

**THE STATUS AND HABITAT OF THE RUSTY BLACKBIRD
IN CALEDONIA AND ESSEX COUNTIES**

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A cooperative project with the
Nongame & Natural Heritage Program,
Vermont Fish & Wildlife Department

ABSTRACT

I surveyed populations of the Rusty Blackbird (*Euphagus carolinus*) in Caledonia and Essex Counties, Vermont from May to June 1990. Rusty Blackbirds were found in 16 blocks of 25 km², with 11 cases of confirmed breeding including five active nests. I estimated the population to be between 25 and 45 pairs in 1990. Comparison of 1990 results with the results of the Vermont atlas project conducted 1977-1981 suggested a 4% population decline. I measured Rusty Blackbird habitat and habitat in sites not occupied by blackbirds in 1990. I analyzed these data with principal components analysis (PCA) and discriminant function analysis (DFA). Much of the variance (32.8%) in the data was explained by the first principal component which was associated with coniferous saplings and thick foliage from 2 to 4 m. DFA results correctly classified 75% of plots. Rusty Blackbird habitat plots were characterized by large numbers of small conifers, and dense foliage from 2 to 4 m. Nest sites tended to have more small balsam fir (*Abies balsamea*) and less spruce (*Picea* spp.) and alder (*Alnus rugosa*) than plots where adults fed fledglings. I did not measure foraging habitat but general observations suggest that clear, shallow water is necessary for successful feeding because Rusty Blackbirds fed on the larvae of aquatic insects. I observed possible competition between Rusty Blackbird and Red-winged Blackbird (*Agelaius phoeniceus*). I also recorded observations on the nesting biology of the Rusty Blackbird in Vermont.

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As early as 1884, the St. Johnsbury naturalist Hiram Cutting listed the Rusty Blackbird (*Euphagus carolinensis*) as a breeding bird in Vermont, although he considered it uncommon. From 1914-1916 F.H. Kennard (1920) located five nests in an unspecified part of Essex County. Fortner et al. (1933) referred to the species as a rare breeder without clearly indicating its range in Vermont. The earliest definite confirmation of nesting from the southern Green Mountains was a nest with young found by L.H. Ross in Woodford in June of 1951 (unpublished notes). Rusty Blackbirds were recorded in 27 priority and 19 non-priority blocks during the Vermont Atlas project from 1977-1981 (Nichols 1985). Vermont is at the southern edge of the species' broad boreal breeding distribution in North America (AOU 1983). The biology of this species is relatively little known. There has been only one paper published on its natural history (Kennard 1920). All other information on the Rusty Blackbird is found in more general literature (Peck and James 1987, Bent 1958, Orians 1985).

The Atlas of Breeding Birds of Vermont (Nichols 1985) shows two major centers of breeding in Vermont, one in the northeastern part of the state, mostly in Essex and Caledonia Counties, and another in the southern Green Mountains in Windham and Bennington Counties. There were several other scattered atlas reports, largely from the Green Mountain chain and its eastern front ranges. The species may have been overlooked in some atlas blocks in Orleans County where there were few reports.

In 1978 Vermont observers noted declines in the nesting population of

Rusty Blackbirds in some well known nesting areas. None were found in Winhall and only 1 male was reported from the Island Pond area (Records of Vt. Birds 1978, RVB hereafter). By 1980 the species had apparently disappeared from all Island Pond nesting localities (RVB 1980). Some observers in Vermont now believe the Rusty Blackbird has undergone a serious decline here (G.F. Oatman, pers. commun.). Independent evidence of a decline in the species is not obvious. USFWS Breeding Bird Survey data are too sparse to detect a decline (Robbins et al. 1986). Migration peaks in eastern Massachusetts appear to have declined, from a high of 1500 in 1940 to one of 300 in 1981 (Griscom 1949, Walton 1984). Because the species has never been considered anything more than uncommon as a nester in Vermont, it is unclear whether the current perception of a decline is correct and if the current scarcity of the bird in Vermont is due to a normal fluctuation in the species' population. It is clearly important to have an inventory of the Rusty Blackbird from northeastern Vermont to determine what the species' current population and to compare its current distribution to that of 1977-1981. I surveyed Caledonia and Essex Counties from 21 April to 18 June 1990 to determine the Rusty Blackbird's current status in its stronghold in northeastern Vermont.

Vermont's Rusty Blackbird population has apparently always been small (Fortner et al. 1933, Nichols 1985). This study provides key information on the species' status in the Northeast Kingdom. It is important to have a thorough knowledge of where the species occurs and of the character of its habitat. The Rusty Blackbird remains uncommon in northeastern Vermont and requires continued monitoring. I have proposed a habitat model which should prove useful in future inventories and provide a basis for future management decisions.

METHODS

Study area and coverage - I chose to conduct this Rusty Blackbird survey in Caledonia and Essex Counties because these counties had the largest number of breeding season records during the Vermont atlas project and because this population is more nearly contiguous with boreal Canadian populations than the isolated population in the southern Green Mountains. I excluded Orleans County, which probably has a significant population of Rusty Blackbirds, for two reasons. First, there were few reports of this blackbird in Orleans County during the atlas project making extensive remedial surveying necessary, and, second, time constraints imposed by the rapidity of the breeding season would have made the entire study less successful if I had expanded its geographic scope.

I established the following priorities for the survey of habitat in Caledonia and Essex Counties. Highest priority was given to coverage of atlas blocks which had records of Rusty Blackbirds. Second in importance was covering atlas blocks given priority coverage during the Vermont atlas project (Laughlin and Kibbe 1985). Priority blocks which appeared to have little suitable habitat on USGS topographic maps or which were difficult to enter were considered less important. Other areas of apparently suitable habitat indicated by topographic maps were given less priority. These areas usually received coverage only if they were adjacent to or near priority blocks. I entered 87.5% of blocks with records of Rusty Blackbird (14/16) and 88% of the atlas priority blocks in Caledonia and Essex Counties (22/25). Table 1 lists the 1977-1981 atlas blocks and blocks entered in 1990, indicates the presence or absence of blackbirds, and presents comments on 1990 coverage and atlas

status of blackbirds in most blocks. I spent a total of 17 days in the field surveying Rusty Blackbird populations from 21 April to 18 June 1990.

Survey techniques and natural history observations - Areas of presumably suitable habitat were located by inspection of topographic maps. I chose areas to survey by searching for the following symbols on USGS maps 1) wetlands, 2) bodies of water, and 3) meandering streams. Recent beaver ponds were unlikely to be found by using maps, especially early in the season when I only had access to older 15 minute USGS maps.

I recorded several repetitions of a burst of Rusty Blackbird song from the Cornell Laboratory of Ornithology's Field Guide to Eastern Bird Songs published by Houghton Mifflin Company. Tape playbacks proved effective as a survey method. Playbacks were used regularly from 22 May onward.

