# Eastern Whip-poor-will Survey:

## Addison, Rutland, and Windsor Counties

**Sarah Carline surveying in Ferrisburg on the Fourth of July. © Troi Perkins**

## Annual Report to Vermont Fish and Wildlife

## August 1, 2017


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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 21 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 suggest 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 four 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 for the state.

## 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, or areas in which we think WPWs may have been more abundant in the past.

### *2017 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 and 2017. 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. 2016 was the first year since implementation that we created, mapped, provided route descriptions, and surveyed new routes. In 2017, we created, mapped, provided route descriptions, and surveyed five new routes – Pawlet, Orwell, Ferrisburg, Randolph, and South Tunbridge.

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 5 July, 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 15 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 Pawlet, Wells, Orwell, Ferrisburg, South Tunbridge, and Randolph. Survey locations were each spaced one mile apart. For most 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 Pawlet, Wells, and Orwell. For Ferrisburg, the replicate survey was done during the sequential lunar cycle due to excessive cloud cover and lack of moon illumination during the first cycle. For Randolph and South Tunbridge, first surveys were done in May, and second surveys were done in July.

In addition to the surveys conducted by VCE, volunteers completed the following roadside surveys, using the Northeast Nightjar Survey protocols, once during the 2017 breeding season and under suitable weather and lunar conditions (as detailed above): Brattleboro, Bennington, Corinth, Concord, Fair Haven, Hartland, Panton, Peacham, Rutland, Salisbury, Snake Mountain, Springfield, and Underhill. The Rockingham Route was surveyed by a volunteer, but was done so outside the parameters allowed by the Northeast Nightjar Survey, during a lunar phase unsuitable for southern Vermont. The West Haven route was attempted, but cancelled due to flooded roads.

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 six minutes, then proceeded to the next location. If we did not hear a WPW, we proceeded to the next point 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

### *2017 Results and Discussion*

The 2017 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.

### *Pawlet:*

The Pawlet route was surveyed completely twice during the 2017 breeding season by VCE (Table 2). Because this is a new route, we did not have a volunteer to survey Pawlet. After sunset on our first suitable night (1 June) the survey was immediately cancelled due to excessive winds. The following morning before sunrise (2 June) we were able to survey a primary point and several supplemental points (5A, 5C, 5D, 5, and 4C) which were selected based on habitat. The second

attempt (3 June) was stopped after sunset at point 3 due to cloudy conditions. We waited for clouds to pass and restarted the survey after midnight, which constituted a third attempt on 4 June. We completed the survey, then surveyed two ad hoc points. The route was completed a second time with our fourth and fifth attempts (9/10 June). Points 1-7 were surveyed on 9 June in good weather conditions after sunset until we reached point 8, at which time excessive cloud cover ended the survey. We restarted the survey before sunrise on 10 June and completed points 9 and 10, then repeated point 8. No WPW detections were made along the route or at any of the ad hoc points.

This route is along the western edge of relatively high elevation forested habitat, with an even mix of dirt and paved roads through lower elevation valleys. Points 1 - 5 have suitable WPW habitat, with pine forests, fields, and several sand pits. In addition, points 8 and 10 have sand pits in the vicinity and are on dirt roads that are not well traveled. The Pawlet route is approximately 9 km east of the small Wells WPW population. Considering all of these factors, this route has the potential to support a WPW population.

### *Wells:*

This route is remote and has been surveyed only three times by volunteers since the implementation of the Northeast Nightjar Survey (2007, 2008, 2009). No WPWs were detected during past volunteer surveys. In 2015, VCE surveyed the route once, late season, and detected two WPWs. The Wells route was surveyed a total of two times by VCE during the 2017 breeding season. The first survey (7/8 June) started after sunset and was completed early the next morning with a total of three detections along the route (Table 2). The first detection was at point 2 (Table 1), where a WPW was seen flying in close proximity. We began cluster sampling and surveyed supplemental point 2A, where we heard a WPW calling (Table 1). Then we surveyed supplemental point 3A, where we also detected a WPW (Table 1). At each supplemental point we took a bearing and estimated the distance from

the observer to the calling WPW. Bearing and distance estimates indicate that all three detections were likely the same WPW. We detected no WPWs at the final supplemental point (2B). At point three, one observer potentially heard a WPW, so we surveyed supplemental point 3B. There were no confirmed WPWs at either 3 or 3B. We completed the survey through point 10 with no more detections. With a clear sky and no winds, we also surveyed three supplemental points (8B, 8A, 1A) and one ad hoc point. Supplemental point 1A yielded three detections (Table 1). Due to the difference in proximity and direction, we concluded that each detection was a separate bird. Two WPWs were calling the entire six minutes, while the third WPW was heard periodically during the survey. Based on the distance and direction of these three WPW detections to the WPW detections earlier in the survey, we documented only three individual WPWs for this survey. The second survey (11/12 June) also started after sunset and was completed early the next morning. In addition, one ad hoc point and three supplemental points (4B, 4A, 1B) were surveyed. No WPWs were detected at any point.

