

**DRAFT INTERIM REPORT**  
**SPRING RAPTOR MIGRATION SURVEYS**  
**Colebrook Wind Resource Area**  
**Litchfield County, Connecticut**

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NATURAL RESOURCES ♦ SCIENTIFIC SOLUTIONS

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## **INTRODUCTION**

Western EcoSystems Technology, Inc. (WEST) initiated surveys in June 2010 on behalf of BNE Energy Inc. (BNE) designed to assess bird and bat use and activity of the proposed Colebrook Wind Resource Area (CWRA) in Litchfield County, Connecticut. Bird and bat studies being completed at the CWRA include pre-construction spring and fall raptor migration surveys. The objective of the raptor migration surveys was to document numbers and species of diurnal raptors (including kites, accipiters, hawks, harriers, eagles, and falcons) and vultures migrating through the CWRA to use in evaluating the potential impact of the proposed wind-energy development to migrating raptors and vultures, and to determine the need for additional studies, if warranted. The spring raptor migration study commenced March 5, 2011 and will be completed on or before May 31, 2011. The Connecticut Siting Council (CSC) requested BNE provide interim results of spring raptor migration surveys during the month of May. The following interim report contains descriptions of methods used during the study as well as findings of surveys completed between March 5 - April 14, 2011. A final survey report will be provided following the completion of the study which will include results from the entire spring season.

## **STUDY AREA**

The proposed CWRA is located near the town of Colebrook, Connecticut, in northeastern Litchfield County (VHB 2010a; Figure 1). The CWRA is being permitted in two phases as Colebrook North and Colebrook South, which are located approximately eight km (five mi) northwest of the city of Winsted. The phases are located adjacent to one another and are comprised of similar vegetation composition and physiographic characteristics.

The CWRA lies within the Northwest Highlands region (Bell 1985), which is characterized by hard, metamorphic bedrock that has shaped the landscape into high, steeply sided plateaus, broad valleys, and rolling foothills. The Appalachian Mountains extend through Connecticut west of the study area. The CWRA is situated primarily along the top and side slopes of an unnamed hill capped with glacial till. It also includes a small part of the eastern slope of Flagg Hill, as well as a valley between the two hills. The CWRA is approximately 80 acres (0.13 square miles [mi<sup>2</sup>]) in size and elevation ranges from approximately 433 to 457 m (1,420 to 1,500 ft) above sea level. The region is primarily deciduous and coniferous forest, with pockets of residential development and agriculture occurring throughout the landscape. The majority of the study area is covered by secondary-growth upland forest, but also includes forested wetland associated with a manmade impoundment located on the western side of the property, and a larger forested wetland that primarily occurs off-site in the northwest corner of the property. Two intermittent watercourses also occur on-site. The forested portion of the CWRA is dominated by deciduous pole timber. The upland forest understory is relatively open, but where vegetated, is dominated by mountain laurel (*Kalmia angustifolia*). Saplings and shrubs of American beech

(*Fagus grandifolia*) and *Rubus* species occur as well. Rotting logs, old forest tracks, woody debris, and slash are abundant throughout the CWRA (VHB 2010a).

