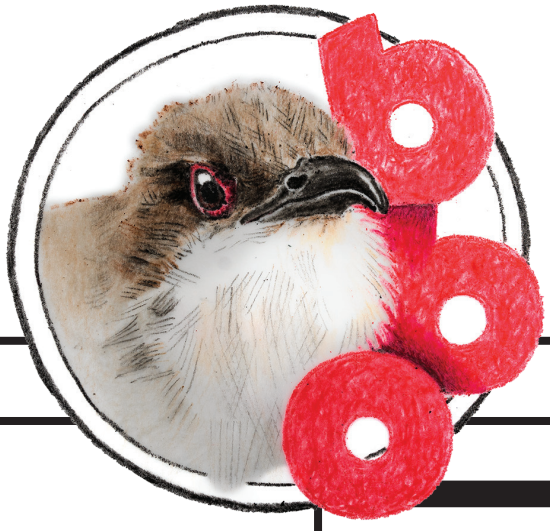

2022

Berkshire Bird Observatory

Berkshire Bird Observatory (BBO)

BBO was established in 2022 as part of Green Berkshires, Inc., a local conservation non-profit. We are a research organization dedicated to the conservation of wild bird populations. Our focus is on birds that rely on the south Taconic Mountains for either breeding or stopover habitat.

In summer, we conduct bird point count surveys throughout the south Taconic massif to determine the abundance, diversity and distribution of breeding birds. In spring and fall—we let the birds come to us—and monitor migrants daily at our banding station at Jug End State Reservation. This includes night-time monitoring of Northern Saw-whet Owls in the fall. Off mountain, we coordinate an American Kestrel nest box program.

Our data will serve as a baseline for bird research in our region. Over multiple years of monitoring, we will be able to detect population trends and shifts in distribution and the timing of migration in response to factors like climate change. To maximize the impact of our data, we participate in collaborative projects and share data with state and federal agencies and our non-profit partners.

As a bird observatory, our aims are both scientific and social. We leverage the wonder of a 'bird-in-the-hand' to inspire people and promote appreciation of birds while encouraging a conservation ethic. We reach out to our community through talks, bird walks and banding demonstrations. Our banding station also serves as a hub for training visiting scientists, students and volunteers.

BBO Team

Author & Director
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2022 Banders
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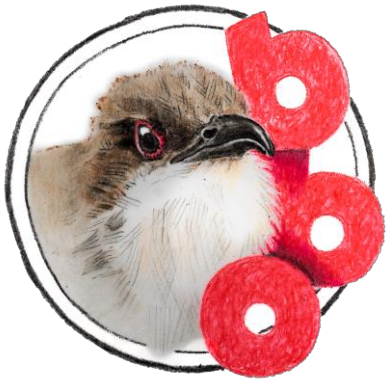

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Contents

Migration Monitoring

We band birds at our migration station at Jug End State Reservation (JESR) during both the spring and fall migratory periods. JESR is owned and managed by the Massachusetts Division of Fisheries and Wildlife and the Department of Conservation and Recreation. Located in the leading valley of the south Taconic Mountains, JESR contains a variety of habitats that offer resources birds need to rest and refuel when they stop over on their migratory journeys along the Atlantic Flyway. Though accurate information on bird populations has arguably never been more important during this era of rapid environmental change, major gaps in our knowledge remain. Neotropical migrants that pass through our area but breed in remote regions of the Boreal Forest are inadequately sampled. Our banding operation samples these birds and others in a standardized way, yielding consistent high-quality data on the timing of migration, abundance of each species passing through and, over the years, population trends.

Spring Migration

Our first spring migration season ran 55 days from April 4th through June 2nd totaling 4123.5 net-hours. We banded 1014 birds of 74 species and had 392 recaptures (top ten in Table 1). Daily totals varied with peaks and troughs in capture rates, presumably resulting from weather conditions that either helped or hindered northward movements. There was a clear uptick in migration starting the second week in May, with three major spikes and high overall volume into the third week of May (Figure 1). Our two most abundant birds, Gray Catbird and Ruby-crowned Kinglet, exemplified peak and early movements, respectively (Figure 2). Our busiest day was May 21st when we banded 72 birds and recaptured 16 (total 93) from our 14 nets over the course of 6.5 hours. We encountered 100 Ruby-throated Hummingbirds but because we are not yet licensed to band them, we cannot be sure how many were new individuals. Our banding totals are in Appendix 1.

