

Eastern Whip-poor-will Survey: Windham, Addison, and Chittenden Counties



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Introduction

The Eastern Whip-poor-will (*Antrostomus vociferus*) is a nocturnal aerial insectivore found in edge habitats across eastern North America. Seldom seen yet well known for its distinctive call, the male Eastern Whip-poor-will (WPW) will call continuously throughout clear, moonlit nights during breeding season (usually late May through early July) (Cink 2002). Habitat requirements for this species are complex and necessitate a mix of open-understory forest, for breeding and rearing young, and large tracts of open land, in order to forage successfully (Hunt 2006). Examples of breeding habitat include forests with dry, nutrient poor soils such as Pine Barrens and Pine-oak Woodlands. Suitable foraging habitats include fields, power-line rights-of-way, agricultural settings, and recently logged or burned areas (Hunt 2013).

Due in part to loss of this composite habitat, the geographic range of WPW has contracted and populations have declined (Sauer et al. 2011). Forest maturation, urbanization, and industrialization have been cited as causal factors in WPW decline (Environment Canada 2015). As agriculture decreases and parts of Vermont revert back to their initial, more forested state, early successional habitat necessary to host a robust WPW population is lost. In addition to habitat loss, WPW declines have also been attributed to population declines in large-bodied moths (possibly due to pesticide use), and collisions with cars (COSEWIC 2009).

WPW numbers declined by 77% between the first (1976-1981) and second (2002-2007) Vermont Breeding Bird Atlas (Renfrew 2013). Other breeding bird atlases (MD, NY, ON, PA) showed an average decline of 54% between their first and second atlases. However, most bird surveys are carried out during the day and associated data may fail to accurately represent nocturnal bird populations. This lack of standardized and consistent nocturnal bird surveys prompted Pam Hunt of New Hampshire Audubon to commence the Northeast Nightjar Survey in 2007.

Now coordinated by the Vermont Center for Ecostudies (VCE), this statewide, annual survey is carried out by volunteers who survey 18 routes within regions exhibiting habitat characteristics considered potentially suitable for WPWs (low elevation, matrix of field and forest). These surveys suggest changes in the Vermont WPW population and contribute to broader efforts to detect regional changes in the northeastern population. In particular, data from these surveys suggests steep declines in Vermont WPW populations. In 2011, in response to data collected from bird surveys, the Northeast Nightjar Survey, and years of anecdotal accounts of population decline in Vermont, the WPW was listed as Threatened in the state.

In order to better understand habitat requirements of this species and obtain more precise counts, VCE has conducted WPW surveys for the past three summers in different regions of Vermont. These surveys are a first step toward determining where additional survey effort may be focused and providing more thorough population estimates.

Methods

Our objective was to obtain an estimate of the number of WPWs in Vermont by surveying areas where the species is known to be relatively abundant, areas with suitable habitat but from which we have few records, and areas in which we think WPWs may have been more abundant in the past.

2016 Methods

Starting in the summer of 2015, in an effort to produce standardized, replicable surveys, we implemented a set of point-count protocols on routes that had been predetermined by Pamela Hunt during the 2007 Northeast Nightjar Survey and continued those protocols in 2016. In addition to the point-count protocols, we employed cluster sampling when a WPW was heard at one of the original points. Since implementation in 2007, volunteers have routinely surveyed most routes for

WPWs and other nightjars. However, in 2016, we created, mapped, provided route descriptions and sampled three new routes.

Similar to the generation of the original routes, new routes were loosely based on habitat associations derived from work done in New Hampshire (Hunt 2006) or other data (e.g., Cink 2002, Hunt pers. obs.). In general, routes were placed in areas that met all or most of the following criteria:

1. Away from major roads and developed areas
2. Lower elevation river valleys
3. Habitat mosaic of forest and open areas (latter including old fields, utility rights of way, and barren lands)
4. Pine or pine/oak forest (though this was often not apparent from Google Earth images)
5. Presence of gravel pits as indicator of well-drained soils

Suitable habitat was identified using Google Earth, then a route consisting of 10 points spaced 1.6 km apart was placed so as to fall as completely within the appropriate habitat as possible.

