

Deerfield Wind Black Bear Study

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Deerfield Wind Black Bear Study Overview

The Deerfield Wind Black Bear Study is an ongoing study to evaluate the impacts of an industrial wind facility on black bear habitat use and foraging behaviors. The study is the result of a condition imposed by the Vermont Public Service Board on Avangrid Renewables as part of their permit for the construction and operation of the Deerfield Wind Energy Project (DWEP). The DWEP is an industrial wind facility that exists within the Manchester Ranger District of the Green Mountain National Forest and is the first industrial wind facility on National Forest in the United States. The DWEP consists of 15 2.0 megawatt turbines with eight turbines placed on a ridge in the town of Searsburg (west ridge) and seven turbines placed on a roughly parallel ridge in the town of Readsboro (east ridge, Figure 1).

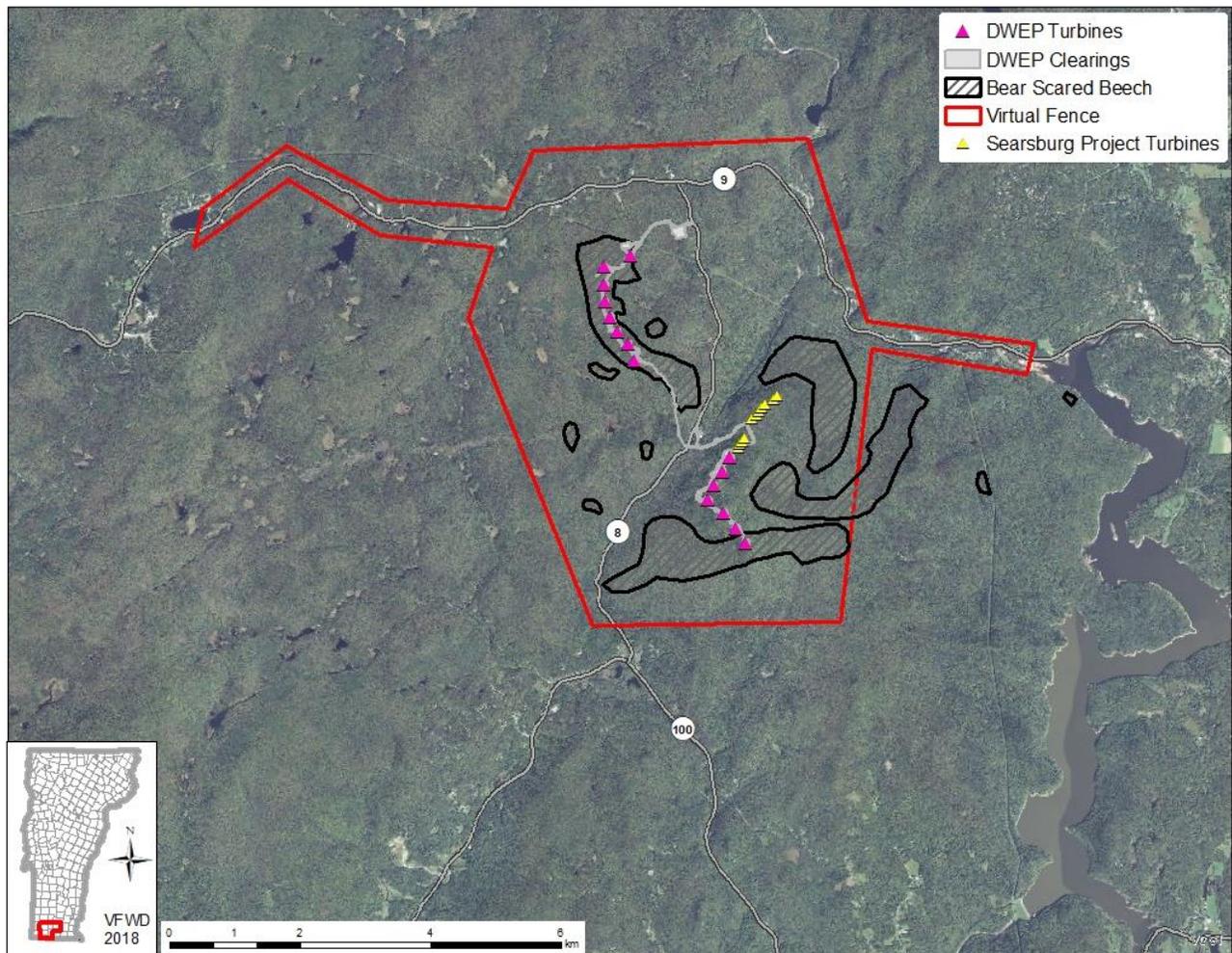


Figure 1. The Deerfield Wind Energy Project (DWEP) consists of 15 2.0 megawatt turbines (pink triangles) along two ridgelines in the Manchester District of the Green Mountain National Forest. Of concern to wildlife managers are the large concentrations of bear scarred beech (black polygons) within and adjacent to the wind facility. To understand the impacts the DWEP has on black bear use of this important foraging habitat a sample of black bears are fit with GPS satellite collars to collect movement and habitat use data. Collars are programmed with a virtual fence (red polygon) and will collect 1 location every 20 minutes within this area.

The impacts of wind energy projects on raptors, migratory birds, and bats have been documented, but potential impacts on large mammals such as black bears have not yet been explored. Of concern to wildlife managers in Vermont is the disturbance to stands of American beech trees on remote ridges that have a history of bear use. Bear use is identified by scarring on the trunks of beech trees as a result of repeated climbing by bears to access beechnuts; these stands are referred to as bear scarred beech (Figure 2). Immediately surrounding the DWEP are the largest known concentrations of bear scarred beech remaining in Vermont (Figure 1). Beechnuts are widely recognized as an important food source for black bear, white-tailed deer, American marten, fisher, wild turkey, ruffed grouse, many small mammals and passerine birds. It has been shown that beechnuts have roughly the same protein content as corn but five times the fat content and they have nearly twice the protein of acorns. In much of the Green Mountain National Forest beech is the predominant nut producing species and represents the major fall food source for bears. It has been documented that black bears show site fidelity to concentrations of beech trees, feeding from them year after year when nuts are abundant.