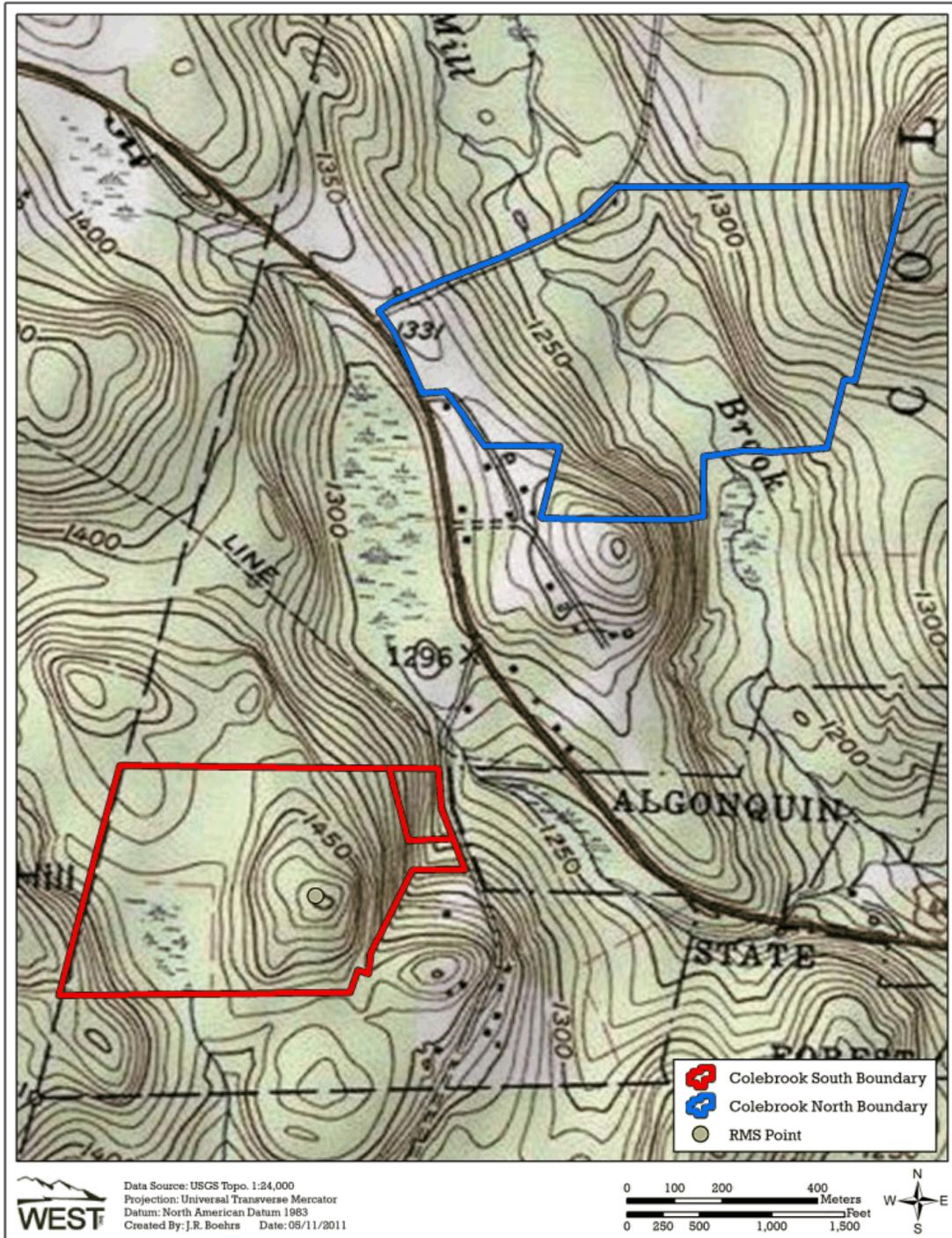


Figure 1. Location of the Colebrook Wind Resource Area and location of the raptor migration survey point (RMS Point).

## **METHODS**

### **Spring Raptor Migration Surveys**

#### *Survey Point*

One survey station was established within the east-central section of the Colebrook South phase of the CWRA (Figure 1). This location is a small forest clearing located atop a high point within the CWRA and is the site of the Project meteorological tower. The station was selected to provide good visual coverage of the surrounding area.

#### *Survey Methods*

Surveys were conducted according to methods used by the Hawk Migration Association of North America (HMANA) and Hawk Watch International (HWI) with observers continuously scanning overhead with binoculars for migrating raptors utilizing determined flight paths. The date, start and end time of the survey period, and weather information such as temperature, wind speed, wind direction, barometric pressure, percent cloud cover, precipitation, and maximum visibility estimates were recorded for each survey. Weather information was recorded every hour during the survey and measured using a Kestrel® 2500 pocket wind meter. Time of observation, species or best possible identification, number of individuals, age and sex (if possible), distance from observer, flight height, and flight direction were recorded for each observation.

#### *Observation Schedule*

Surveys were conducted approximately once per week from March 5 - April 14, 2011. Survey periods were at least six hours, from approximately 9:00 am to 5:00 pm to cover the peak period for observing migrating raptors. Surveys were attempted to be completed only on days when weather conditions were conducive to raptor migration (i.e. warm, clear, high pressure conditions).

### **Statistical Analysis**

#### *Quality Assurance and Quality Control*

Quality assurance and quality control (QA/QC) measures were implemented at all stages of the studies, including in the field, during data entry and analysis, and report writing. Following field surveys, field technicians were responsible for inspecting data forms for completeness, accuracy, and legibility. A sample of records from an electronic database was compared to the data forms and any errors detected were corrected. Irregular codes or data suspected as questionable were discussed with the field technician and project manager. Errors, omissions, or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes in all steps were made.

*Data Compilation and Storage*

A Microsoft® ACCESS database was developed to store, organize, and retrieve survey data. Data were keyed into the electronic database using a pre-defined format to facilitate subsequent QA/QC and data analysis. All data forms, field notebooks, and electronic data files were retained for reference.