This being our first season of banding, every species was a first for the station. The very first bird we banded was a female Golden-crowned Kinglet. We also caught two Fox Sparrows on our first day leading the vanguard of migration. Highlights include four Philadelphia Vireos (May 17-21) and a Gray-cheeked Thrush (May 21)—both species are considered rare in our region during spring migration (Figure 3). On May 18th, we captured a Blue-winged x Golden-winged Warbler hybrid after hearing it sing a four-note Golden-winged song type. This individual looked like a Blue-winged Warbler, except it had noticeably more extensive yellow on its wing patch. Backcrosses like this are occasional in our area. The four Black-billed Cuckoos we captured (May 26-30) impressed us so much with their elegance and spunk that they inspired BBO's logo (Figure 4).

Other highlights include Barn Swallow (May 24), Pileated Woodpecker (May 28), two Bay-breasted Warblers (May 16-18) and four Mourning Warblers (May 19-29).

Remarkably, we had two foreign recaptures during our first season: a Common Yellowthroat banded on May 19, 2021, near Crown Point, NY, and, amazingly; an American Kestrel (April 28) originally banded by Art Gingert on July 13, 2020 in West Cornwall, CT (Figure 5). Art has put up dozens of boxes for Kestrels in NW CT over the years and catching one of his birds in the Berkshires shows how his conservation efforts are spilling over state lines. That we caught one of his Kestrels in a mist-net, no less, is an encouraging and propitious sign for our own Kestrel conservation efforts (discussed below). See Figure 5 and Tables 2 and 3 for information on foreign recaptures and encounters for the year.

Gray Catbird	121
Ruby-crowned Kinglet	74
Common Yellowthroat	68
Cedar Waxwing	39
Chestnut-sided Warbler	37
Magnolia Warbler	36
Veery	32
American Redstart	28
Black-and-white Warbler	27
American Robin	27

Table 1. Top ten captures during our spring season. Common Yellowthroat was our most frequently captured warbler.

Figure 3. The Philadelphia Vireos and Gray-cheeked Thrush we captured are both considered rare in our area during spring migration.