Our surveys were conducted from 16 May through 25 June, on nights with at least 50% moon illumination, during the full moon or waxing and waning gibbous moons, when WPWs are known to call more frequently. We arrived at a predetermined site approximately 30 minutes prior to beginning the survey, to organize ourselves and allow birds to settle. In the evening, surveys started 20 – 30 minutes after sunset and continued through the specified end point, as long as the moon was visible and the weather was suitable. During the waning moon, surveys began after sunset, continued until it was dark, then were delayed varying amounts of time until the moon rose above the horizon. Early morning surveys ended 15 minutes before sunrise and were often used to complete roadside surveys from the previous night or used for ad hoc surveys. We did not conduct surveys if conditions were windy (wind speed > 8 mph), cloudy (> 50% cloud cover), or rainy.

Each survey consisted of point counts at 10 locations along 6 pre-established routes in Vernon, Brattleboro, Rockingham, Hinesburg, Shoreham, and Panton. Survey locations were each spaced one-mile apart. For all surveys, routes were followed in order, from point 1 to point 10. If there was no safe or quiet parking at a point, the point was moved as far up the road as needed to be safe, but no further than 0.24 km.

Each point on a given route included a six-minute count, during which time observers listened silently and recorded birds independently. Latitude, longitude, wind speed, cloud cover, and noise were noted at each point along the route prior to the start of the count. Passing cars were noted during the course of the survey. Individual WPWs were counted in one-minute intervals for six minutes, with a compass bearing and qualitative proximity assessment (very close, close, far, very far) for each WPW. A single bird that was heard singing from two different locations during the same survey was only counted once. If a WPW was heard at one of the 10 original points, a supplemental point survey was completed at least 0.8 km, and no more than 1.2 km away, using the same point-count protocol. Ideally, there would have been 2 - 3 supplemental points available for each original point. However, road conditions and the lack of roads often constrained supplemental counts. For most of the original points at which we heard a WPW, we were only able to access 1 - 2 supplemental points.

When a WPW was documented at a particular point, each observer took bearings to better determine (and potentially triangulate) the location of the individual bird. Supplemental points were often close enough to original points to allow for implementation of triangulation techniques in order to determine if the same WPW was heard in both locations. We have mapped each WPW detection to 1 km along the compass bearing noted, with the understanding that the location of the individual WPW was somewhere between the observer and the 1 km marker.

Each route was surveyed to completion, points 1 through 10, twice. Several surveys were aborted mid survey due to inclement weather, but all points within the route were visited at least twice. Ideally, repeat surveys would have been conducted within the same lunar cycle so as to reduce variability in counts that might arise due to immigration or emigration into the survey area. We were able to adhere to this protocol for Vernon and Rockingham. For Brattleboro, Panton, Hinesburg, and Shoreham, replicate surveys were done during sequential lunar cycles due to excessive cloud cover and lack of moon illumination during the first cycle.

In addition to the surveys conducted by VCE, volunteers completed the following roadside surveys, using the same standard protocols, once during the 2016 breeding season and under suitable weather and lunar conditions (as detailed above): Hartland, Corinth, Brandon, Concord, Underhill, Fair Haven, West Haven, Salisbury, Peacham, Rutland, Bennington, Snake Mountain, Springfield, Vernon, and Brattleboro.

When time allowed, ad hoc surveys were completed to find WPWs in locations outside the survey routes. Similar to our 2014 methods, we scouted habitat during the day in order to pinpoint suitable locations for ad hoc surveys. These surveys consisted of walking or driving in potential habitat and listening for singing birds. At each site we listened for WPWs for 6 minutes, then proceeded to the next location, which was often determined by detection of a different WPW. If we did not hear a WPW, we proceeded in 0.40 km increments and listened until the survey window closed or unsuitable weather forced us to end the ad hoc survey. In addition to surveying ad hoc points and because so few WPWs were detected this year, we also surveyed supplemental points, even when no WPWs were detected on a route. Unlike ad hoc points, supplemental points were chosen based on the original route rather than suitable WPW habitat. Supplemental points were located at least 0.8 km, and no more than 1.2 km away from original points along the route.

Results and Discussion

2016 Results and Discussion

The 2016 WPW breeding season was completed using the improved and more systematic protocol implemented in 2015. In order to produce standardized, replicable surveys with more reliable results, we conducted surveys on pre-established Northeast Nightjar Survey routes using point counts, which were augmented with cluster sampling using point counts at supplemental points. In addition, we focused our survey efforts over a much larger portion of the state.