Figure 2. By climbing American beech trees to feed on beechnuts, black bears leave scars on the tree's thin bark. The Vermont Fish and Wildlife Department considers concentrations of bear scarred beech as an indicator of critical bear habitat.

In Vermont, precedent has been set to afford bear scarred beech concentrations legal protections under Vermont's Act 250 and 248. Through the 248-review process, the VFWD argued that the location of DWEP would have a negative impact on the regional black bear population; therefore, the VFWD recommended that the VT Public Service Board not grant Avangrid Renewables a permit for the wind facility at this location. However, arguments were made that construction and operation of DWEP would

not remove all the bear scarred beech and an adequate beechnut source would remain for black bears. Because no research has been done to evaluate the impacts of black bear habitat use and foraging behaviors in proximity to industrial wind development the VT Public Service Board required a study to evaluate what impacts DWEP has on the black bear population in this area. This study is referred to as the Deerfield Wind Black Bear Study.

The Deerfield Wind Black Bear Study objectives are:

1. Evaluate the movements and habitat use of black bears in response to the construction and operation of the DWEP
 - a. Determine the extent of indirect effects resulting from the project and quantify displacement distances if possible;
2. Evaluate the relationship between hard mast (beechnuts and acorns) availability and human-bear conflicts
 - a. Determine if there is a relationship between the amount of time bears use bear scarred beech habitat and human-bear conflicts;
3. Evaluate the behavioral response of black bears to the wind turbines activity levels.

Methods

To address these objectives, a target of 12-15 black bears are fit with GPS satellite collars to collect movement and habitat use data. Collars are programmed with a “virtual fence” that allows them to recognize when they are within a designated area surrounding the DWEP; collars collect 1 location every 20 minutes when the bear is within this area and they collect 1 location every 2 hours and 50 minutes outside this area (Figure 1).