The habitat surrounding the first few points along the Wells route is highly unusual in that it is dominated by miles of slate quarry. Much of this route is developed in one way or another, providing an abundance of open area with many pine forests surrounding. Further exploration of gated quarry roads north of supplemental point 2A could yield more information about habitat and potential nesting areas. Every effort should be made to recruit and train a volunteer to adopt this route.

### *Orwell:*

The Orwell route was surveyed a total of two times during the 2017 breeding season (Table 2). Because this is a new route, we were unable to find a volunteer to survey Orwell for the 2017 season. The first survey (12/13 June) started after sunset and was completed through point 10, with supplemental points surveyed early the next morning. There were several WPWs detected at points 2 and 3. We immediately surveyed surrounding supplemental points (2A, 2B, and 3B). Because

of the lack of roads in the area, we were not able to survey more supplemental points. Due to the distance and direction of the detections, we concluded that the WPWs detected during this survey were in New York and did not include them in our data. The second attempt (14 June) started after sunset, and four points were completed before we had to stop to wait for the moon to rise over the mountains. We resumed the survey for our third attempt (15 June) and completed the survey along with one supplemental point (10B) and five ad hoc points, finishing at sunrise. Despite starting the surveys at similar times, within several days, there were no detections of WPW during the second survey of the route and surrounding points.

The majority of the points on this route are on dirt roads with hayfields. However, most of the nearby forests are hardwood forests, with the exception of points 8-10. The proximity of this route to a small population of WPWs in NY along Lake Champlain, and the fairly good habitat at points 8-10, make much of this route ideal WPW habitat.

### *Ferrisburg:*

The Ferrisburg route was surveyed twice by VCE during the 2017 breeding season (Table 2). Since this was a newly created route, we were unable to find a volunteer to survey this route in 2017. Due to excessive traffic noise along the main route on the first night (13 June), we surveyed four ad hoc points after sunset, then waited for the moon to rise to begin the main route. Just after midnight (14 June) we started the survey of the main route and completed it through point 10. There were some moderate wind gusts from points 6-10, but not enough to cancel the survey according to the Northeast Nightjar Survey protocol. No WPWs were detected at any of the ad hoc points or along the route. Due to inclement weather the last several nights of the survey period in June, we did not survey Ferrisburg a second time until the next moon phase. Fourth of July fireworks and traffic along the main route would have caused excessive noise had

we started the survey after sunset at point one. As a result, we elected to begin the second survey after sunset with three ad hoc and one supplemental point (7C) in a more rural section of the route. By the time we traveled back to point 1 (4 July), most of the fireworks and traffic had subsided. We completed points 1-10 in succession on a clear, calm night with no WPW detections. Just after midnight (5 July), we surveyed a supplemental point (9C) and three ad hoc points. Once again, there were no WPW detections at these points.

Although a large portion of the route lies in developed, suburban areas along a major highway, several of the points are on dirt roads with fields and pine forests surrounding. Bullfrogs, traffic, and the din of urban bustle make detecting WPWs a challenge on this route. However, late night or early morning surveys on calm nights may yield detections in areas with good habitat.

### *Randolph:*

The Randolph route was created in 2017, and was generated based on the criteria used for generation of the original Northeast Nightjar Survey routes. In addition, we mapped and surveyed several supplemental and ad hoc points. Because this route was not designated as one of our priority areas, we chose to survey Randolph early in the season, during a time when WPWs may still have been migrating through the area and not yet nesting. The first survey (16 May) (Table 2) began after midnight and was completed before sunrise, along with a supplemental point (10B) and two ad hoc points. No WPWs were detected. The second attempt (8 June) (Table 2) was stopped after point 4 due to cloud cover, and no WPWs were detected. The next survey (2 July) (Table 2) was completed two moon phases later in the season. Points 1-10 were surveyed after sunset to completion with an ad hoc point immediately after the survey. In addition, three more ad hoc points were surveyed before sunrise on 3 July. Neither primary points nor ad hoc points yielded any WPW detections. With an abundance of good habitat in this area, along with an extra night of good weather (5 July), we

surveyed seven additional ad hoc points. We detected no WPWs at the ad hoc points.