Vernon:

The Vernon route was attempted a total of four times during the 2016 breeding season: once by a volunteer and three times by VCE. The first survey attempt (16 May) was ended after point 6 due to excessive cloud cover. The second and third attempts (18/19 May) were ended at point 8, when we were again stopped by clouds. On the fourth attempt (20 May) we were able to survey points 1-10 in one night. The volunteer survey (13 June) was ended after point 7 due to rain. Neither the volunteer survey, nor our first three survey attempts yielded any detections. However, one WPW was detected from point 4, then another from point 6 during our fourth survey (20 May) (Table 2). Immediately following these detections, we surveyed four supplemental points (two for point 4, two for point 6). Two of the four supplemental points yielded detections (4A and 6A), however, due to the estimated distance and direction of the supplemental detections, we believe these were the same WPWs heard at the original points.

Though much of this route exists along paved roads in populated areas, the habitat along those roads consists primarily of large tracts of open land—farms, Vermont Yankee Facility, hay fields, gravel pit—all suitable WPW habitat. However, no past volunteer surveys of this route have yielded detections.

Brattleboro:

The Brattleboro route was surveyed a total of three times during the 2016 breeding season: once by a volunteer and twice by VCE. Each of the surveys was completed in the span of one night. No WPWs were detected during the volunteer survey (19 June) or the VCE surveys (19 May and 25/26 June) (Table 2).

Though some suitable habitat exists along this route, many of the points lie in and around urban areas, or in otherwise unsuitable WPW habitat (corn fields, forest with thick understory). In addition to the pre-established points, we surveyed three supplemental and two ad hoc points: three supplemental on the morning of 20 May, and two ad hoc on the morning of 26 May. WPWs were not detected from any of these points. Since surveys began in 2006, WPWs have not been detected on this route.

Though much of this route is along paved roads and in urban areas, it intersects a large power-line cut at points 4 and 10 and has several points with open land surrounded by mixed forest, making parts of this route ideal WPW habitat. Two of the three supplemental points surveyed were on power-line rights-of-way and one of our ad hocs was in a gravel pit.

Rockingham:

The Rockingham route was surveyed a total of two times during the 2016 breeding season. Because this is a new route, we were unable to find a volunteer to survey Rockingham for the 2016 season. Inclement weather caused us to terminate the first survey after point 9 and finish point 10 the following morning. Neither the first (14/15 June) nor second (16 June) survey yielded any detections (Table 2). In addition to the pre-established points along the survey route, we surveyed two supplemental points on the morning of 15 June. No WPW were detected from either supplemental point.

The bulk of the points along the Rockingham route were on dirt roads, surrounded by mixed forest with some open areas, railroad tracks, and a small gravel pit. Though WPW habitat along this route is marginal, the gravel pit makes future surveys a worthwhile endeavor.

Hinesburg:

The Hinesburg route was surveyed twice by VCE during the 2016 breeding season (15 June and 24 June) (Table 2). Though usually surveyed by a volunteer, we were unable to find anyone to fill in this season. Due to the large amount of traffic during our first evening survey, we repeated points 1-4 on the morning of 16 June when there was less traffic. In addition to the four repeated points, we surveyed three supplemental points (all near sand pits) on 23 June. No WPW were detected during our surveys of primary or supplemental points.

The majority of the points on this route exist along a busy paved road or at intersections with a lot of traffic. The few open or forested areas are close enough to traffic that if WPW were present (even with their loud call), they would be difficult to hear. This route was surveyed by volunteers from 2005-2009, then again in 2015. No WPW were detected during any of the volunteer surveys.

Shoreham:

Because Shoreham is a new route, the survey was completed twice by VCE during the 2016 breeding season (18 June and 21 June). There were no volunteer surveys of this route in 2016. In addition to the points along our established route one ad hoc (19 June) and two supplemental (19 June) points were surveyed. No WPW were detected during our surveys of primary, supplemental, or ad hoc points. Most of the points along this route are on dirt roads surrounded by open farmland and mixed or hardwood forest. Though no WPW were detected during the two surveys, the route has a large amount of potential habitat and is close to Snake Mountain, which has an established (albeit small) population of WPW.