I recorded observations of Rusty Blackbirds including all natural history observations in a field notebook. Nests were located by observing the behavior of pairs. Fledglings were also noisy when they were fed. Breeding status codes used on the range map (Figure 3) were derived from breeding bird atlas terminology (Laughlin et al. 1982). Personal contacts with other observers added one nest, as well as several sightings of Rusty Blackbirds to the survey effort.

Selection of habitat plots and measurement techniques - I established two types of Rusty Blackbird habitat plot. Ten plots were in occupied habitat and 10 sites were not occupied by Rusty Blackbirds in the 1990 nesting season. Five nesting habitat plots were centered on nest sites and five others were placed in vegetation where adult Rusty Blackbirds were seen feeding less-than-10-day-old fledglings. Fledgling plots were centered on a small conifer to maintain uniformity with nest plot sampling. A single fledgling site where

a nest was subsequently found was centered on the nest tree. Because one fledgling site had no conifers, I chose a snag as the center of the plot, because adults perched on snags or tall trees before delivering food to juveniles.

The 10 unoccupied sites were located in habitats similar to sites that were occupied by the blackbirds. Lack of response to tape playback or sightings of Rusty Blackbirds during May and June were the primary reasons for selection of unoccupied sites. I centered plots in unoccupied sites on a small conifer. I also attempted to cover a wide geographic area when I selected non-rusty plots. Figure 1 shows the locations of habitat plots and unoccupied plots.

I used a modified version of James and Shugart's (1970) method of habitat measurement. A circle of 11.28 m radius encompassing an area of 0.04 ha was established at the predetermined central point. Transects were established through the center of each plot in the cardinal compass directions. Several measurements were taken on these transects. Canopy and ground cover were estimated by viewing along a pointer held skyward and below chest level at five points along the transects in each compass direction. When a registration was made a further annotation indicated when the hit was in coniferous foliage. Registrations were also sub-divided by estimated height classes. From 0 to 4 m strata were estimated at half meter intervals. Above 4 m heights were estimated at larger intervals (see Figure 2). All hits in canopy and ground cover were identified to species or to the lowest taxonomic category identifiable (e.g. *Carex*, moss). In James and Shugart's method shrubs are defined in terms of habitat structure and include sapling trees as well as plants with a shrub life-form. Shrub density was estimated

by counting all shrubs 1.5 m tall within arm's length of the two transects. All shrubs were identified to species. All trees, defined as woody vegetation with diameter equal to or greater than 7.5 cm, were measured at a height of 1.5 m with a diameter tape and identified. I also measured snags 7.5 cm and greater in diameter at 1.5 m and identified them to species if they were not too decayed. Canopy height was estimated by selecting the tallest tree in each quadrant and estimating its height. A water sample was collected on the plot or from the nearest standing water to it. The pH of water samples was measured within 72 hours with a pH meter. Figure 2 illustrates the habitat data form I used in this study.

All 20 plots were measured from 29 June to 28 July 1990. The vegetation on plots must have differed from vegetation structure when Rusty Blackbirds selected habitat during April. In particular, herbaceous vegetation was much taller with higher cover values in July than in April. Other habitat variables should have been similar, although leaves would not have been present on deciduous species and pH probably varies seasonally.

Statistical methods - I analyzed my survey results in atlas project priority blocks against atlas project results from 1977-1981 by devising a scoring system graded by level of breeding confirmation in the block and the status of Rusty Blackbird in neighboring non-priority blocks. I assigned three points to blocks with confirmed breeding, two points to blocks with evidence of probable breeding or confirmations in neighboring blocks, and a score of one to blocks with possible breeding or with probable breeding in a neighboring block. I then calculated the percent change in the accumulated scores between the atlas project results and the results of my 1990 survey.

I summarized the raw data from habitat and unoccupied plots for 19

habitat variables. Eleven of these described vegetation structure, seven were floristic variables (e.g. frequency of alder), and one was a physical variable (pH). Table 2 shows abbreviations of variables and summarizes the mean values and standard deviations of these variables for each plot type. I used principal components analysis (Gauch 1982) to reduce the dimensionality of my data to a few component factors. This method allowed me to identify those variables which most influenced the variance of the data. I then selected these influential variables and used them to execute a discriminant function analysis to identify variables discriminating between plot types and to produce a post hoc classification of plots. The small sample size used and possible violations of the assumptions of the discriminant model (Morrison 1984, Williams 1981) require cautious interpretation and qualified acceptance of any conclusions drawn from my analysis. All statistical analyses of habitat variables were done with SYSTAT v. 4.0 statistics software (Wilkinson 1988).

RESULTS

Population survey - Five of the 31 blocks targeted for survey were not entered in 1990. Priority blocks that were not surveyed included blocks in Ferdinand (Seneca Mt.), Maidstone (Cutler Mill Brook), Guildhall, and Kirby. The first two were not surveyed because of difficulty of access and time constraints. The Guildhall and Kirby blocks were not entered because of time limitations and lack of promising habitat on topographic maps. Only one of these blocks, Cutler Mill Brook, had an atlas project report of Rusty Blackbird. I recorded Rusty Blackbird in 1990 at the eastern boundary of this

block in the adjacent non-priority block. Only one non-priority block with a Rusty Blackbird report in 1977-1981 was not surveyed. This was the Holland Pond block which lies largely in Orleans County.

I recorded Rusty Blackbirds in a total of seven priority blocks including three which had no record in 1977-1981. Blackbirds were also recorded in an additional nine non-priority blocks, bringing the 1990 total to 16 blocks with records of the species. Table 1 lists the blocks with Rusty Blackbird reports in both survey periods. Figure 3 illustrates the distribution and breeding status of Rusty Blackbirds in 1977-1981 and 1990. Rusty Blackbirds were recorded in 11 priority blocks during 1977-1981, but six of these reports were of possible breeding, the weakest and most error-prone of atlas codes. Blackbirds were recorded in an additional four non-priority blocks, raising the total number of reports for 1977-1981 to 15 blocks. The results of scoring atlas and 1990 survey data weighted by level of breeding evidence produced a score of 23 points for 1977-1981 and 22 points for 1990. The 4% decline in score is probably not a significant change between atlas project and 1990 survey results.

Direct counts of Rusty Blackbirds during the 1990 survey allowed me to develop a rough estimate of the blackbird population in survey blocks. My minimum estimate of the adult Rusty Blackbird population in Caledonia and Essex Counties is 45 to 50 birds (ca. 25 pairs). I presume that there were at least a few other pairs in areas I did not survey. I estimate that there were between 10 and 20 additional pairs in the two counties providing an estimated maximum population of 65 to 90 birds. This population appeared to be concentrated in east central and northeastern Essex County. The largest numbers of blackbirds were found in Lewis, Averill, Ferdinand (especially

Ferdinand Bog), and Maidstone. These four towns accounted for 79% (37/47) of all Rusty Blackbirds recorded in 1990.