The habitat along the Randolph route primarily follows low elevation river valleys with fields and forested hills surrounding. The first several points are near sandpits, while the last several points have large open fields with farms and pine forests nearby, providing good potential WPW habitat.

### *South Tunbridge:*

South Tunbridge was another non-priority area surveyed early in the season. We focused on habitat near Rt. 14/Rt. 110, along dirt roads in valleys with a mosaic of forests and fields, then mapped a route along with several supplemental and ad hoc points. The South Tunbridge route was attempted five times in order to achieve two complete surveys (Table 2). The first attempt (16 May) was stopped after point 3 due to bad weather. The second attempt (17 May) started after sunset, and continued through point 4. We then waited for moonrise, resumed the survey for the third attempt (18 May), and completed the survey with a supplemental point (10C). The next survey (3/4 July) was two moon phases later in the season. On the fourth attempt, two ad hoc points and points 1-9 were completed, but the remainder of the survey was cancelled due to excessive cloud cover. We resumed the survey for the fifth attempt before sunrise the next morning at Point 10, where a WPW was heard (Table 1). We employed cluster sampling and surveyed a supplemental point (10A) and an ad hoc point without WPW detections. Unfortunately, more supplemental points were not surveyed due to daylight and lack of roads nearby.

The South Tunbridge route follows fairly narrow river valleys on dirt roads. Many of the points have large pine forests, hay fields, shrubby fields, and farms. This route has ideal WPW habitat and should be surveyed by volunteers each year.

## Conclusion

While VCE's 2014 and 2015 surveys and cluster sampling produced a large number of WPW detections, the 2016 and 2017 breeding season yielded few. In 2017, though 123 new points were surveyed (many of them twice), only four individual birds were detected. Few historic WPW records exist for areas in which the new routes were created. Though few WPWs were detected on the new routes, the value of these surveys exists in their generation of data for areas in which there is sparse historical data, ultimately providing more insight into the overall WPW populations in Vermont. The land surrounding the five new routes possesses potential WPW habitat and should be surveyed in the future with volunteer surveys. Rain, inclement weather, and a short breeding season prevented more routes from being created and surveyed in 2017.

Though the 2017 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, quarries, and recently logged areas 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 a critical 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 and recently logged areas. 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 2017. Includes supplemental points, ad hoc surveys, and repeat individuals.

| Date | Time | Point Type | XCOORD | YCOORD | Repeat? |
|---|---|---|---|---|---|
| 7-June-17 | 21:04 | Primary | -73.231963 | 43.450419 | N |
| 7-June-17 | 21:19 | Supplemental | -73.233513 | 43.456430 | Y |
| 7-June-17 | 21:37 | Supplemental | -73.227400 | 43.446304 | Y |
| 8-June-17 | 1:30 | Supplemental | -73.243826 | 43.462629 | Y |
| 8-June-17 | 1:30 | Supplemental | -73.243826 | 43.462629 | N |
| 8-June-17 | 1:30 | Supplemental | -73.243826 | 43.462629 | N |
| 4-July-17 | 3:59 | Primary | -72.526304 | 43.893042 | N |

**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 # |
|---|---|---|---|---|
| Pawlet 1 | - | - | - | 0 |
| Pawlet 2 | - | - | - | 0 |
| Pawlet 3 | - | - | - | 0 |
| Pawlet 4 | - | - | - | 0 |
| Pawlet 5 | - | - | - | 0 |
| **Pawlet Best Estimate** | | | | **0** |
| | | | | |
| Wells 1 | - | 43.450419 | -73.231963 | 1 |
| Wells 2 | - | - | - | 0 |
| **Wells Best Estimate** | | | | **1** |

| | | | | |
|---|---|---|---|---|
| Orwell 1 | - | - | - | 0 |
| Orwell 2 | - | - | - | 0 |
| Orwell 3 | - | - | - | 0 |
| **Orwell Best Estimate** | | | | **0** |
| | | | | |
| Ferrisburg 1 | - | - | - | 0 |
| Ferrisburg 2 | - | - | - | 0 |
| **Ferrisburg Best Estimate** | | | | **0** |
| | | | | |
| Randolph 1 | - | - | - | 0 |
| Randolph 2 | - | - | - | 0 |
| Randolph 3 | - | - | - | 0 |
| **Randolph Best Estimate** | | | | **0** |
| | | | | |
| South Tunbridge 1 | - | - | - | 0 |
| South Tunbridge 2 | - | - | - | 0 |
| South Tunbridge 3 | - | - | - | 0 |
| South Tunbridge 4 | - | - | - | 0 |
| South Tunbridge 5 | 10 | 43.893042 | -72.526304 | 1 |
| **South Tunbridge Best Estimate** | | | | **1** |