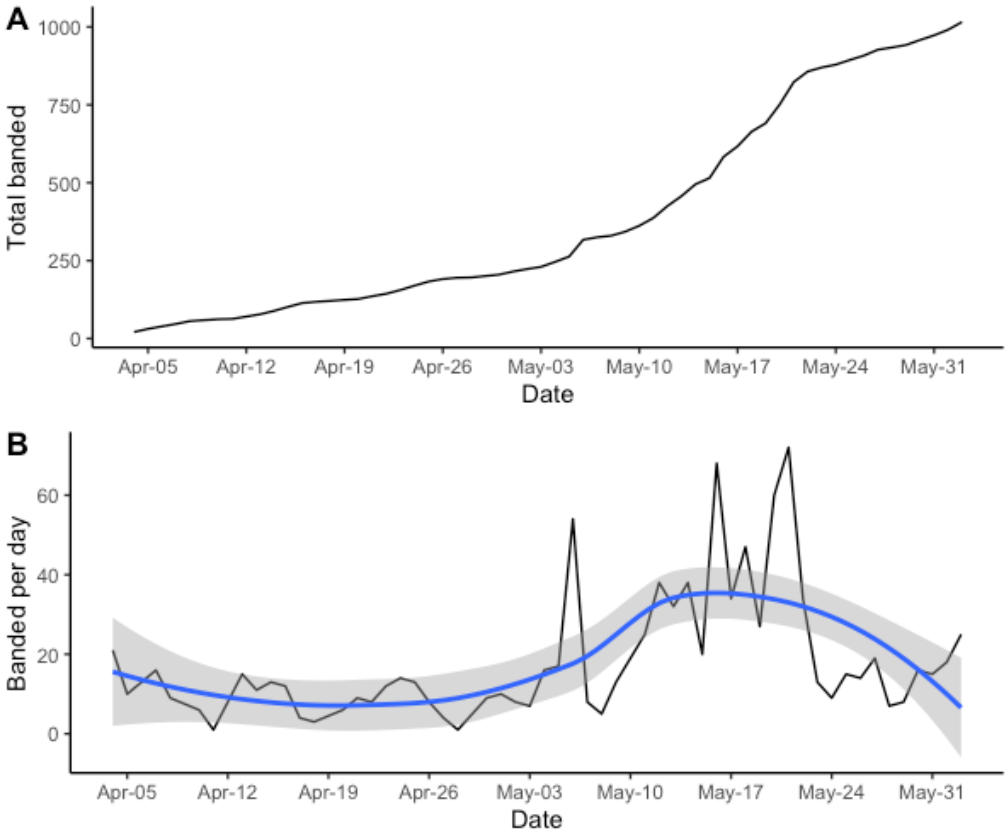


Figure 1. A shows the cumulative sum of migrants while B shows daily totals and a lowess trend line. Spring migration ramps up early in May (steepening slope in A) and peaks in mid-May, with several major pulses in migration occurring between May 3rd and May 24th (spikes in B).

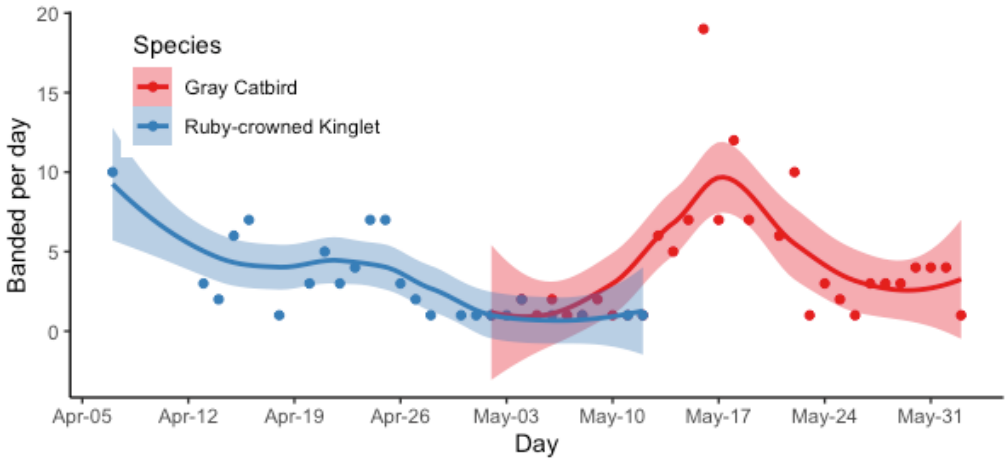


Figure 2. Ruby-crowned Kinglets moved early in the season, peaking in the third week in April. Gray Catbirds peaked mid-May—a trend typical of many migrants that we sampled.

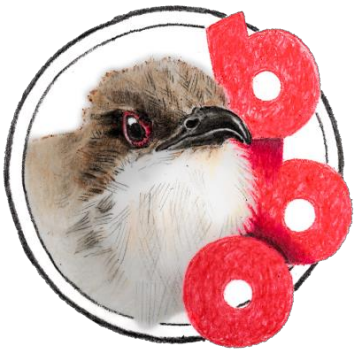


Figure 4. The Black-billed Cuckoo was one of our favorite birds from our first spring season. They're elegant and charismatic—plus they eat Spongy Moths! They inspired our logo designed by Will Nickley.