Phenology and natural history - I located six Rusty Blackbird nests during the 1990 field season, five during my surveys, and one found and reported by D. L. Cargill and B. Butler. Three nests found during incubation were located on dates ranging from 23 May to 17 June. Two nests with young were found on 27 May. Extrapolations using the incubation period of 14 days suggest that four of the nests contained fresh clutches between 10 and 14 May. The nest found on 17 June was almost certainly a re-nest. One other nest was located on 18 July after the young had left it. Fledglings, or large nestlings, were detected by voice at this site on 17 June. Fledglings were found on 12 June at two locations on the Lewis Pond Road in Lewis, at miles 5.2 and 7.3. I observed fledglings with adults at the same two sites on 5 July, indicating that fledglings remain with adult birds up to four weeks after leaving the nest. The last fledglings I observed with an adult were seen with a male at a beaver pond south of Duck Pond, Waterford, on 22 July. An independent juvenile in post-juvenal molt was seen at Wheeler Pond, Brunswick, on 14 July. An adult male Rusty Blackbird in late flight feather molt and mid-contour feather molt was seen on the East Branch Road in Bloomfield, on 18 and 19 July, this bird probably did not nest in 1990. The male seen with fledglings on 22 July was apparently not in molt indicating that Rusty Blackbirds probably delay molt until after their young become independent.

Nest heights ranged from 1 to 2.5 m. with a mean height of 1.8 m. All nests were placed in small conifers. Five were in balsam firs (*Abies balsamea*), and one was in a red spruce (*Picea rubens*). All nests were lodged

on a network of thin side branches, but they were bulky enough to abut the trunk in three nest trees. Five of the nests were placed between two small trees with the trunks less than 10 cm. apart.

Both sexes of Rusty Blackbirds were observed singing. Male song was accompanied by a low intensity variant of the song-spread displays of other Icterinae. When a song was uttered, male Rusty Blackbirds subtly relaxed their wings and fanned their tails. Song was interspersed with relatively high-pitched 'chek' call-notes. As this call was given males pumped their tails downward and rapidly flicked them upward. Male song during May and June appeared to function primarily for territorial defense. Female song may also be used in territorial defense because females responded to playback of territorial song in the absence of males. The major context of female song that I noted appeared to be in communication with a mate. An incubating female sang while sitting on the nest in response to male song. Another female sang when she was flushed from the nest while brooding nestlings. Her calls and song quickly attracted the male. Female singing behavior was similar to that of males, with tail spreading when song was given, and tail-flicking during intermingled bouts of calling.

Rusty Blackbirds were not as aggressive in defending their young as male Red-winged Blackbirds (*Agelaius phoeniceus*) are. The intensity of agitated behavior and display appeared to increase with increasing parental investment. Protective behavior during late incubation and early in the nestling period consisted of calling and song combined with tail flicking. Rusty Blackbirds were not overtly aggressive to observers near nests. If I watched quietly from a distance birds proved tolerant enough to feed young in my presence. A pair with fledglings displayed more demonstratively. The birds perched in

trees away from the thick cover the juveniles were hidden in and regularly flicked their wings open and slightly fanned their tails while they gave a constant, rapidly uttered stream of 'chek' calls. The intensity of the display increased as I approached the fledglings, the parents then drooped their wings and waved them shallowly. Nonetheless, these adult Rusty Blackbirds would not dive at me as a Red-winged Blackbird would.

Although I recorded several isolated pairs of Rusty Blackbirds (8 total), the species was often gregarious. Whether these groups represented colonial aggregations or not was unclear. In three instances I observed groups of adult blackbirds accompanying fledglings from several nests. It seemed likely that these groups were the result of several pairs gathering their offspring into loose creches comparable to those seen in waterfowl. However, further study will be necessary to conclusively establish this.

My limited observations of Rusty Blackbird foraging (5 sequences) were of birds engaged in terrestrial foraging in shallow water and hawking airborne prey. I had no observations of arboreal foraging. I saw males hawking emergent adult caddis-flies, an abundant resource during hatches, on two occasions. One male was adept at capturing additional caddis-flies while still holding previously caught insects. In two of the three observations of birds foraging afoot the foragers waded up to their heels in shallow water. Another bird reached into shallow water but remained on shoreline debris. All of these birds combined scanning and manipulation of substrate in their foraging activities. Litter in pools was often flipped with the bill. One bird often manipulated sticks picked out of submerged litter. When the debris offered some cue, probably weight, the bird placed it between its toes and tore it apart revealing a caddis-fly larva. This bird also inspected the ends

of drift logs on the shore and after detecting something, possibly a hole in the wood, it would tear at the rotten wood until it extracted a large greenish Tipulid larva. Other behaviors I observed in foraging sequences included gleaning prey from submerged litter and moss, and bill spreading. The latter is characteristic of Icterinae (Orians 1980) and starlings and involves plunging the bill into a substrate and opening it like a pair of pliers to expose prey in soft mud and loose soil. I was able to identify 13 prey items captured or carried by Rusty Blackbirds. These were evenly divided among three orders of insects: Trichoptera, Caddis-flies (4), Odonata, dragonflies (4), and Diptera, flies (4). Eight prey items were the aquatic larvae of these groups; dragonfly nymphs (3) and Tipulid (crane fly) larvae (3) appeared especially common. I also identified one recently metamorphosed adult dragonfly among prey brought to young. My observations suggest that Rusty Blackbirds largely concentrate on aquatic prey and adult insects emerging from water after metamorphosis.

I obtained evidence of a possible competitive interaction between Rusty Blackbirds and the more common Red-winged Blackbird, and gained some insights into the relationship between the Rusty Blackbird and the larger but otherwise similar Common Grackle (*Quiscalus quiscula*). On 22 and 23 May I saw male Red-winged Blackbirds attack and drive off male Rusty Blackbirds. The Red-winged Blackbirds flew at foraging male Rusties on two occasions in full aggressive flight display with the red coverts exposed and song given in flight. After displacing the smaller blackbird the red-wings rose to high perches and gave song-spread displays. One Rusty Blackbird was attacked twice by a male red-wing. Red-winged Blackbirds were also recorded responding aggressively to tape playback of Rusty Blackbird song on four occasions. Male Red-winged

Blackbirds responded to these playbacks with flight and song-spread displays, on one occasion a female red-wing also responded to the tape. Common Grackles never showed overt aggression to Rusty Blackbirds, but did respond to playback of Rusty Blackbird song on four occasions. These responses were brief and the birds did not give any obvious aggressive displays.