Panton:

The final route surveyed during the 2016 breeding season was Panton, a new route. This route was surveyed twice by VCE (19 June and 25 June) (Table 2). During our first survey (19 June), a calling WPW was detected by one observer.

Due to the estimated distance and location, subsequent lack of detection at supplemental points, and suitable habitat in New York versus poor habitat in Vermont, that bird was considered a New York WPW and was therefore not counted in our detections. However, because of the initial detection we implemented cluster-sampling protocol. One supplemental point was surveyed and no WPW were detected. In addition to the one aforementioned supplemental point survey, five supplemental (four on 20 June and one on 24 June) and three ad hoc (one on 20 June and two on 24 June) points were surveyed on. During the 20 June ad hoc survey, a WPW was detected, but again due to the distance and direction, this WPW was determined to be in New York.

The habitat along the Pantan route is paved and surrounded primarily by open large commercial farmland and a small amount of hardwood or mixed forest. It runs parallel to Dead Creek, ending north of Button Bay State Park. Though no WPW were documented on this route, an effort should be made to resurvey next year due to proximity of New York WPW.

Conclusion

While VCE's 2014 and 2015 surveys and cluster sampling produced a large number of WPW detections, the 2016 breeding season yielded detection of only two individual birds. Though our survey protocols did not deviate from those implemented in 2015, the three established routes surveyed by VCE had no history of WPW detection during previous volunteer surveys. Therefore, our results are consistent with previous findings. The land surrounding the three new routes possesses potential WPW habitat, but may be too heavily farmed over too extensive an area to support a population. Although the 2016 survey protocols do not yield results directly comparable with the volunteer surveys, patterns of detection of WPW were roughly similar, albeit with fewer WPW detected by volunteers.

Though the 2016 survey season yielded few detections, the protocol is sound and comparably rigorous surveying protocols in other parts of Vermont are warranted,

particularly in areas without established routes (i.e. areas with little historical data). In addition to continuing the survey protocol implemented in 2015, as well as the establishment of new routes around the state, we also suggest conducting an analysis of habitat use, which would better enable assessment of WPW habitat capacity in Vermont and permit fine-tuning of route designations for regular monitoring. This should include not only analyzing habitat relationships along existing survey routes, but also in other potentially suitable environments that are not well covered by roadside surveys. For example, expanding surveys to include power lines and quarries would allow us to evaluate use of these disturbed areas by WPW and to determine whether they constitute an important source of habitat that might play an important role in recovery efforts.

VCE's recent WPW surveys have been highly constrained due to the limited number of sites and routes that could be surveyed during a short breeding season and under conditions in which WPWs are known to call. To acquire more robust and comprehensive data, we suggest use of automated recording units (e.g., Digby et al. 2013), which would allow for a more extensive survey. Automated recording units might prove especially useful in surveying areas that are difficult to access, such as power-line rights-of-way. While the many years of volunteer survey data are invaluable, we have documented a disparity between number of WPWs detected during single volunteer surveys and the number detected during duplicate surveys that employ a cluster sampling methodology. The systematic protocols and methods used during VCE's 2015 survey, if implemented more broadly, would provide better insights into breeding WPW numbers in the state of Vermont.

Table 1. Date, time, and location of observer at time of WPW detection in 2016.
Includes supplemental points, ad hoc surveys, and repeat individuals.

Date	Time	Point Type	XCOORD	YCOORD	Repeat?
20-May-16	21:06	Primary	-72.515338	42.752744	N
20-May-16	21:17	Supplemental	-72.517657	42.759416	Y?
20-May-16	21:54	Primary	-72.522279	42.779896	N
20-May-16	22:10	Supplemental	-72.515490	42.773811	Y?

Table 2. Route, point number, approximate location of observer at time of WPW detection, and WPW number at primary points on routes surveyed by VCE.
Numbers do not include supplemental points, ad hoc surveys, or repeat individuals.