## 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 WPWs detected, Pawlet route

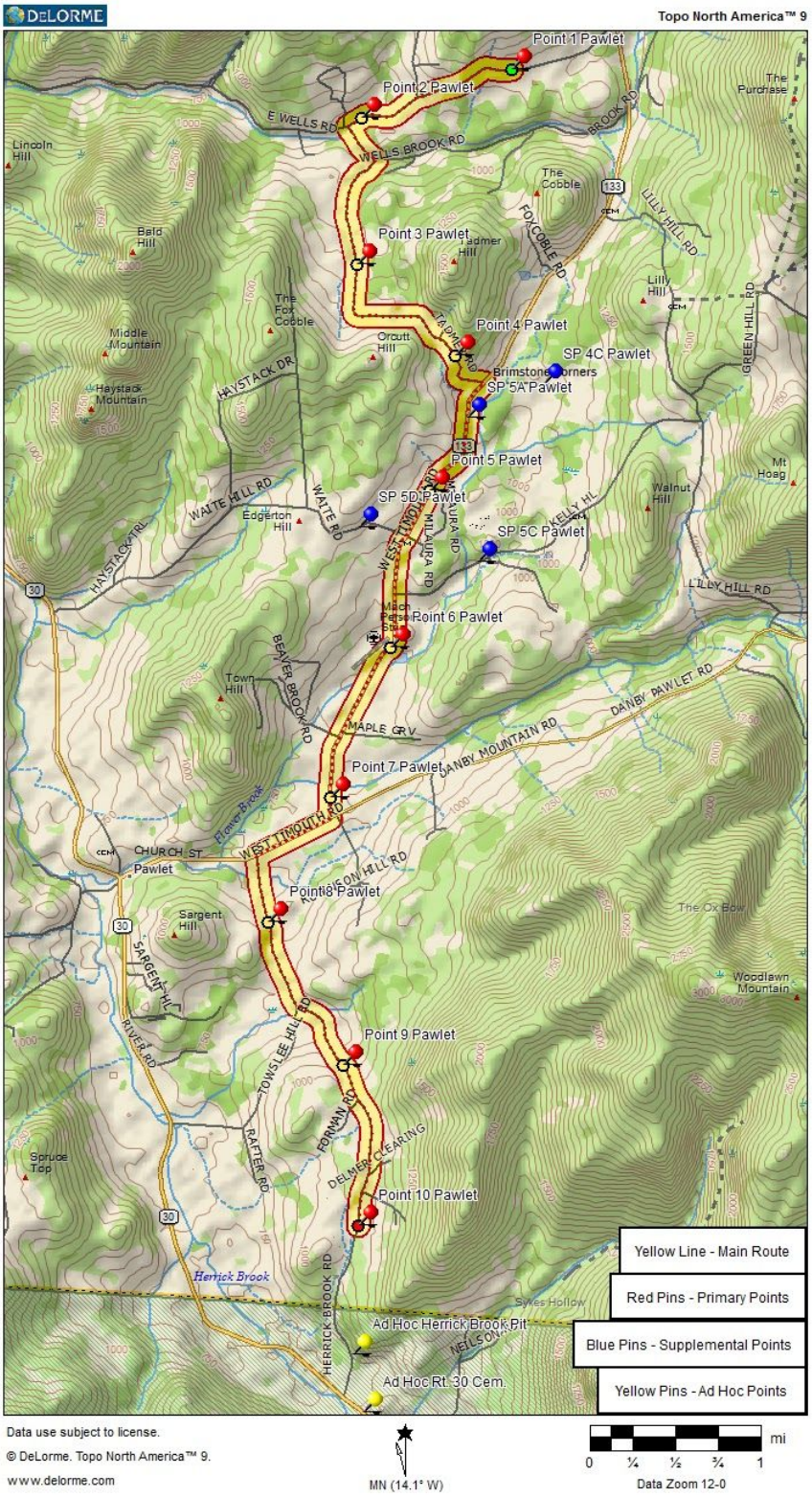