Habitat - The first three components produced by principal components analysis explained 67.6% of the variance in my habitat samples. Component one explained 32.8% of variance and had strong positive correlations with foliage at 2 to 4 m, coniferous foliage in the canopy, canopy cover, and fir and spruce, and a strong negative correlation with percent ground cover, and less strong negative relationships with number of alders and percent cover of sedge. The second principal component, which explained 20.4% of variance, was positively associated with number of shrubs including conifers and alder, and was negatively correlated with canopy height, foliage above 4 m, and basal area of trees and snags. Principal component three explained 14.4% of sample variance and showed positive loadings for foliage at 1 to 2 m, number of alders, pH, ground cover, and fir trees, and negative relationships with percent *Sphagnum*, spruce saplings, and foliage below 1 m. Plots measured in Rusty Blackbird habitat showed a weak tendency to be positive on component one, and unoccupied plots tended to be negative. Figure 4 illustrates the relationship of habitat plots to principal components. I selected seven habitat variables for discriminant function analysis: foliage at 2 to 4 m, balsam fir trees, fir saplings, spruce trees, spruce saplings, percent ground cover, and percent frequency of sedge.

Seventy-five percent of plots were correctly classified by the discriminant model. Eight of the 10 Rusty Blackbird habitat plots were

correctly classified, although one fledgling plot was classified as a nest plot. This plot was the fledgling plot centered on a used nest. Table 3 summarizes the canonical correlations of discriminant functions one and two, correlations between variables and the discriminant functions, and plot classification coefficients for dependent variables. Rusty Blackbird habitat plots were characterized by negative values on discriminant function one. This indicates that Rusty Blackbirds tended to occur in sites with fewer fir trees, more fir saplings, fewer spruce saplings, less ground cover, larger volume of foliage at 2 to 4 m, and less sedge. Nest and fledgling plots were distinguished on discriminant function two with nest plots showing positive values and fledgling plots the reverse. Fledgling plots tended to have more spruce, and fewer fir saplings.

DISCUSSION

My survey results suggest that Rusty Blackbird populations in Caledonia and Essex Counties have been stable or may have declined by 4% from 1981 to 1990. The last comprehensive survey of Rusty Blackbirds was the Vermont atlas project from 1977 to 1981 (Nichols 1985). The atlas project made no pretense of determining the populations of nesting birds and was designed to document the breeding status of all of the state's breeding birds. Therefore it was at best a conservative method for measuring the status of a given bird species. This limitation suggests the possibility that Rusty Blackbird population declines may be masked by the imprecise nature of atlas survey techniques. The largest decline I might suggest based on comparison of my data and atlas results is 10% but based on my impressions during field work I believe that

the calculated estimate of 4% is more likely. My survey results suggest declines have been most pronounced in the southern parts of Caledonia and Essex Counties. Unfortunately most atlas records in Caledonia County which imply a larger population during 1977-1981 were of possible breeding, a code which allows observers to report migrants and wandering non-breeders and post-breeders as potential nesters. The use of this code suggests that the atlas records in Caledonia County did not reflect a sizable breeding population.

In 1978 and 1980, *Records of Vermont Birds* reported that Rusty Blackbirds had declined and subsequently disappeared from several well known breeding localities in Essex County, particularly Moose Bog in the Wenlock WMA in Ferdinand. My survey results run counter to the belief expressed in 1980 that this blackbird had been lost as a breeding bird in the Island Pond area. However, I found no Rusty Blackbirds in such well documented breeding sites as Joes Pond in Cabot and Danville, the Victory Basin, and Wenlock WMA. W. H. Barnard and B. L. Rist reported at least one pair at Wenlock WMA during 1990, but I could not locate the birds there with tape playback. The population at Wenlock WMA must now be very small or transient. G. Lisi, who studied Black-backed Woodpeckers at Joes Pond and Victory Basin, informed me that he found no Rusty Blackbirds in these areas. W. H. Barnard also did not mention any Rusty Blackbird sightings in the Victory Basin. The prerequisites of Rusty Blackbird habitat appear to remain at these locales, so it is not clear why they have apparently declined. Local population shifts in response to successional changes, or possibly interspecific competition with Red-winged Blackbirds, may explain the decline, but this is pure speculation. The decline of Rusty Blackbirds in the southern Green Mountains may have been more severe than in Caledonia and Essex Counties (W. J. Norse, W. D. Nichols, pers.

comm.). A survey in Bennington and Windham Counties comparable to the 1990 survey will be necessary to document this.

Rusty Blackbirds are currently uncommon in Essex County and rare in Caledonia County. Some populations in northeastern Essex County appear to be fairly large, nonetheless it was difficult to find these birds. My survey results agree with atlas data in establishing the center of the Rusty Blackbird's nesting range in the Northeast Kingdom in east central and northeastern Essex County.

My observations on the social behavior of Rusty Blackbirds were few, therefore much of the following discussion is speculative. Rusty Blackbirds are considered monogamous (Orians 1985) and my findings do not contradict this. However, without color marking and careful study of several pairs it is not possible to rule out the existence of secondary or tertiary mates. The patchy distribution of habitat and apparent loose coloniality of Rusty Blackbirds may be conducive to occasional polygamy. Horn (1968) proposed a resource-based model for coloniality in the closely related Brewer's Blackbird (*Euphagus cyanocephalus*) suggesting that colonial aggregations are selectively advantageous when food is patchily distributed and ephemeral. Colonies of Rusty Blackbirds in Vermont may fit the conditions of this model because colonial groups in Lewis and Ferdinand were found in habitats subject to water level variation. Isolated pairs were seen in more reliable wetlands associated with pond inlets. Other authors (e.g. Lack 1968) propose that predation is a more important influence in colony formation. Possible creche formation by Rusty Blackbirds may be related either to patchiness of foraging habitat and the ephemeral abundance of prey, or the need for group protection of fledglings from predators. Considering the apparently rather feeble

defense of fledglings by individual pairs group defense of fledglings and nests may be important in improving individual nesting success. Further field research on this topic would be a useful contribution to the extensive knowledge of behavioral ecology in the Icterinae.

The interactions between Rusty Blackbirds and Red-winged Blackbirds, and to a lesser extent, the Common Grackle, might influence habitat use by Rusty Blackbirds. My limited observations of aggressive encounters between Rusty Blackbirds and Red-winged Blackbirds, and the aggressive responses of red-wings to playback of Rusty Blackbird song suggest a competitive relationship between these birds. Red-winged Blackbirds prefer more open wetlands than Rusty Blackbirds, and they do not often forage in ephemeral pools in swamps and clear-cuts as Rusty Blackbirds do. The putative interference competition between these species may exclude Rusty Blackbirds from open wetlands and fields where Red-winged Blackbirds are common. Clearing of most of the trees in wet coniferous woodlands and from the margins of ponds may lead to more intense competition between red-wings and rusties leading to local declines of the latter. Increases in the population of Red-winged Blackbirds in previously less open boreal wetlands may be a cause of the declines of Rusty Blackbirds in northeastern Vermont. This possibility needs investigation.