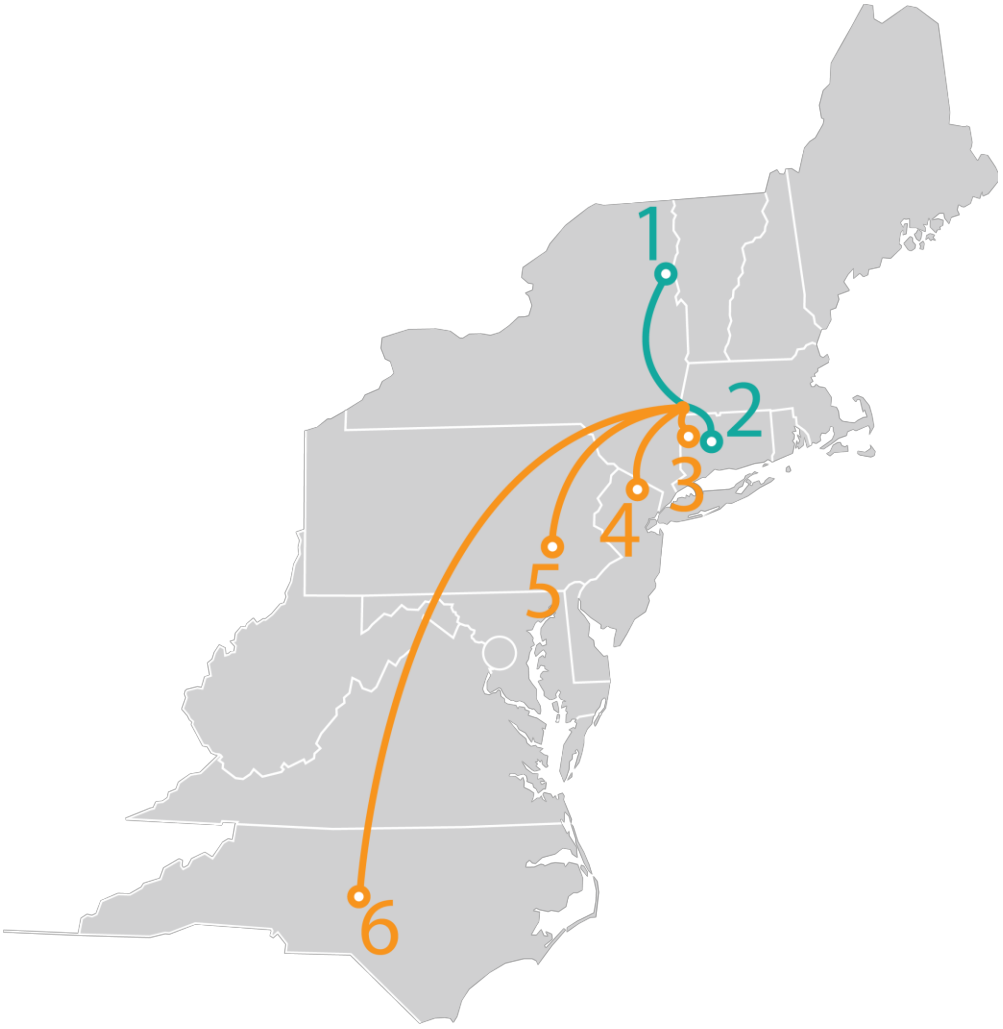


Figure 5. Original locations of foreign recaptures (teal) and foreign encounters (orange). For specifics, refer to the following tables (2&3).

Map #	Species	Capture date at BBO	Banding date	Banding location
1	Common Yellowthroat	6/1/22	5/19/21	Crown Point, NY
2	American Kestrel	4/28/22	6/13/20	West Cornwall, CT

Table 2. Birds captured at BBO that were originally banded elsewhere (i.e. foreign recaptures).

Map #	Species	Band date at BBO	Encounter date	Encounter location
3	Northern Saw-whet Owl	10/27/22	12/16/22	near Sharon, CT
4	Black-capped Chickadee	10/22/22	12/6/22	Passaic Co., NJ
5	American Kestrel	6/23/22	9/19/22	Randolph Co., NC
6	American Kestrel	6/29/22	10/1/22	Berks Co., PA

Table 3. Birds originally banded at BBO that were encountered elsewhere (i.e. foreign encounters).

Figure 6. Our first foreign recapture! A beautiful adult male American Kestrel, originally banded as a nestling in West Cornwall, CT in 2020.

Fall Migration

Our first fall migration season ran 74 days from August 15th through November 6th totaling 5905.9 net-hours. We banded 2225 birds of 80 species, had 433 recaptures, and encountered Ruby-throated Hummingbird 135 times (unbanded). Our banding totals are in Appendix 1. The pattern of migration differed from spring, in that capture rates started out relatively high, due primarily to dispersing young. Pulses in migration were also less concentrated, with peaks occurring the last week of September and the third week of October (Figure 8). Our two most frequently encountered species, Black-capped Chickadee and Common Yellowthroat, exhibited middle and late migration peaks (Figure 9). Surprisingly, Black-capped Chickadee was by far our most frequently encountered bird with 297 banded (top ten in Table 4). Though considered resident species, we caught 30 of them in a single day on October 20th—our highest day count for any species all year. Our busiest day was September 24th when we banded 70 birds and recaptured 4 (total 74) from our 15 nets over the course of 6 hours.