Route and Visit #	Primary Point #	Latitude	Longitude	WHIP #
Vernon 1		-	-	0
Vernon 2		-	-	0
Vernon 3		-	-	0
Vernon 4	4	42.752744	-72.515338	1
Vernon 4	6	42.779896	-72.522279	1
Vernon Best Estimate				2
Brattleboro 1		-	-	0
Brattleboro 2		-	-	0
Brattleboro 3		-	-	0
Brattleboro 4		-	-	0
Brattleboro Best Estimate				0

Rockingham 1	-	-	0
Rockingham 2	-	-	0
Rockingham 3	-	-	0
Rockingham Best Estimate			0
Hinesburg 1	-	-	0
Hinesburg 2	-	-	0
Hinesburg 3	-	-	0
Hinesburg 4	-	-	0
Hinesburg Best Estimate			0
Shoreham 1	-	-	0
Shoreham 2	-	-	0
Shoreham 3	-	-	0
Shoreham Best Estimate			0
Panton 1	-	-	0
Panton 2	-	-	0
Panton 3	-	-	0
Panton 4	-	-	0
Panton Best Estimate			0

Key for Figures 1 - 6

Red pins indicate original points along survey route. Blue pins indicate supplemental points for cluster sampling. Yellow pins indicate ad hoc points. Red lines indicate direction from observer to WPW and continue for 1 km, regardless of actual distance from observer to WPW. Only VCE survey results included.