Common Grackles did not appear to react aggressively to Rusty Blackbirds in spite of their tendency to respond to playback of Rusty Blackbird song. The 'chek' calls given in Rusty Blackbird songs are characteristic of alarm notes given by many closely related species including the Common Grackle. This may have been the element responsible for attracting grackles to recordings. On the three occasions I observed mixed flocks of grackles and Rusty Blackbirds around shallow ponds I saw no interaction between the two

species. The influence of grackles on Rusty Blackbirds may be via preemptive competition for food and nest sites. Because Common Grackles are more generalized in nest site selection and foraging behavior than rusties and are scarce in wooded areas, they probably have little effect on nesting Rusty Blackbirds. Nonetheless Common Grackles are much larger than Rusty Blackbirds and should easily win contests over food or nest sites. It may thus not be an accident that Rusty Blackbirds are largely absent from areas with large Common Grackle populations in Vermont.

The most important features of Rusty Blackbird nesting habitat appear to be large numbers of coniferous saplings, especially balsam fir, and dense foliage from 2 to 4 m. Nest sites are provided by small conifers, and thick foliage from 2 to 4 m. provides concealment and overhead cover for the nest which tends to be placed at the bottom of this foliage layer. Large numbers of young conifers might provide cover for the comings and goings of adult blackbirds, and numerous potential nest sites might act to decoy would-be nest predators. Martin and Roper (1988) found that predation was reduced for Hermit Thrush (*Catharus guttatus*) nests surrounded by an abundance of potential nest sites. Fir seems to be preferred as a nest site over spruce. Structural characteristics which appear to favor fir over spruce include thicker foliage, longer retention of living foliage at mid-story height, and thicker, stiffer side branches to support the bulky nest.

Habitats where fledglings were fed were more variable than nesting habitats. There are less restrictive requirements for fledgling nurseries than for nest sites, which are at fixed locations and thus more vulnerable to predators and inclement weather. Conifers still tended to be important in habitat selection, but spruce increased in importance and alder was more

common in fledgling nurseries. Foliage density from 2 to 4 m also remained important in fledgling habitat. Apparently the value of cover was still high, but the birds were more flexible in choosing the vegetation which formed that cover. Adults seemed to move fledglings to sites closer to foraging areas. Fledgling habitat might also be a measure of Rusty Blackbird foraging habitat.

Rusty Blackbirds tended to use sites that were moderately to severely disturbed. Fledglings were found in recently logged sites with abundant standing water in three instances. The standing water on these sites appeared to serve as foraging sites for adult blackbirds. Regenerating clear-cuts were used for nest sites on three occasions. Rusty Blackbirds were also twice found at silted-in beaver ponds. These blackbirds may require habitats at early to middle stages of succession to provide the abundance of young conifers needed as nest sites, and the shallow pools necessary for feeding. Large areas of mature conifer woodland may be less attractive to Rusty Blackbirds. The susceptibility of boreal forest to fire, windthrow, and beaver activity probably allows Rusty Blackbirds to exist in this biome. Rusty Blackbird habitat appears to be provided by modest openings in mature woodland. Large-scale openings might allow Red-winged Blackbirds to exclude them.

CONCLUSIONS

This study establishes a model for Rusty Blackbird habitat near the southern edge of its nesting range. Nest sites were characterized by large numbers of small conifers, notably balsam fir which appears to be favored for nest sites, and thick cover at and just above nest height. Cover to hide vulnerable fledglings also appears important in fledgling habitat as foliage density from 2 to 4 m was an important feature of fledgling sites. Spruce and

alder, as well as fir, appear to be important cover for fledglings. Fledgling habitat also appears to be close to foraging sites which probably reduces the work-load of foraging adults. The small sample size and possible violations of the assumptions of multivariate methods render these conclusions tentative. Although this model is intuitively satisfying, more thorough sampling of Rusty Blackbird habitat will be necessary to confirm the conclusions I have drawn.

One field season of research raises more questions than it answers. Several lines of necessary research are indicated by my 1990 results. Foraging habitat is a third element of habitat necessary to maintain a viable Rusty Blackbird nesting population in Vermont. Sampling of foraging habitat to determine its structural features will allow managers to identify important sites. Sampling of food resources in these sites to discover the dietary requirements of Rusty Blackbirds also needs to be done. The foraging behaviors of the Rusty Blackbird and its apparent competitor the Red-winged Blackbird need to be quantified in areas where these species overlap. Diet overlap should also be quantified to determine the niche breadths of these two blackbirds. High levels of dietary overlap might suggest that the competitive exclusion principal comes into play when Red-winged and Rusty blackbirds co-occur (Cody 1974). Because male Red-winged Blackbirds are larger than rusties and appear to displace them during conflicts, these data would have important implications for habitat alternatives available to Rusty Blackbirds. It follows that further research is needed to document the influence of possible interference competition on Rusty Blackbirds. Perhaps judicious removal of some Red-winged Blackbird populations and comparison with controls might demonstrate this effect (see Sherry and Holmes 1988). Further study is also needed to determine the extent of Rusty Blackbird use of habitats created by

logging. If the species uses these sites, it should be demonstrated when these disturbances of natural habitat are useful to the birds and when they might be deleterious. It is also important to establish the status of the species outside of the study area, especially in the southern Green Mountains where declines may have been greater (W. D. Nichols, pers. comm.).

I recommend that the Rusty Blackbird be retained on the Species of Special Concern list for two reasons. First, the species continues to exist in low numbers. The highest population estimate for Caledonia and Essex Counties I could develop was 90 birds. A small population is vulnerable to a variety of negative factors and must be monitored carefully if it is to be maintained. Secondly, if the population has declined even slightly this is cause for concern. The apparent loss of populations at Wenlock WMA and the Victory Basin is worrisome. I believe that continued monitoring of Rusty Blackbirds is warranted. An effort should be made to canvass Rusty Blackbird populations in the Northeast Kingdom at two to five year intervals. It would also be useful to determine if Red-winged Blackbird populations are increasing in Caledonia and Essex Counties, because of the potential influence of this bird on the status of the Rusty Blackbird.

ACKNOWLEDGMENTS

This study was funded by a grant from the Nongame Program of the Vermont Department of Fish and Wildlife. I extend sincere thanks to the Research Department of the Vermont Institute of Natural Science (VINS). I am especially grateful to VINS Research Director Chris Rimmer for the loan of a canoe, equipment used for habitat measurement, constructive conversations and

written comments on this paper. I also thank VINS summer research staff members Scott Hall, Ted Gaine, and Ros Renfrew for their hospitality when I stayed in Westmore during overnight trips to Caledonia and Essex Counties. Nancy Martin was an invaluable field assistant, editor, consultant, critic, and a sensible, intelligent companion throughout this study. Field observers who contributed valuable observations of Rusty Blackbirds or data on the lack thereof included Bill Barnard, Byron Butler, Dwight Cargill, George Lisi, and Betty Rist.

Table 1. Atlas priority blocks and non-priority blocks with Rusty Blackbirds 1977-1981 and blocks covered during 1990 survey in Caledonia and Essex Counties, Vermont, with annotations on Rusty Blackbird occurrence during the survey periods and 1990 coverage limitations. See Figure 1 for the distribution of blocks, arabic numerals correspond to numerals appearing in Figure 1.