We had an auspicious start to the season, catching two rare southern warblers on our first two days: a Worm-eating Warbler on August 15th followed by a Hooded Warbler the next day (Figure 7). These birds were both born this summer (HY) and likely dispersed into our area from nearby. If breeding ranges for these species are tracking the changing climate, we would expect to capture them more frequently in subsequent seasons, as their ranges continue to extend further north.

August 22nd was a particularly good day, as we caught our first Yellow-throated Vireo along with a Warbling Vireo and a Blue-headed Vireo—all on the same net run (Figure 18)! The top highlight for the day—and perhaps the whole season—was a station first Red-shouldered Hawk (Figure 10). This incredible bird found its way into our stream net at just the right moment in our net run that we were able to get to it and close the pocket before it could escape. It took all three of us songbird banders to safely extract, process and release this large raptor.

On September 9th we caught the station's first Nuthatches: both Red-breasted and White-breasted. To round out representatives from the bark-foraging guild, we caught our first Brown Creeper on October 2nd. Other firsts include Wilson's Warbler (9/1), Cape May Warbler (9/7), Connecticut Warbler (9/10), Brown Thrasher (9/15), Sharp-shinned Hawk (10/6) and Wilson's Snipe (11/2) (Figure 11). Another noteworthy capture was a late Louisiana Waterthrush (9/1) which was a Berkshire County record for September. Though we did not have any foreign recaptures this fall, we did have four of our banded birds encountered at other locations (Figure 5).

Black-capped Chickadee	297
Common Yellowthroat	192
Ruby-crowned Kinglet	171
Swainson's Thrush	144
Gray Catbird	135
Red-eyed Vireo	104
Magnolia Warbler	102
Veery	68
White-throated Sparrow	60
Traill's Flycatcher	58

Table 4. Top ten captures during our fall season. Black-capped Chickadee (right) was **by far** our most frequently captured bird.

Figure 7. Within the first two days of our fall season we captured two warblers that are considered rare in our area because they typically breed further south. As these birds were both young of the year, it is likely they hatched locally and were dispersing from their natal sites prior to migrating.

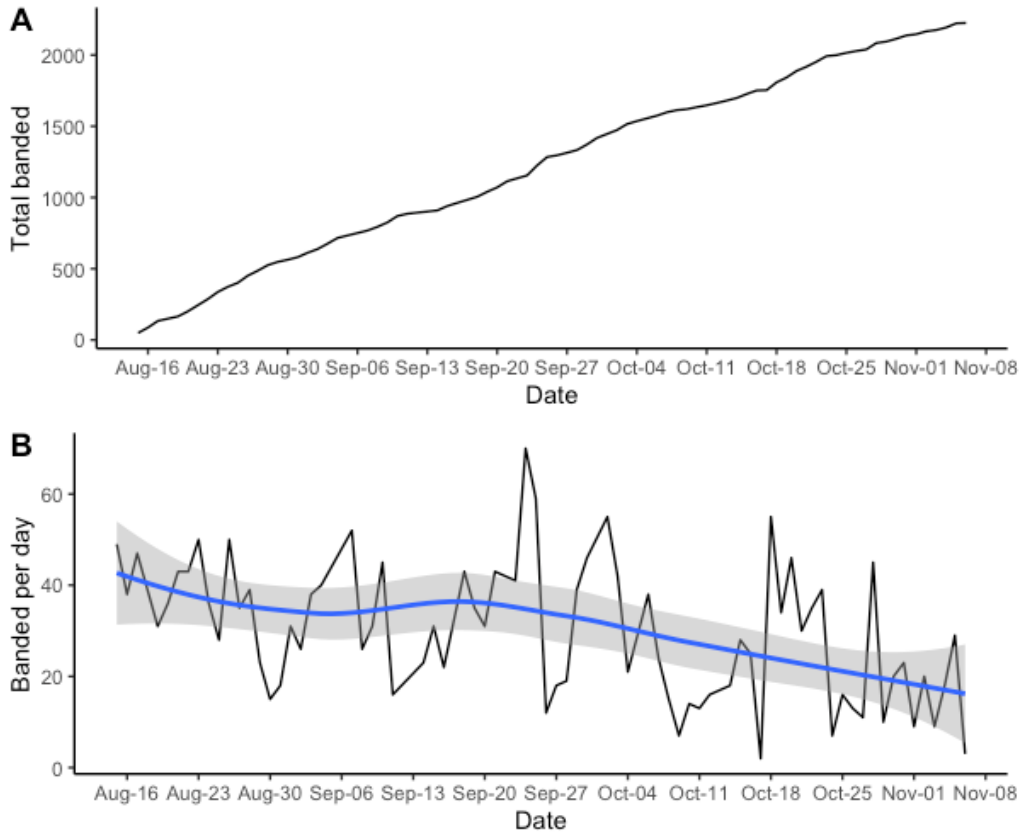


Figure 8. A shows the cumulative sum of migrants while B shows daily totals and a lowess trend line. Fall migration was fairly consistent throughout (steady slope in A) due to dispersing young early in the season and a big push of Chickadees late in the season.