Figure 1. Points surveyed and WPW detected, Vernon route

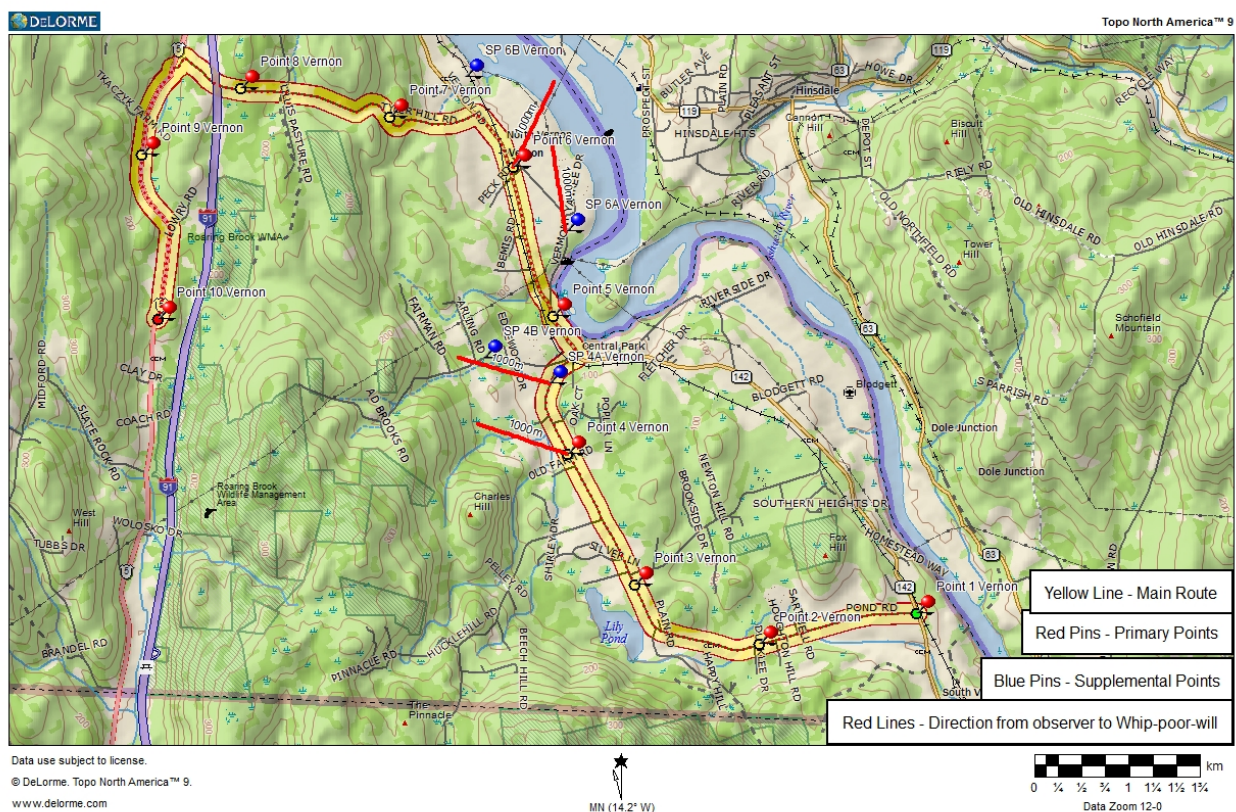


Figure 2. Points surveyed