Block # and Name	Presence/Absence of Rusty Blackbird		Comments
	1977-1981	1990	
1 Holland Pond *	+	Not entered.	Block lies largely in Orleans County.
2 Norton Pd./Sladyk WMA	-	+	
3 Lewis Pond	+	-	The bird reported in 1977 was an independent juvenile, the species was found in neighboring blocks in 1990.
4 Brouilliard Brook/E. Branch	-	+	
5 Monadnock Mt., Lemington	-	-	
6 Underpass Pond	+	-	Block lies largely in Orleans County.
7 Connecticut R., Bloomfield	-	-	
8 Nulhegan Pd., Brighton	-	-	W. H. Barnard reported a single bird late in 1990 season. Not a breeding bird?
9 Wenlock WMA, Ferdinand	+	+	Reports by W. H. Barnard and B. L. Rist in 1990.
10 Seneca Mt., Ferdinand	-	Not entered.	Difficult access, little habitat on USGS map.
11 Ferdinand Bog	+	+	
12 West Mt. Pd., Maidstone *	+	+	
13 Paul Stream, Maidstone *	+	+	
14 East Haven	+	-	Little appropriate habitat seen in 1990.
15 Cutler Mill Brook	+	Not entered.	Time limitation, birds were present at eastern edge of block in 1990.
16 Gallup Mills	+	-	
17 Wheeler Mt.	-	+	
18 Bruce Pd., Sheffield	-	-	
19 Sutton-south	+	-	Possible breeding in 1977-1981.

Table 1 (Continued)

Block # and Name	Presence/Absence of Rusty Blackbird		Comments
	<u>1977-1981</u>	<u>1990</u>	
20 Flagg Pd., Wheelock	+	+	
21 E. Hardwick/Walden	+	-	Possible breeding in 1977-1981. Little appropriate habitat.
22 Lyndon Center *	+	-	Possible breeding in 1977-1981. No appropriate breeding habitat.
23 Kirby	-	Not entered.	Time limits, and lack of habitat on USGS map.
24 Guildhall	-	Not entered.	Time limits, and lack of habitat on USGS map.
25 East Danville	-	-	
26 Concord	-	-	
27 Joes Pond	+	-	
28 Stiles Pd., Waterford	+	+	
29 West Danville	-	-	
30 Barnet	-	-	
31 Groton	-	Not entered.	Half of block in Orange County, no Rusty Blackbirds in 1977-1981.

An * indicates non-priority atlas blocks, non-priority blocks with new records of Rusty Blackbird in 1990 are not listed here.

Table 2. Measured variables on Rusty Blackbird habitat plots and from plots without Rusty Blackbirds in Caledonia and Essex Counties, Vermont. UN = Unoccupied, RN = Rusty nest, RF = Rusty fledgling.

Variable (abbreviation)	Mean	(Standard Deviation)
Basal area - trees (BASALT)		
UN (n = 10)	2811.4 cm ²	(2745.9 cm ²)
RN (n = 5)	2036.4 cm ²	(2274.6 cm ²)
RF (n = 5)	1726.9 cm ²	(1084.5 cm ²)
Basal area - snags (BASALS) *		
UN	1369.4 cm ²	(1934.5 cm ²)
RN	1440.8 cm ²	(2441.2 cm ²)
RF	431.2 cm ²	(412.2 cm ²)
Absolute frequency of balsam fir - trees (ABT)		
UN	9.2	(8.4)
RN	5.0	(3.3)
RF	2.2	(2.4)
Absolute frequency of balsam fir - saplings (ABS)		
UN	8.5	(9.8)
RN	29.6	(23.9)
RF	21.0	(32.7)
Absolute frequency of spruce - trees (PT)		
UN	2.4	(2.9)
RN	2.0	(2.8)
RF	5.8	(8.6)
Absolute frequency of spruce - saplings (PS)		
UN	2.2	(3.8)
RN	6.1	(9.2)
RF	18.0	(38.6)
Absolute frequency of alder (ALNUS)		
UN	54.5	(40.7)
RN	26.0	(23.0)
RF	59.8	(90.0)

Table 2 (Continued)

Variable (abbreviation)	Mean	(Standard Deviation)
Absolute frequency of shrubs (SHRUB)		
UN	120.8	(55.9)
RN	112.4	(51.9)
RF	146.6	(104.0)
Percent canopy cover (CANO)		
UN	48.0 %	(19.6 %)
RN	51.0 %	(18.2 %)
RF	52.0 %	(33.3 %)
Percent ground cover (GROUND)		
UN	91.0 %	(6.1 %)
RN	83.0 %	(14.8 %)
RF	78.0 %	(17.9 %)
Percentage of coniferous foliage in canopy (CONIF)		
UN	25.3 %	(15.4 %)
RN	24.0 %	(9.6 %)
RF	25.0 %	(40.4 %)
Canopy height (CHGT)		
UN	7.3 m	(2.6 m)
RN	7.1 m	(2.4 m)
RF	6.1 m	(1.5 m)
Foliage density at 0-1 m (FHA)		
UN	58.6 %	(12.7 %)
RN	51.4 %	(13.5 %)
RF	57.9 %	(16.7 %)
Foliage density at 1-2 m (FHB)		
UN	16.7 %	(5.5 %)
RN	19.9 %	(7.3 %)
RF	14.9 %	(10.6 %)
Foliage density at 2-4 m (FHC)		
UN	16.7 %	(6.1 %)
RN	22.4 %	(8.7 %)
RF	23.2 %	(15.3 %)

Table 2 (Continued)

Variable (abbreviation)	Mean	(Standard Deviation)
Foliage density above 4 m (FHD)		
UN	6.5 %	(4.4 %)
RN	6.2 %	(9.8 %)
RF	4.0 %	(5.6 %)
Percent coverage of <i>Sphagnum</i> (SPHAG)		
UN	20.7 %	(23.1 %)
RN	22.2 %	(23.2 %)
RF	24.9 %	(33.5 %)
Percent coverage of sedge (CAREX)		
UN	10.9 %	(11.4 %)
RN	4.1 %	(4.5 %)
RF	5.5 %	(5.4 %)
pH of standing water (PH)		
UN	6.11	(0.6)
RN	6.15	(0.5)
RF	6.07	(1.0)

Table 3. Results of discriminant function analysis contrasting Rusty Blackbird nest and fledgling habitat plots with sites not used by Rusty Blackbirds in Caledonia and Essex Counties, Vermont. DF1 = Discriminant Function 1, DF2 = Discriminant Function 2, UN = Unoccupied plot, RN = Rusty Blackbird nest plot, RF = Rusty Blackbird fledgling plot. Abbreviations for dependent variables are found in Table 2.