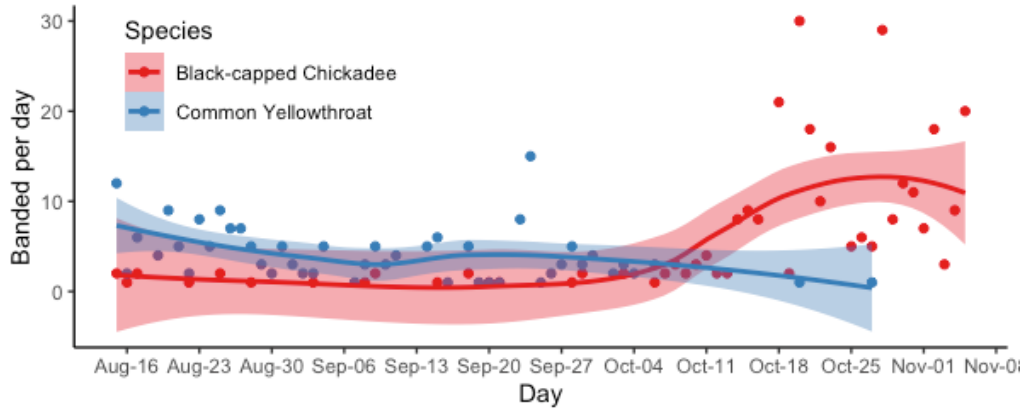


Figure 9. Common Yellowthroats show a phenological pattern typical to many of the songbirds we sampled, with highest capture rates during the early and middle periods of migration. Chickadees, however, had a huge push late in the season.

Figure 10. Perhaps the highlight of the year: a spectacular Red-shouldered Hawk that somehow found itself in our stream net.

Figure 11. Station firsts for the Fall season: Cape May Warbler, Connecticut Warbler and Wilson's Snipe, from left to right.

Northern Saw-whet Owl Monitoring

We banded Saw-whet Owls for five total nights this fall, starting October 27th and ending November 8th. We banded for four hours per night, starting at sunset, using a single array of four 12-m (60 mm mesh) mist nets centered on an audio lure. We chose to open nets only on nights with relatively cold temperatures and north winds to maximize our capture rates. This season, our aim was to engage our visitors and determine the potential of our site for regular monitoring in subsequent years (Figure 12). We were surprised by how well we did! In total, we banded 66 owls and our high for a single night was 21 (10/28).

Figure 12. Worth the wait in the dark and cold: few birds impress like the Northern Saw-whet Owl. Though we only banded five nights this Fall season, we were able to share the sense of wonder these small owls inspire with many of our visitors and volunteers. With 66 owls banded in total, our site has great potential for committed, long-term monitoring.

American Kestrel Nest Box Project

American Kestrels are vibrant and agile falcons of open country that have unfortunately experienced steep declines throughout our region. This spring we started putting out nest boxes throughout the southern part of Berkshire County to provide Kestrels with nesting structures—a resource that likely limits their populations. Not only do these boxes give Kestrels a place to raise their young, they also give us a chance to engage our community in a local conservation effort. We received enthusiastic support for this project from towns, landowners, schools and other local non-profits. People from our community helped us find suitable sites, build and install boxes and—importantly—host boxes on their land (Figure 13).

The boxes we put up also present a valuable monitoring opportunity. We check all of our boxes four times per year and collect data on occupancy and nest success. As our project expands, our data will help us understand—and ultimately reverse—local declines. Further, we participate in the American Kestrel Partnership and contribute our data to continent-wide analyses. As of this winter we have installed 16 boxes. Four of the boxes that were up early enough in the spring attracted breeding pairs and successfully fledged young.