In addition to the data collected by GPS collared bears, four permanent sampling plots have been established within proximity to the DWEP. Each plot contains 10 remote wildlife camera traps that are set during the fall and early spring – the time periods when bears rely on beechnuts. These sampling plots are used to help detect the presence and activity of bears around the DWEP.

Finally, beechnut and acorn surveys are conducted each fall across a sample of beech and oak stands within the study area. These surveys allow researchers to quantify the availability of these important hard mast foods each year and then evaluate habitat use, activity, and movements in relation to natural food availability.

Data will be collected in three phases: a pre-construction phase which will serve as a baseline understanding of how bears use the DWEP area without the wind facility, a construction phase, and a post operation phase (Figure 3). At least one good beechnut production year needs to occur during each phase of the study so that black bear use of the bear scarred beech concentrations can be compared across each phase of the study to determine potential impacts of construction and operation of the wind facility. Construction of the DWEP began in September of 2016 and concluded early in 2018. The wind facility began operation in the spring of 2018 (Figure 3). Data was collected for five years during the pre-construction phase, one and a half years during the construction phase, and it is anticipated that data will be collected for three years during the post operation phase.

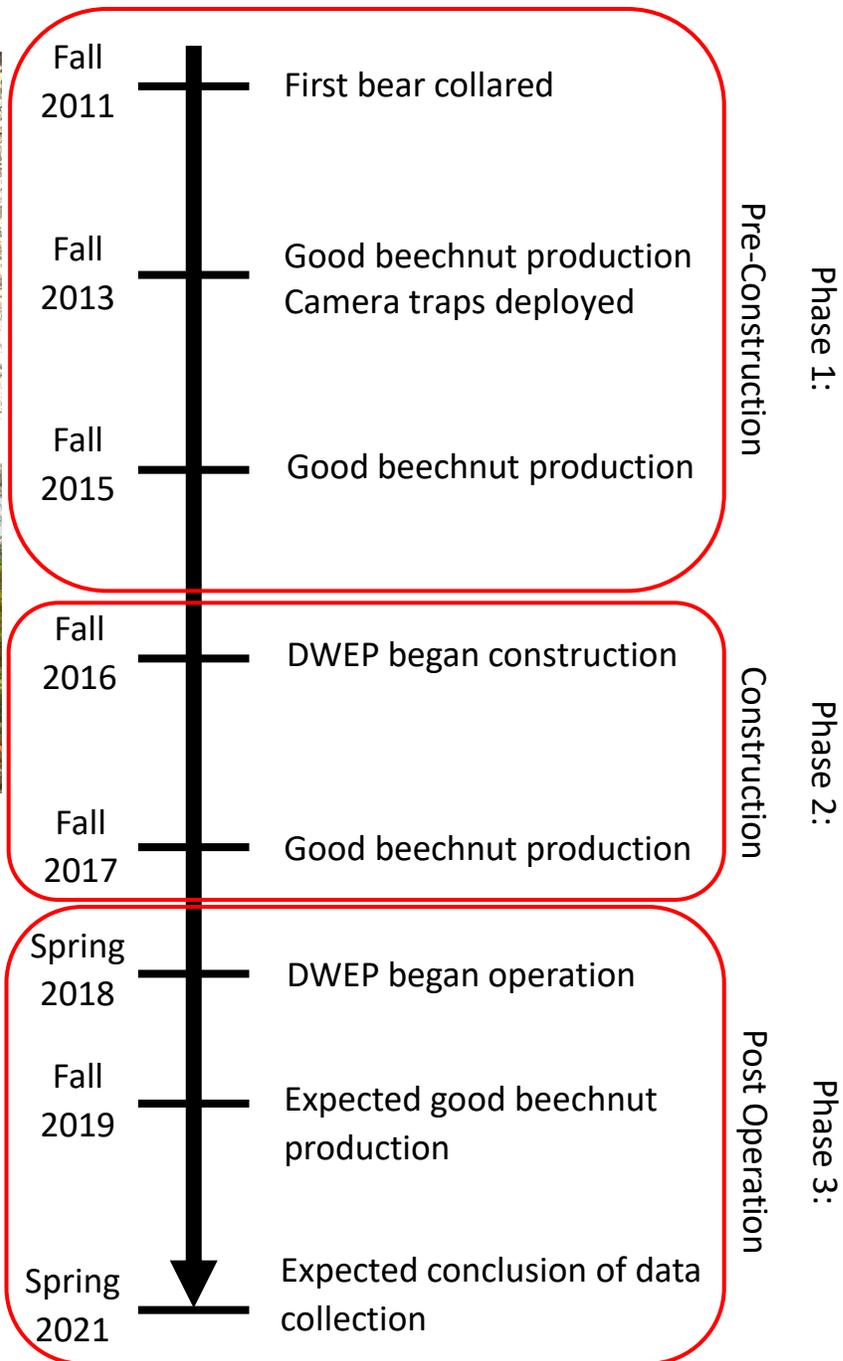


Figure 2. Deerfield Wind Black Bear Study timeline. The study consists of three stages: pre-construction of the DWEP, construction of the DWEP, and post operation of the DWEP. Telemetry, camera trap, and mast production data will be collected during all three phases. Beechnut production will be evaluated each fall - at least one good beechnut production season must occur in each phase of the study. At the conclusion of the study analysis will be done to determine the impacts of the construction and operation of the DWEP on black bear use of the bear scarred beech stands and surrounding habitats.

Telemetry Data

The first bear was fit with a GPS satellite collar in the fall of 2011 and since the spring of 2012 a target of 12-15 bears are collared per year. Efforts are made to keep the same individuals collared throughout the length of the study; however, due to bears pulling off collars (16), collar malfunctions (9), mortality from hunting (8), researchers removing collars (5), mortality from human-bear conflicts (3), and vehicle collisions (2) new animals are collared each year. A total of 43 unique bears have been collared, 30 males and 13 females, with an average of 10 bears collared per year. Well over 150,000 bear GPS locations have been collected for a total of 15,757 days. Study bears have worn GPS collars for an average of 375 days with a range of 10 – 1,463 days (2011 – 2018).