*Species Diversity*

Species diversity was presented as the total number of unique species observed. A species list with the number of observations and the number of groups observed was generated.

**RESULTS**

A total of seven raptor migration surveys were completed over seven weeks between March 5 – April 14, 2011. Surveys were completed once per week for approximately eight hours per day. Results from these surveys are reported below, however, comprehensive analysis of these results will occur following completion of all seasonal surveys at the end of May and findings reported here should be considered preliminary.

A total of 22 species, as well as unidentified gull, comprising 447 individuals in 142 groups were observed (Table 1). A total of 76 diurnal raptors and 52 vultures were observed. The most common raptor species observed was broad-winged hawk (*Buteo platypterus*; 24 individuals), representing 31.5 % of raptors observed. The most common bird observed overall was turkey vulture (*Cathartes aura*; 50 individuals), representing 11.2 % of all birds recorded.

Observations of sensitive species for the sampling period are summarized in Table 2, which includes birds sighted during raptor migration surveys as well as birds identified incidentally. A total of 52 of the 447 individuals sighted during raptor migration surveys were sensitive species (11.6 %). A further two Common ravens (*Corvus corax*), a state species of special concern, were documented incidentally. Three federal species of concern were observed, however no federally listed threatened, endangered or candidate species were documented. Four state endangered species were observed as well as the state threatened American kestrel (*Falco sparverius*). The state-candidate broad-winged hawk was the most frequently observed sensitive species.

**Table 1. Total number of groups and individuals for each bird type and species during spring 2011 raptor migration surveys conducted March 5 – April 21, 2011 at the CWRA.**

| Species/Type           | Scientific Name          | Spring    |            |
|------------------------|--------------------------|-----------|------------|
|                        |                          | # grps    | # obs      |
| <b>Waterfowl</b>       |                          | <b>14</b> | <b>205</b> |
| Canada goose           | <i>Branta Canadensis</i> | 14        | 205        |
| <b>Gulls/Terns</b>     |                          | <b>4</b>  | <b>38</b>  |
| unidentified gull      |                          | 4         | 38         |
| <b>Diurnal Raptors</b> |                          | <b>65</b> | <b>75</b>  |

**Table 1. Total number of groups and individuals for each bird type and species during spring 2011 raptor migration surveys conducted March 5 – April 21, 2011 at the CWRA.**

| Species/Type            | Scientific Name                 | Spring     |            |
|-------------------------|---------------------------------|------------|------------|
|                         |                                 | # grps     | # obs      |
| <u>Accipiters</u>       |                                 | 10         | 10         |
| Cooper's hawk           | <i>Accipiter cooperii</i>       | 3          | 3          |
| sharp-shinned hawk      | <i>Accipiter striatus</i>       | 7          | 7          |
| <u>Buteos</u>           |                                 | 38         | 45         |
| broad-winged hawk       | <i>Buteo platypterus</i>        | 18         | 24         |
| red-shouldered hawk     | <i>Buteo lineatus</i>           | 7          | 7          |
| red-tailed hawk         | <i>Buteo jamaicensis</i>        | 13         | 14         |
| <u>Northern Harrier</u> |                                 | 2          | 2          |
| northern harrier        | <i>Circus cyaneus</i>           | 2          | 2          |
| <u>Eagles</u>           |                                 | 7          | 10         |
| bald eagle              | <i>Haliaeetus leucocephalus</i> | 3          | 5          |
| golden eagle            | <i>Aquila chrysaetos</i>        | 4          | 5          |
| <u>Falcons</u>          |                                 | 6          | 6          |
| American kestrel        | <i>Falco sparverius</i>         | 3          | 3          |
| Merlin                  | <i>Falco columbarius</i>        | 2          | 2          |
| peregrine falcon        | <i>Falco peregrines</i>         | 1          | 1          |
| <u>Osprey</u>           |                                 | 2          | 2          |
| Osprey                  | <i>Pandion haliaetus</i>        | 2          | 2          |
| <b>Vultures</b>         |                                 | <b>43</b>  | <b>52</b>  |
| black vulture           | <i>Coragyps atratus</i>         | 2          | 2          |
| turkey vulture          | <i>Cathartes aura</i>           | 41         | 50         |
| <b>Passerines</b>       |                                 | <b>16</b>  | <b>77</b>  |
| American crow           | <i>Corvus brachyrhynchos</i>    | 9          | 27         |
| American robin          | <i>Turdus migratorius</i>       | 1          | 3          |
| black-capped chickadee  | <i>Poecile atricapilla</i>      | 1          | 4          |
| blue jay                | <i>Cyanocitta cristata</i>      | 1          | 2          |
| common grackle          | <i>Quiscalus quiscula</i>       | 1          | 6          |
| common raven            | <i>Corvus corax</i>             | 2          | 5          |
| rusty blackbird         | <i>Euphagus carolinus</i>       | 1          | 30         |
| <b>Overall</b>          |                                 | <b>142</b> | <b>447</b> |