Canonical Correlations

	DF1	0.81			
	DF2	0.58			
Variable	Canonical Correlation		Plot Classification Coefficients		
	<u>DF1</u>	<u>DF2</u>	<u>UN</u>	<u>RN</u>	<u>RF</u>
ABT	0.29	0.42	-0.45	-1.03	-0.89
ABS	-0.33	0.03	-0.39	-0.16	-0.32
PT	-0.05	-0.48	0.18	0.03	0.35
PS	-0.14	-0.43	-0.45	-0.75	-0.58
GROUND	0.29	0.41	0.91	0.84	0.82
FHC	-0.23	-0.19	1.69	1.97	1.84
CAREX	0.26	0.07	0.11	-0.01	-0.02

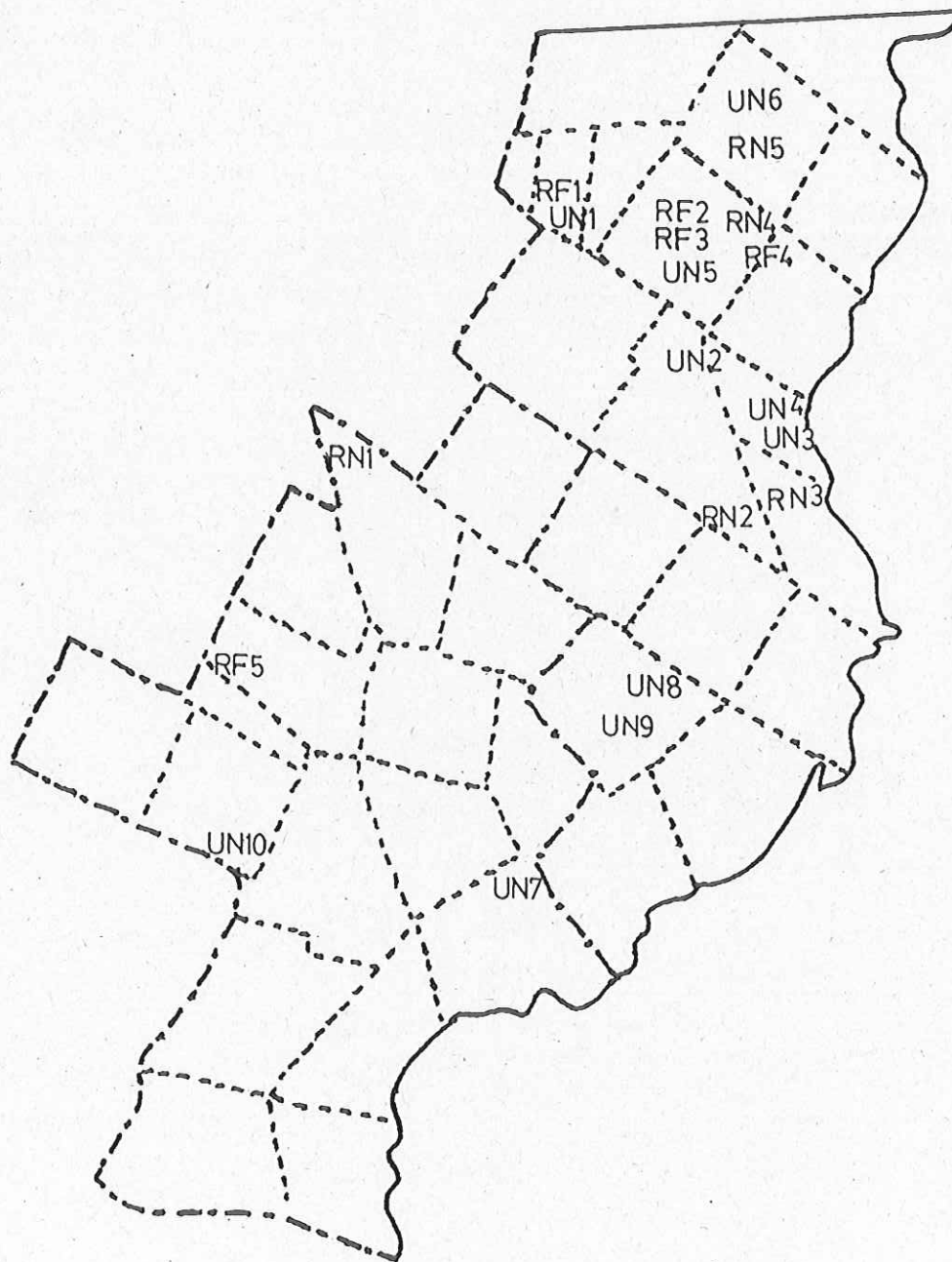


Figure 1. Locations of Rusty Blackbird habitat plots and unoccupied habitat plots sampled in June-July 1990. RN = nests, RF = fledglings, UN = unoccupied habitat. Each site is numbered sequentially by sampling date.

RUSTY BLACKBIRD HABITAT FORM

LOCATION:
LAT/LONG:
SITE TYPE:

DATE:
OBSERVERS:

ESTIMATED PCT. WATER:
WATER SAMPLE:

pH:

TREE SPECIES (LIVE)

DIAMETER (in, cm: CHECK ONE)

SNAGS (SPECIES, IF KNOWN)

SHRUBS N-S
 E-W

FOLIAGE PROFILE
METERS N E S W

HITS IDENTIFIED TO
SPECIES (binomial)

>20 _____
15-20 _____
10-15 _____
8-10 _____
6-8 _____
4-6 _____
3.5-4 _____
3-3.5 _____
2.5-3 _____
2-2.5 _____
1.5-2 _____
1-1.5 _____
0.5-1 _____
0-0.5 _____

CANOPY COVER ____/20 = ____ % CONIFERS: ____/20 = ____ %

GROUND COVER ____/20 = ____ % CONIFERS: ____/20 = ____ %

CANOPY HEIGHT (m): N E S W MEAN _____ MAX ____ MIN ____

KEY TO PLANT ABBREVIATIONS:

Figure 2. Form used for measuring Rusty Blackbird habitat.