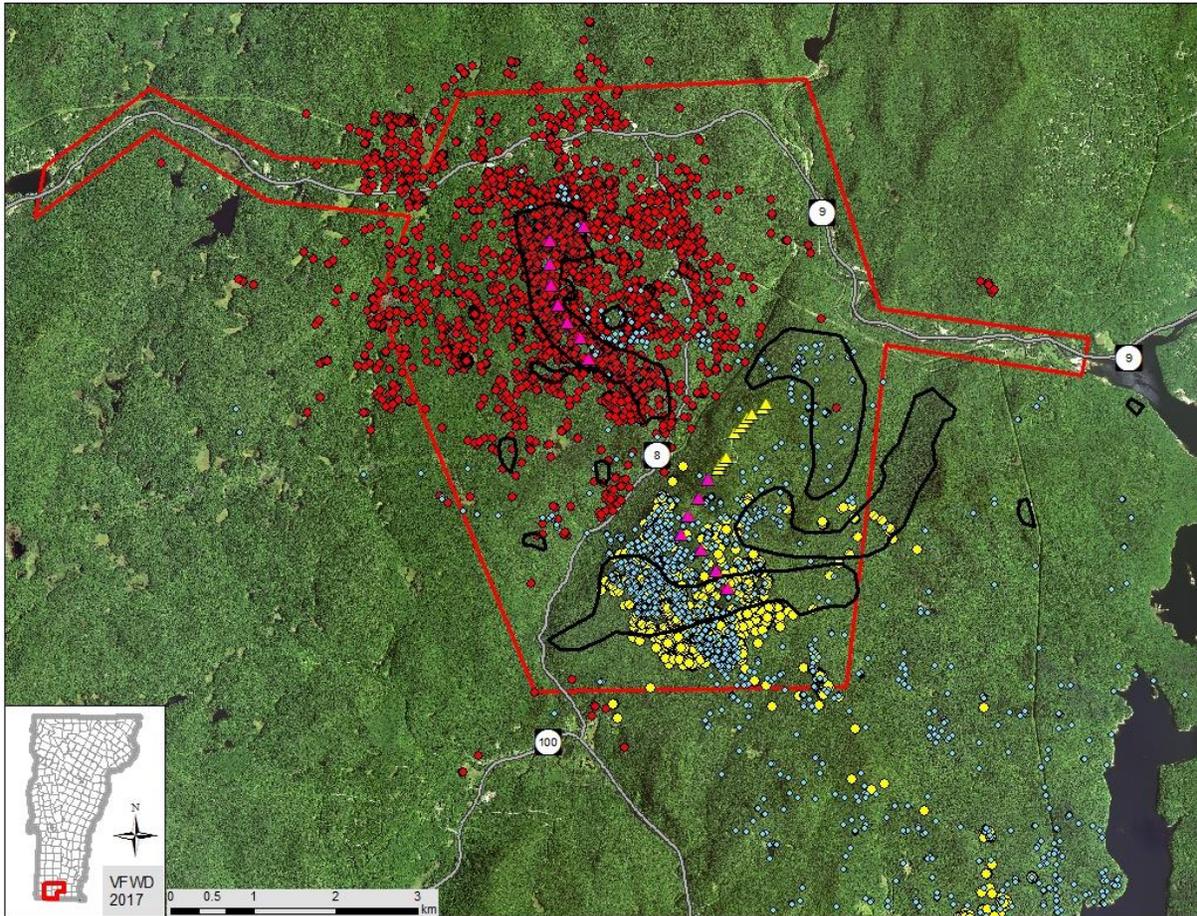


Figure 3. Locations of three study bears during 2015 near the future Deerfield Wind Energy Project (pink triangles). The red circles and yellow circles represent the locations of two different female bears and the blue circles are the locations of a male bear. The black polygons are mapped stands of bear scarred beech concentrations. The red polygon is the virtual fence – collars within the fence collect 1 location every 20 minutes. Beechnut production was good in 2015 and collared bears spent a lot of time in the fall and following April in the bear-scarred beech concentrations. Construction of the wind facility did not begin until the fall of 2016.

Although habitat use analyses has yet to be performed, 29 black bears (18 males and 7 females) have been documented within the bear scarred beech concentrations associated with the DWEP (2011 – 2018). Bears with home range cores that overlap with these beech concentrations have been documented within these features throughout the year; however, there has been a noticeable increase in bear activity during the fall and early spring months when beechnut production is fair-good (Figure 4). Additionally, during the pre-construction phase in the fall of 2015 when beechnut production was good a female was documented leaving her core home range, centered around the Atherton Meadows Wildlife Management Area, and traveling roughly 7.5 km northwest to the southern bear scarred beech concentration on the east ridge. She spent approximately two months on the east ridge, presumably foraging on beechnuts, before returning to her home range core in mid-November to den for the winter. The following spring, she returned to the east ridge for and spent approximately one month in the bear scarred beech concentrations (Figure 4).

Monitoring the daily movements of the study animals has allowed documentation of the use of different seasonal feeding habitats, travel corridors and road crossing areas associated with Routes 8, 9 and 100. Further, these movements have provided insight into a number of human-bear conflicts including the locations of illegal feeding sites by some members of the public, study animals feeding on garbage, and bears traveling to feed on corn. Interesting observations include study animal use of the Atherton Meadows Wildlife Management Area; the heavy use of power line corridors and a tornado damaged swath of forest in the George Aiken Wilderness by bears seeking soft mast; movements away from the study area during the fall of 2012, 2014, and 2018 when natural foods were scarce; and the early spring use of beech stands following years of beech nut abundance. Many of the bears collared in this study area have spent time outside of Vermont. In total, 28 bears (19 males and 9 females) have spent time in Massachusetts and 8 (all males) have spent time in New York. Only 10 bears (6 males and 4 females) have not been documented outside of Vermont; all but one of these 3 were collared for less than 12 months. The documented use of habitat outside of Vermont suggests the bear population in this study area is potentially impacted by management activities occurring outside of Vermont.