**Figure 2.** Points surveyed and WPWs detected, Wells route

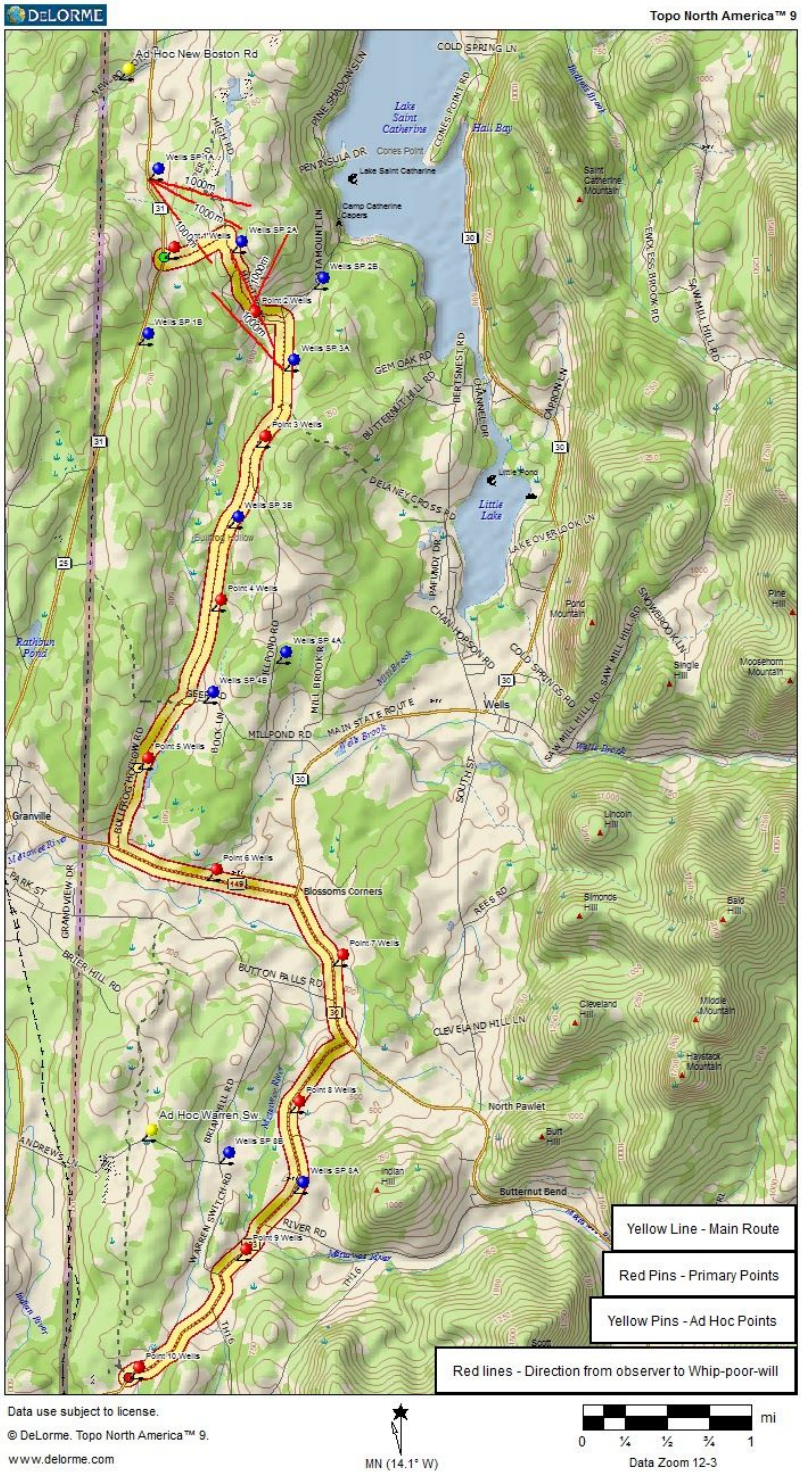


**Figure 3.** Points surveyed and WPWs detected, Orwell