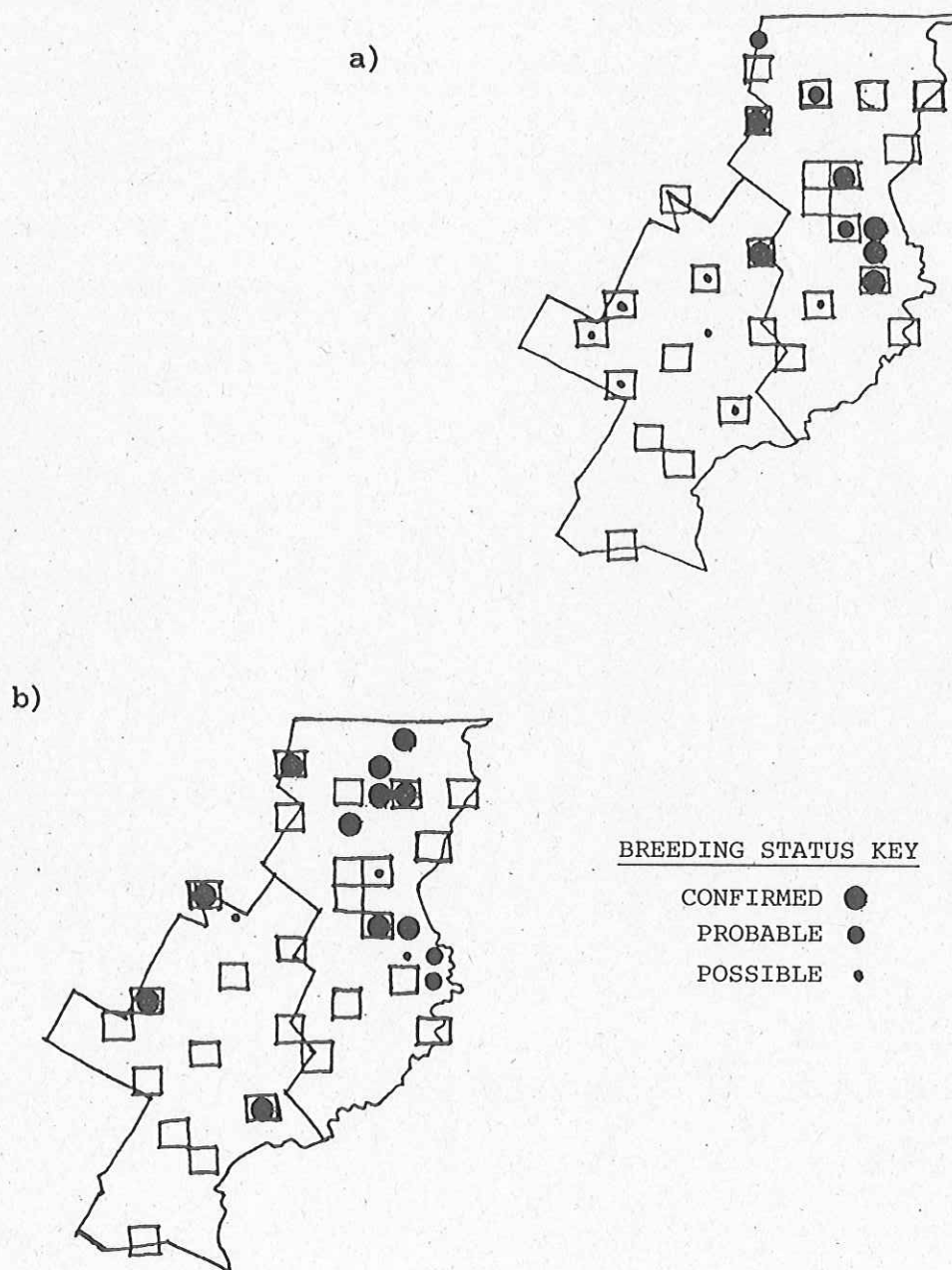


Figure 3. Distribution of the Rusty Blackbird in Caledonia and Essex counties, Vermont. a) atlas project results 1977-1981, b) 1990 survey results. Breeding status codes are those used during the atlas project.

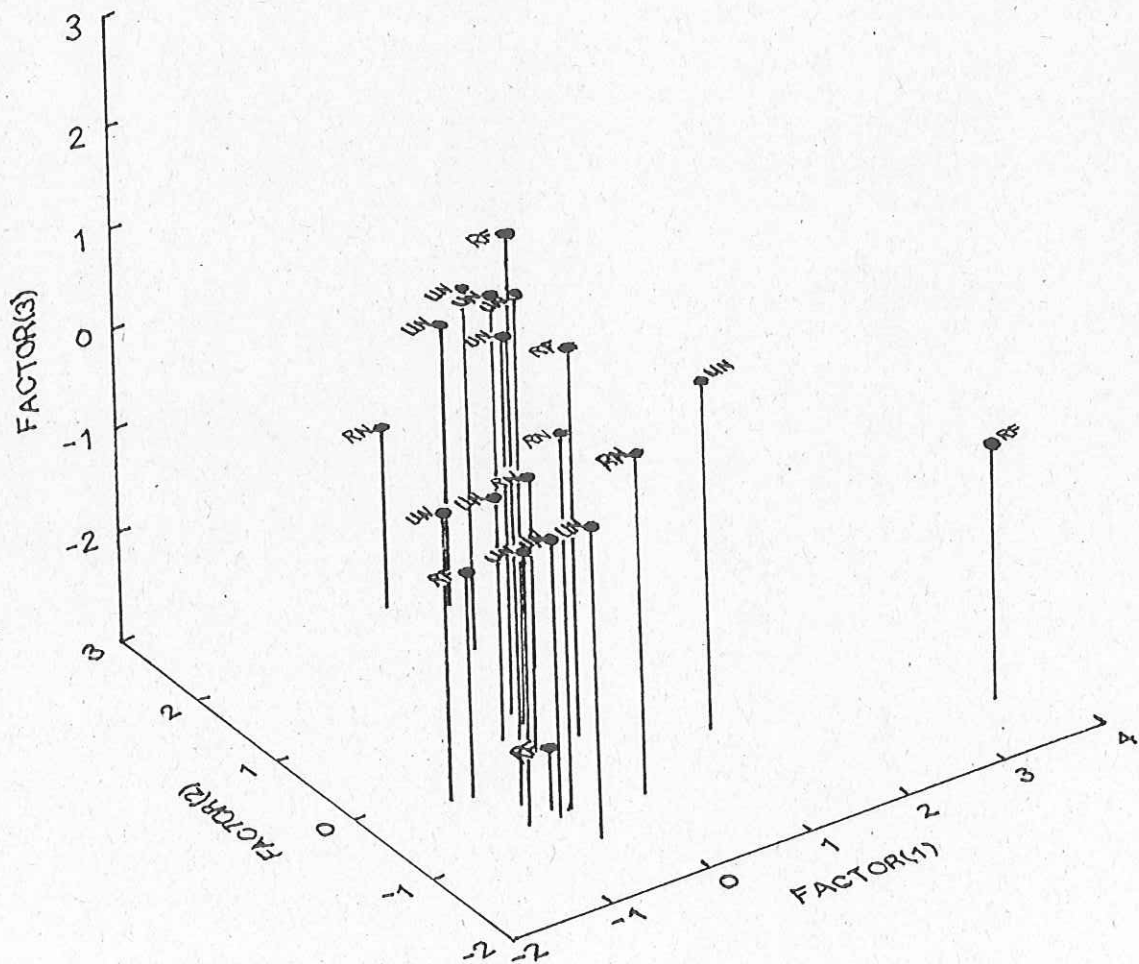


Figure 4. Graph of habitat and non-rusty plots against the three principal component factors. UN= Unoccupied, RN = Rusty nest, RF = Rusty fledgling.

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