Activity and Behavior at Camera Traps

In late September 2015, four plots with 10 camera traps each were established to monitor black bear presence and activity near the DWEP. Two plots were established within bear scarred beech concentrations: one near the west ridge (Plot 1) and the other near the east ridge (Plot 2). Additionally, two plots were established in areas outside bear scarred beech concentrations; one near the west ridge (Plot 3) and the other near the east ridge (Plot 4). Plot locations were selected to maximize the likelihood of detecting bears. Selections were based on a combination of telemetry locations from collared bears and sign of black bear use observed while in the field.

Within each plot cameras are aimed at foraging sites (i.e. bear scarred beech trees), wildlife trails, and openings. The location and direction of each camera was marked and recorded so that cameras are deployed consistently over time. Additionally, each camera is assigned a unique identification number that will be associated with the location over the life of the study. Cameras are programmed to take a burst of 3 photographs per trigger event with a 10 second rest period between events. Cameras are set during a fall sampling period (October 1st – December 31st) and spring sampling period (April 1st – May 31st). These sampling periods were selected to target black bear use of the DWEP area during months

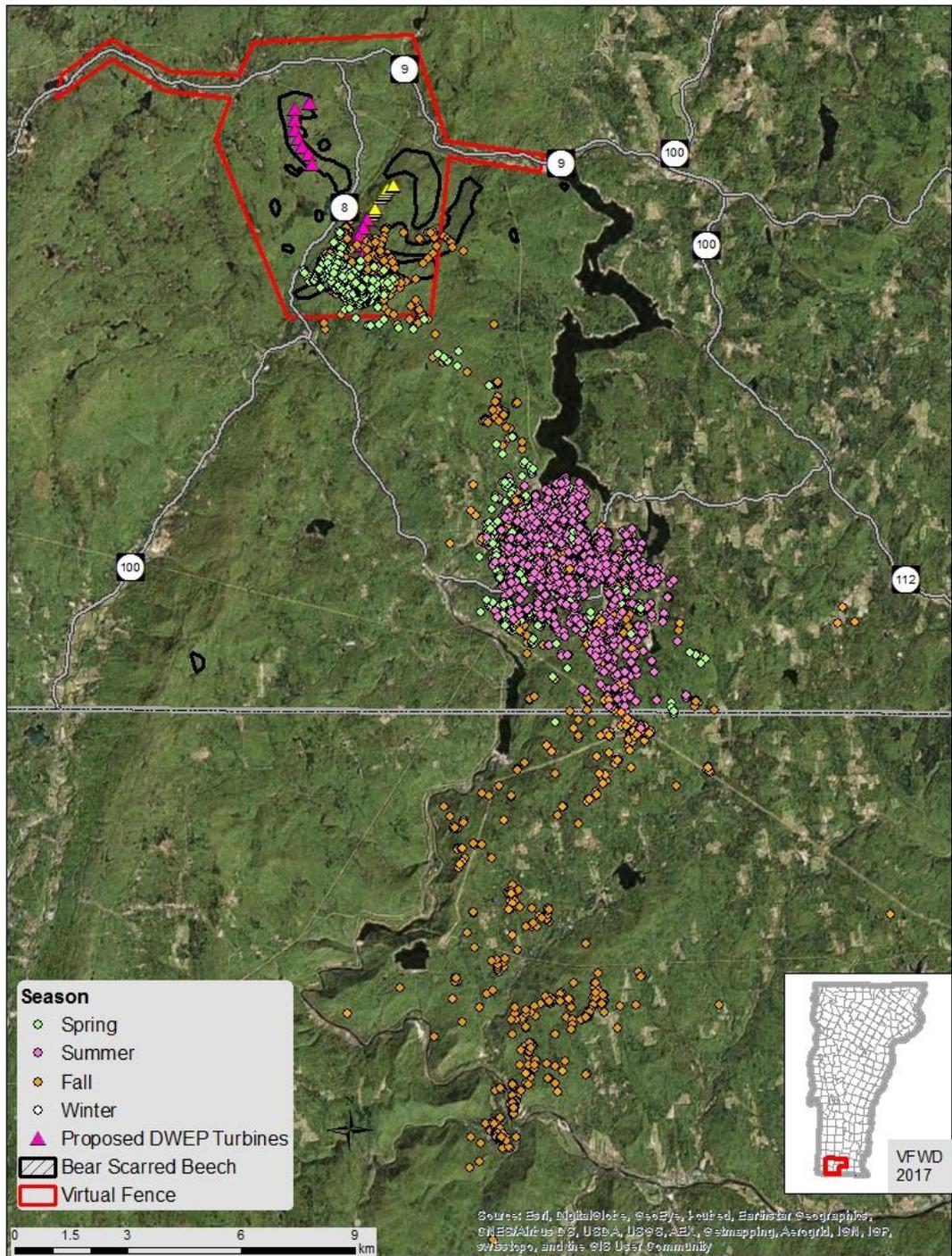


Figure 4. The locations of F32, summer 2014 through fall 2016 – pre-construction phase. Green circles represent spring-time locations, pink circles represent summer-time locations, and orange circles represent fall-time locations. During the fall of 2015 and spring 2016 when beechnut availability was good, F32 traveled northwest to the bear scarred beech concentrations on the east ridge of the future DWEF. In years when beechnut availability was poor she traveled south during the fall to areas where acorns were more plentiful.

when beechnuts could be available. All photograph data is managed and tagged using CPW Photo Warehouse, which is a Microsoft Access based database designed by Colorado Parks and Wildlife specifically for wildlife camera data. All photographs are tagged and stored based on their location, date, time, and species detected.

Camera traps have been deployed for 7 sampling periods: fall 2015, spring 2016, fall 2016, spring 2017, fall 2017, spring 2018, and fall 2018. Beechnut production was good during the fall 2015 and fall 2017 sampling periods. During good beechnut production events nuts are still available on the landscape the following spring therefore, the spring 2016 and spring 2018 sampling periods are also classified as good beechnut production. Camera traps were deployed for only one good beechnut production season in the pre-construction phase of the study.