route

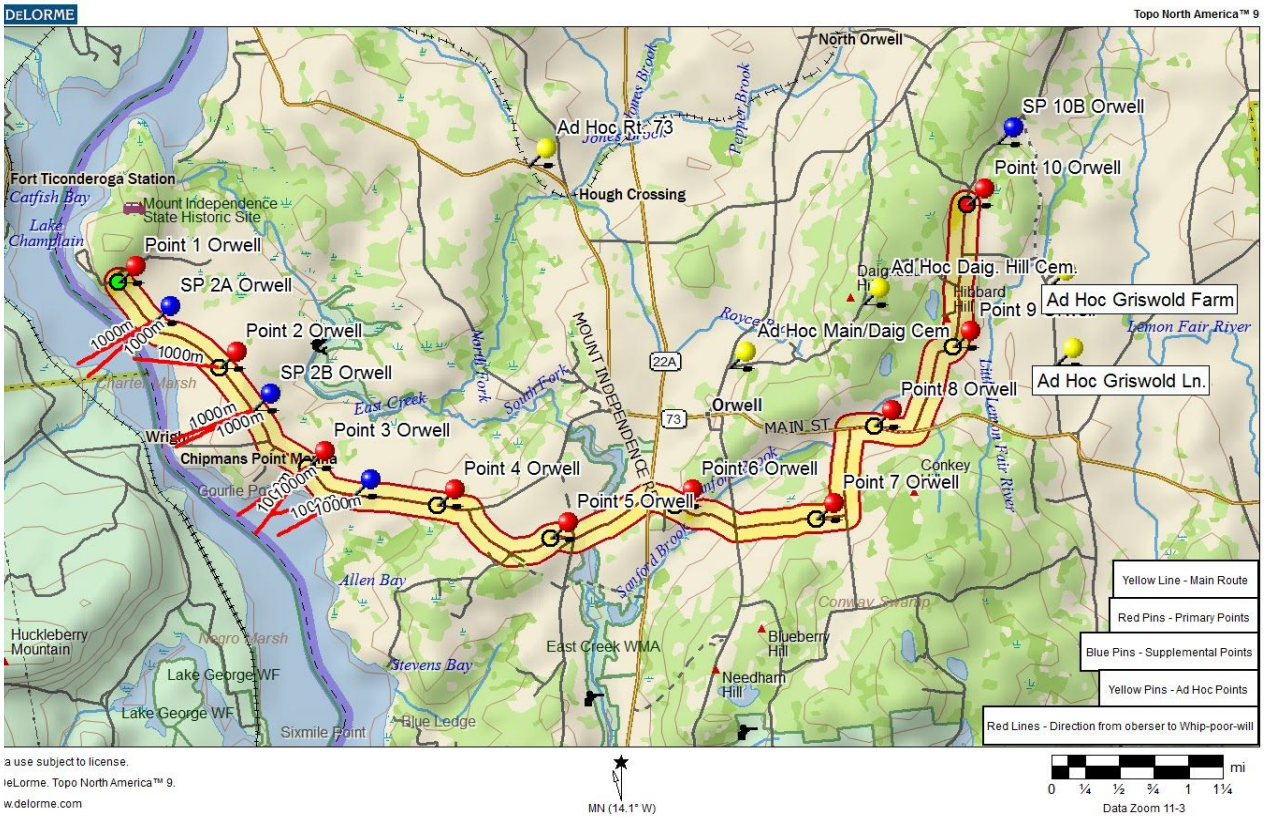


**Figure 4.** Points surveyed and WPWs detected, Ferrisburg route

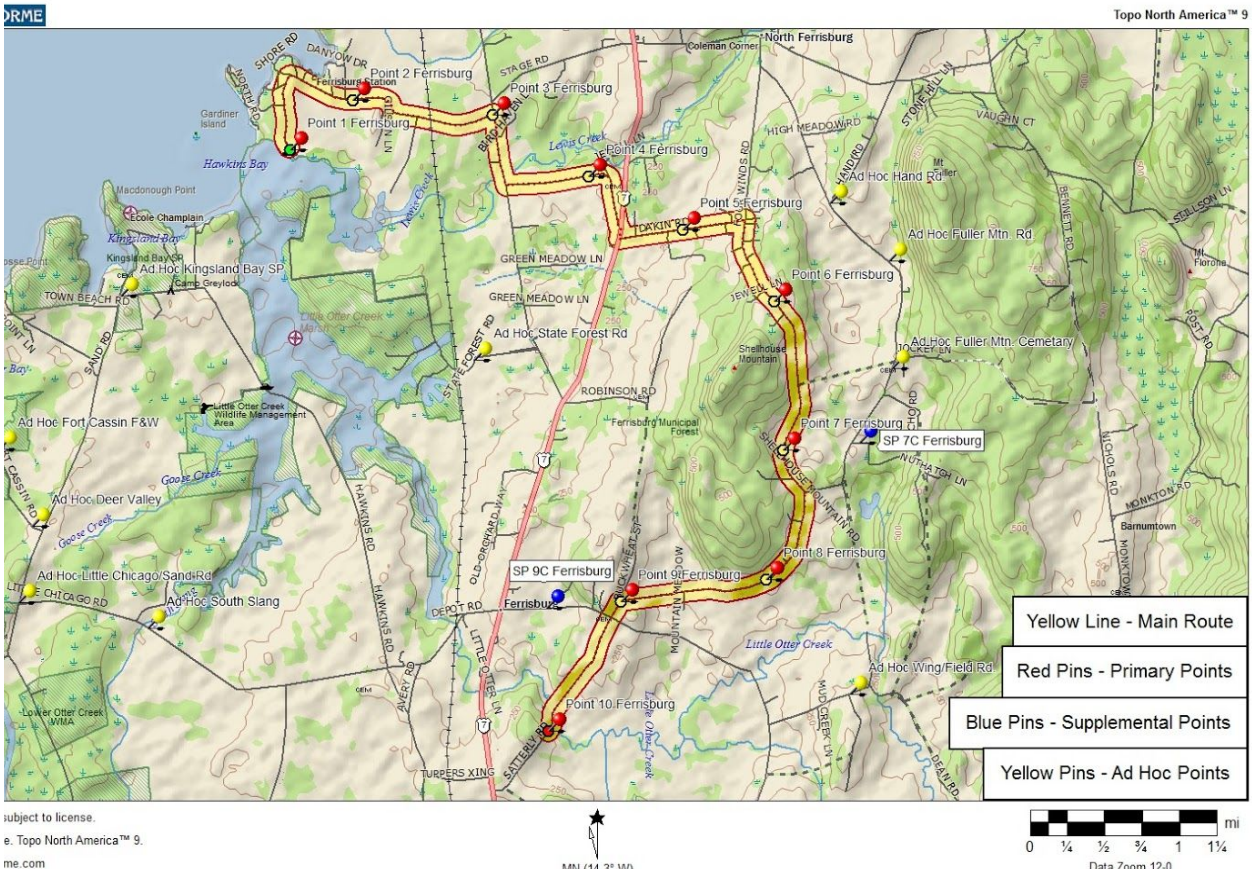