**Table 2. Summary of sensitive species observed at at the CWRA during raptor migration surveys (RMS) and incidental observation (INC); March 5 – April 21, 2011.**

| Species            | Scientific Name                 | Status | RMS       |           | INC       |          | Total     |           |
|--------------------|---------------------------------|--------|-----------|-----------|-----------|----------|-----------|-----------|
|                    |                                 |        | # of grps | # of obs  | # of grps | # of Obs | # of grps | # of obs  |
| common raven       | <i>Corvus corax</i>             | SSC    | 2         | 5         | 2         | 2        | 4         | 7         |
| sharp-shinned hawk | <i>Accipiter striatus</i>       | E      | 7         | 7         | 0         | 0        | 7         | 7         |
| bald eagle         | <i>Haliaeetus leucocephalus</i> | E, FSC | 3         | 5         | 0         | 0        | 3         | 5         |
| American kestrel   | <i>Falco sparverius</i>         | T      | 3         | 3         | 0         | 0        | 3         | 3         |
| northern harrier   | <i>Circus cyaneus</i>           | E      | 2         | 2         | 0         | 0        | 2         | 2         |
| peregrine falcon   | <i>Falco peregrines</i>         | E, FSC | 1         | 1         | 0         | 0        | 1         | 1         |
| broad-winged hawk  | <i>Buteo platypterus</i>        | SC     | 18        | 24        | 0         | 0        | 18        | 24        |
| golden eagle       | <i>Aquila chrysaetos</i>        | FSC    | 4         | 5         | 0         | 0        | 4         | 5         |
| <b>Total</b>       | <b>8 species</b>                |        | <b>40</b> | <b>52</b> | <b>2</b>  | <b>2</b> | <b>42</b> | <b>54</b> |

T= State Threatened Species; E= State Endangered Species; SSC= State Species of Concern; SC= State Candidate Species; FSC= Federal Species of Concern.

## DISCUSSION

The interim report presented basic findings from the first half of the spring migration season completed at the CWRA between March 5 – May 31, 2011. Findings presented herein included tabulation of species diversity for all birds, raptors and sensitive species recorded between March 5 – April 14. Sensitive species observations included those individuals sighted incidentally. The final spring raptor migration report will include additional analysis of species richness, mean use, frequency of occurrence, flight height, behavior and risk exposure.

Species richness will be calculated as the mean number of species observed per survey. Typically, mean use by species or bird type is calculated as the mean number of observations per survey within a certain distance of the survey point or station. For raptor migration studies, this is often reported as the mean number of raptors per observer hour within an unlimited view shed. These types of metrics allow standardized spatial and temporal comparisons as well as comparisons with other studies where similar data exist. Due to the unlimited view shed used in the surveys, the distribution of distances from the observer recorded in the field will be evaluated to determine the estimated percent of observations of birds passing through the study area. However, to allow a comparison with other bird survey types, the distance from observer will also be used to standardize observations to within 800 m. Percent composition is defined as the mean use as a proportion of the overall use for a particular subtype or species. Frequency of occurrence is defined as the percentage of total surveys in which a particular subtype or species was observed.

To calculate the potential risk of collision to a particular species, flight height at first observation will be used to estimate the percentage of birds flying within the zone of risk (ZOR) for a wind turbine with blades of 35-135 m above ground level (AGL). A relative index of collision

exposure ( $R$ ) will be calculated for bird species observed flying during the raptor migration surveys using the following formula:

$$R = A * Pf * Pt$$

Where  $A$  equals mean relative use for species  $i$  (large bird observations within 800 m, small birds within 100 m of the field technician) averaged across all surveys,  $Pf$  equals the proportion of all observations of species  $i$  where activity was recorded as flying (an index to the approximate percentage of time species  $i$  spends flying during the daylight period), and  $Pt$  equals the proportion of all initial flight height observations of species  $i$  within the ZOR.

The final survey report will include a comparison with raptor migration characteristics such as species composition and number of raptors observed per hour at the CWRA with hawk migration sites located in Connecticut.