetts.

WETLAND AREA	PRIME (IDEAL)	POTENTIAL	LOW POTENTIAL/NO POTENTIAL
Salt Marsh			X
Wetland AA			X
Wetland AB		X	
Wetland AC			X
Wetland AE			X
Wetland AF		X	
Wetland AG			X
Wetland AI			X
Wetland AJ			X
Wetland AK			X
Wetland AL			X
Wetland AM		X	X
Wetland BA		X	
Wetland BB			X
Wetland BC		X	
Wetland CA	X	X	
Wetland CB		X	
Wetland CC			X
Wetland CD		X	
Wetland DA			
Wetland DB/FG	X	X	
Wetland DC			X
Wetland DD	X	X	
Wetland DE		X	
Wetland DF			X
Wetland DG			X
Wetland DH			X
Wetland DI			X
Wetland DJ			X
Wetland DK		X	
Wetland DL			X
Wetland DM			X
Wetland EA			X
Wetland EB		X	X
Wetland FA			X
Wetland FB			X
Wetland FC			X
Wetland FD			X
Wetland FE			X
Wetland FF			X
Wetland FH			X
Wetland FI			X
Wetland FJ			X
Wetland A		X	
Wetland B	X	X	
Wetland C		X	X
Wetland C/J/FK	X	X	
Wetland D			X
Wetland E	X	X	
Wetland F		X	
Wetland H		X	X
Wetland I		X	X
Wetland K	X	X	
Wetland L	X	X	
Wetland M			X
Wetland N			X

Note: Wetland areas not listed were not assessed for the potential to provide breeding habitat for Eastern Spadefoot. Also, Wetland G was incorporated into Wetland BC/F during initial delineation.