**Figure 5.** Points surveyed and WPW detected, Randolph route

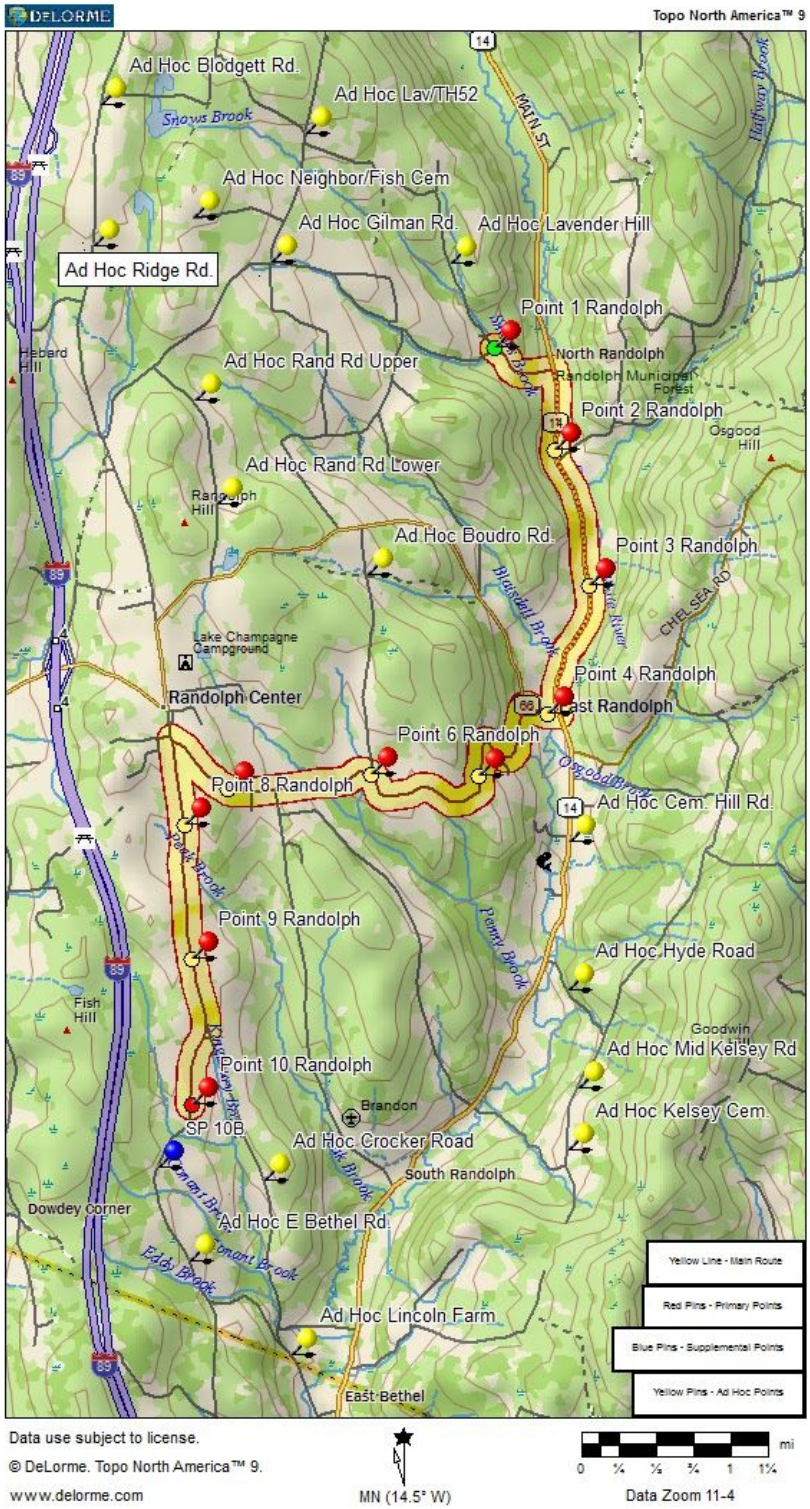
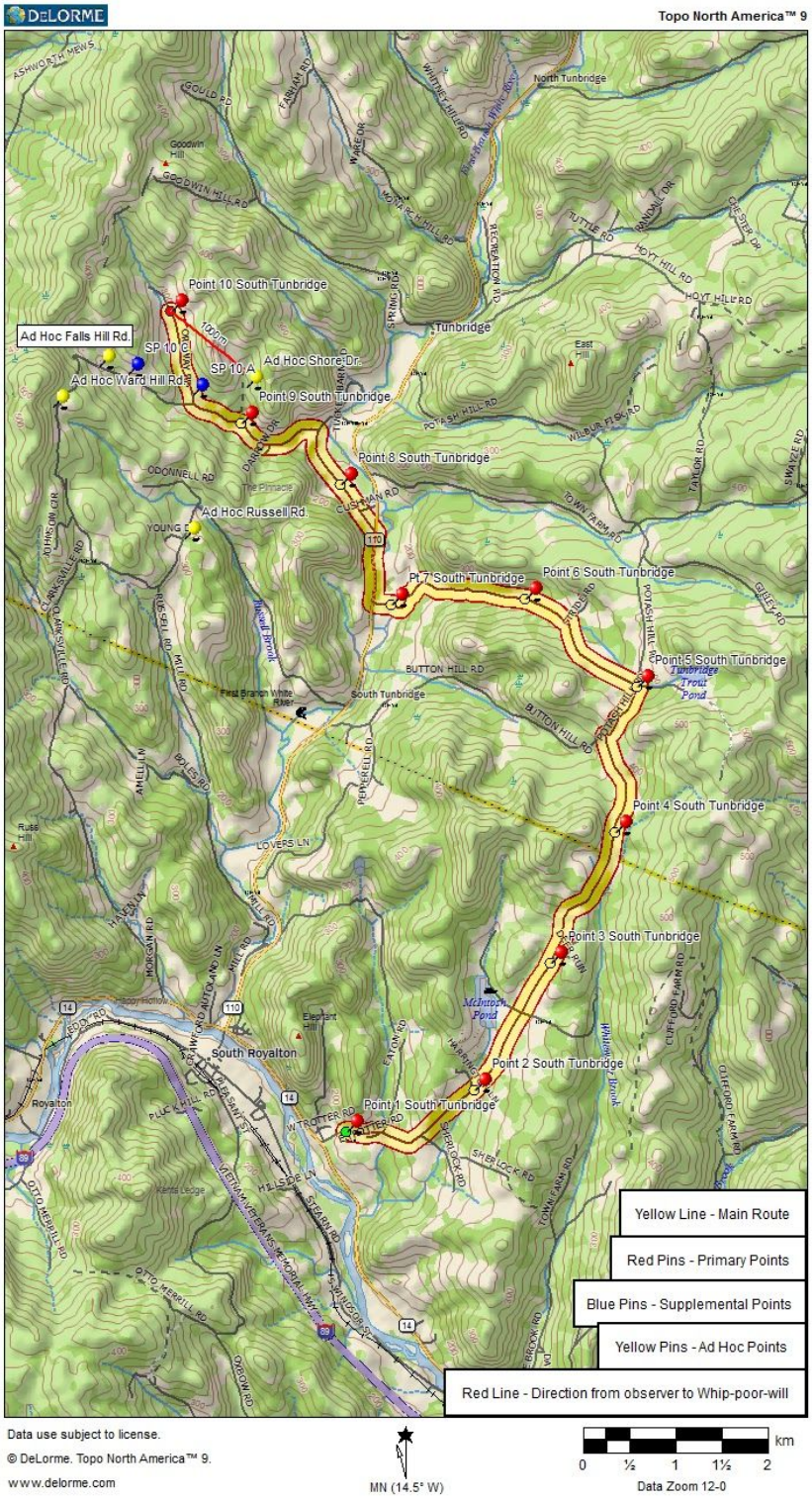


**Figure 6.** Points surveyed and WPWs detected, South Tunbridge route



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