and WPW detected, Brattleboro route

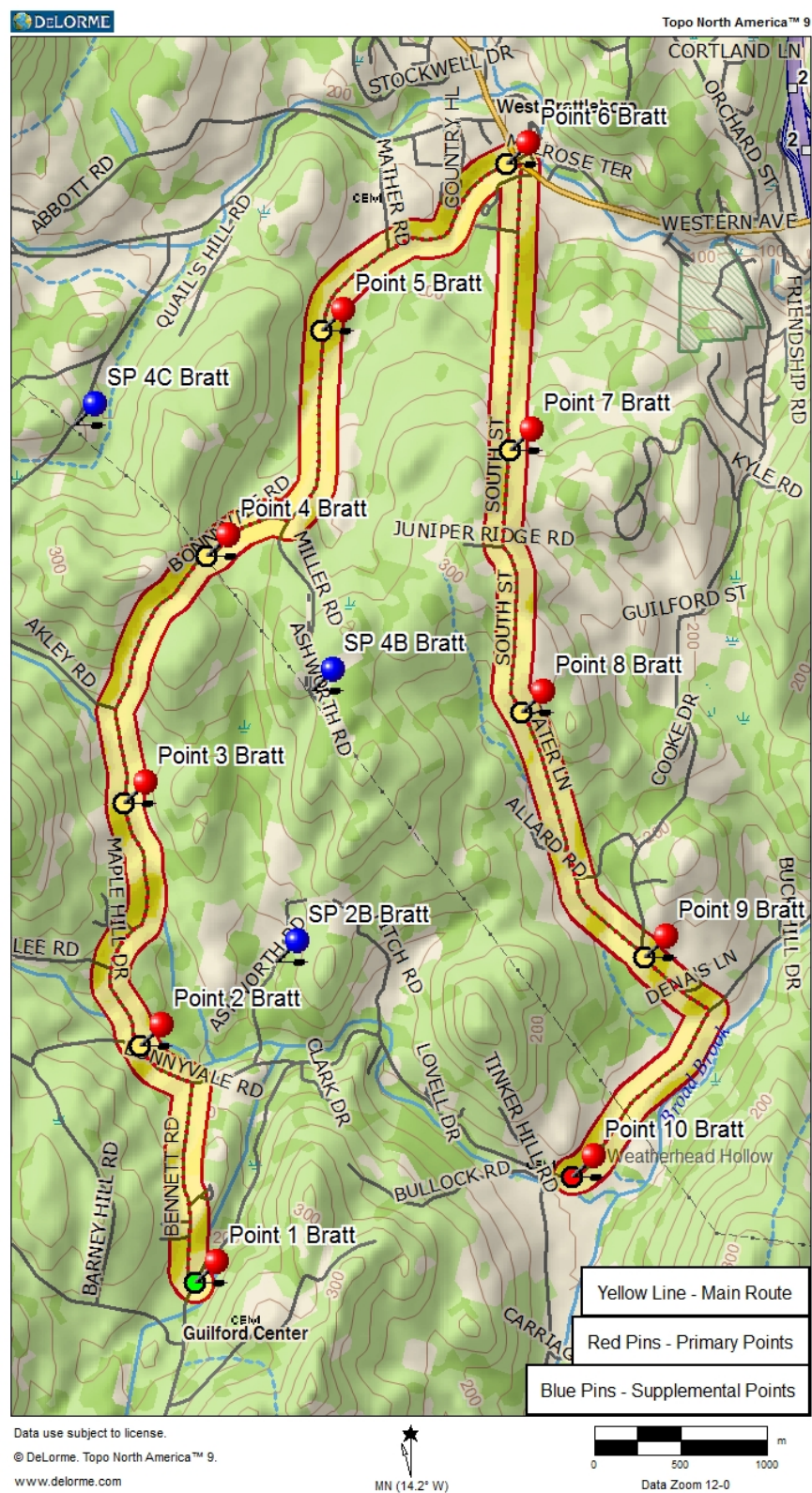
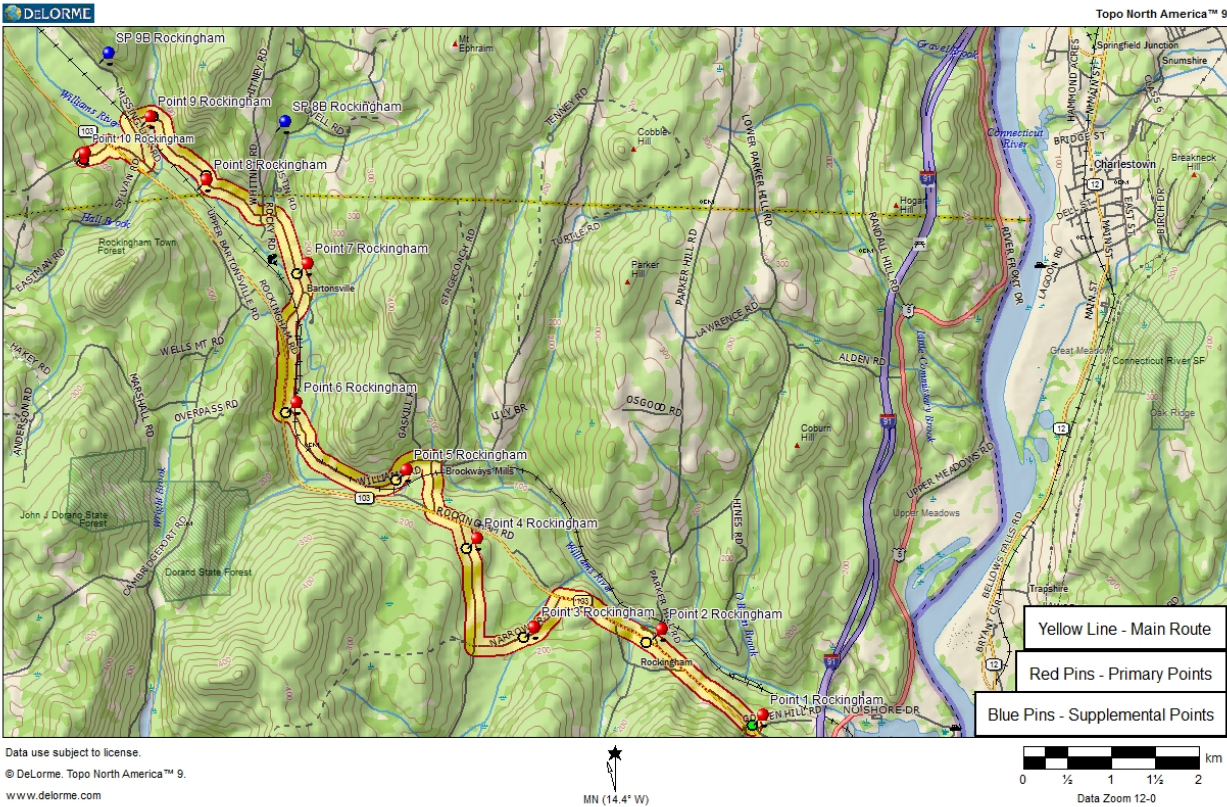