At this time camera trap data has only been summarized for the fall 2015 through spring 2017 sampling periods; however, during this period 16,403 photographs have been collected of wildlife. The most frequently detected species is white-tailed deer followed by black bears and moose (Table 1). A total of 2,714 photographs of black bears have been collected; 1,776 photographs were collected in the bear scarred beech plots and 938 were collected in the non-bear scarred beech plots. During the good beechnut production season of fall 2015/spring 2016 2,470 photographs of bears were collected while only 244 photographs of bears were collected during the poor production season of fall 2016/spring 2017; however, this poor beechnut season overlapped entirely with the construction phase of the DWEP. Analysis of future sampling periods may provide more insight into the role the construction phase had on wildlife use of these mast production sites.

Table 1. The number of photographs of the most commonly detected species activity survey plots, fall 2015 – spring 2017 sampling periods. White-tailed deer, black bears, and moose are the most commonly photographed species. These numbers represent the raw number of photographs not the number of detections.

Species	Plot 1	Plot 2	Plot 3	Plot 4	Total
Deer	2155	1904	3162	2556	9777
Black Bear	393	1383	275	663	2714
Moose	59	40	388	669	1156
Snowshoe Hare	22	82	147	209	460
Coyote	133	37	129	131	430
Wild Turkey	178	0	81	21	280
Porcupine	0	89	6	38	133
Bobcat	0	15	9	65	89
Raccoon	26	41	19	3	89
Ruffed Grouse	3	26	11	40	80
Fisher	26	21	11	9	67

Efforts Continue

GPS collars and camera traps will continue to collect data regarding black bear use of the bear scarred beech concentrations and surrounding habitats through 2020. In order to evaluate potential impacts of the DWEP on black bear habitat use it is important to assess black bear use of the bear scarred beech stands now that the DWEP is in operation. It is key to make these assessments when beechnut production is good. Based on the beechnut production cycle documented in the study area thus far, beechnut production is expected to be fair – good during the fall of 2019. If this occurs, collars will be removed from bears in March of 2021 while in their winter dens. If beechnut production is poor in 2019 data collection will extend through 2021. Due to their lower cost and non-invasive nature, camera traps will likely be used to monitor black bear activity within the DWEP beyond 2021. This data will help researchers monitor the long-term relationship between the DWEP and wildlife use of the bear scarred beech concentrations.