Figure 3. Points surveyed and WPW detected, Rockingham route



Topographic map of the Hinesburg area in Vermont, showing a yellow main route and red pins for primary points. The map includes contour lines, roads, and water bodies. A legend at the bottom left identifies the yellow line as the main route and red pins as primary points. A scale bar and north arrow are at the bottom right.

Legend:

- Yellow Line - Main Route
- Red Pins - Primary Points
- Blue Pins - Supplemental Points

Map Labels:

- Point 1 Hinesburg
- Point 2 Hinesburg
- Point 3 Hinesburg
- Point 4 Hinesburg
- Point 5 Hinesburg
- Point 6 Hinesburg
- Point 7 Hinesburg
- Point 8 Hinesburg
- Point 9 Hinesburg
- Point 10 Hinesburg
- SP 1A Hinesburg
- SP 1B Hinesburg
- SP 3A Hinesburg
- SP 4 Hinesburg
- SP 5 Hinesburg
- SP 6 Hinesburg
- SP 7 Hinesburg
- SP 8 Hinesburg
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Figure 5. Points surveyed and WPW detected, Shoreham route

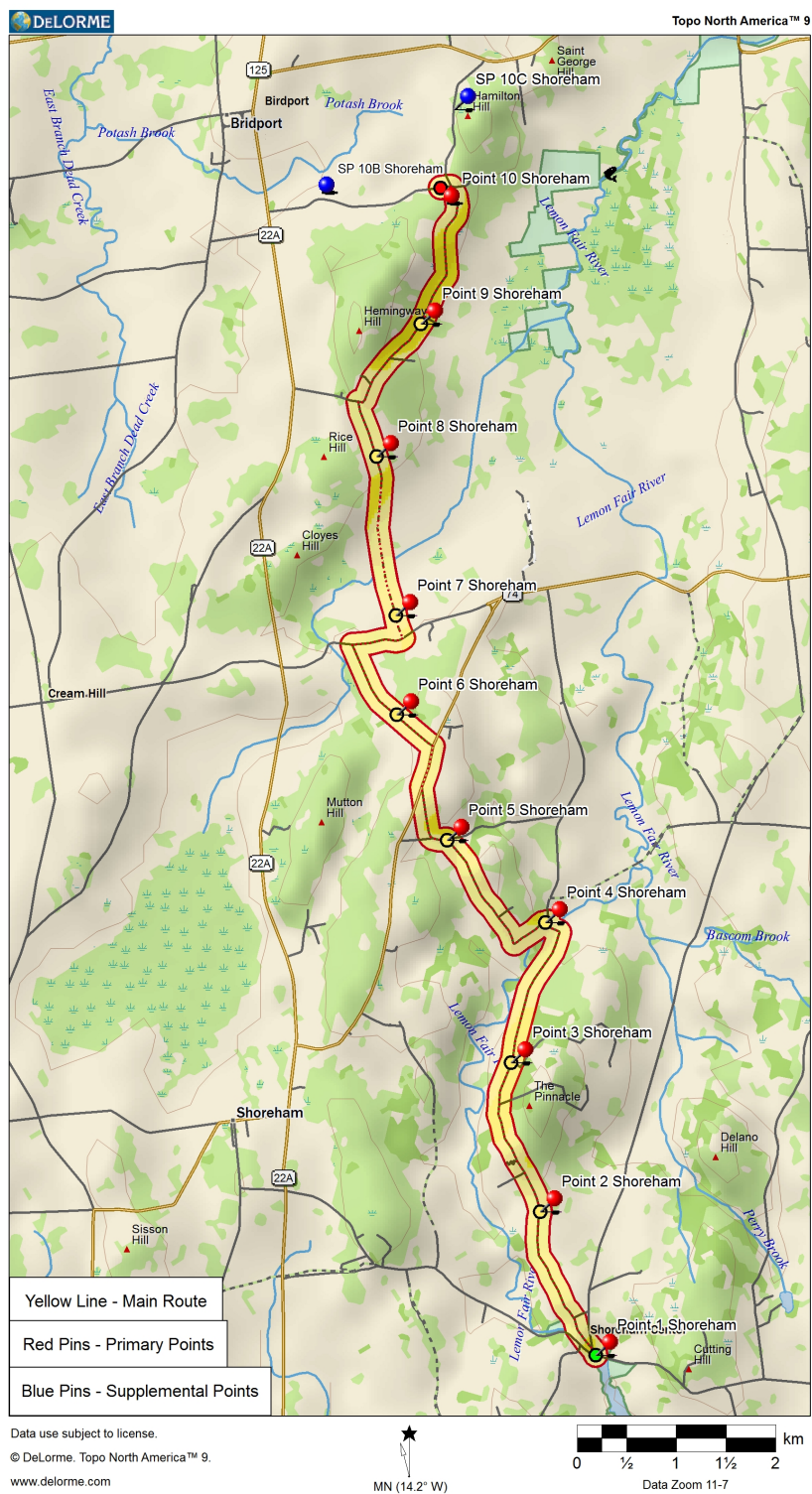


Figure 6. Points surveyed and WPW detected, Pantan route



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