Figure 13. Kestrel box installed in excellent habitat at April Hill Farm with the help of Greenagers staff.

Summer MAPS Banding

During the breeding season we participate in The Institute for Bird Populations (IBP) Monitoring Avian Productivity and Survivorship (MAPS) program. MAPS is a cooperative effort among bird banders and their organizations to gather important population and demographic data on many of our landbird species. Our MAPS banding station is located at Jug End State Reservation, adjacent to our migration monitoring station. Our nets are placed in a variety of cover types centered on a 20-hectare core area of forest and edge habitat in the Jug End Valley. Though our station focuses on a core 20 ha area of habitat, our sample area is much bigger. Both young and adult birds disperse after the breeding season, but before migration, and may move up to 2.5 miles from their nest sites. Many of these birds target scrubby forest edges, like those found at our MAPS station at Jug End. This means that though our MAPS station is in the Jug End Valley, we are sampling birds from the broader landscape and determining productivity for 10 South Taconic peaks and their surrounding slopes (Figure 14). By sharing our data with IBP, we are also contributing to continent-wide analyses. This data will become increasingly valuable in the long-term, as it takes 5+ years to reliably estimate productivity and survivorship.

Our MAPS season ran from June 7th to August 1st and we banded birds on 7 days, one for each MAPS period, totaling 517 net-hours. We banded a total of 253 birds, recaptured 89 with 5 unbanded Ruby-throated Hummingbirds. Our busiest day was July 14th when we banded 52 birds and recaptured 16. The ratio of young to adults was 128:123 with two birds of inderminable age. Highlights for the season include a station first adult male Purple Finch, also banded on July 14th, and several exceedingly cute baby birds (Figure 15). Our top ten captures are in included in Table 5, below, with the full summary in the Appendix 1.

Gray Catbird	40
Common Yellowthroat	39
Song Sparrow	21
Ovenbird	15
Wood Thrush	15
Red-eyed Vireo	13
American Redstart	11
Veery	9
Black-and-white Warbler	8
Rose-breasted Grosbeak	8
Tufted Titmouse	8

Table 5. Top ten captures during our summer season. Gray Catbird (right) was our most frequently captured bird.

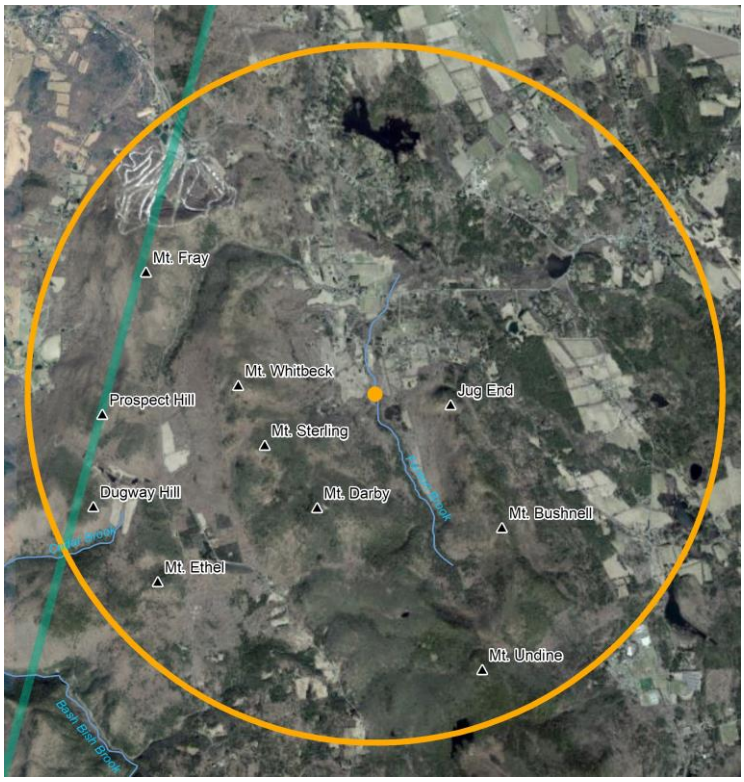


Figure 14. Though our summer MAPS banding station is situated in the Jug End Valley, it samples birds dispersing from a much wider area (2.5 mile-radius) that includes 10 south Taconic peaks and surrounding slopes.

Figure 15. A sample of babies captured at our summer MAPS station: Veery, Tufted Titmouse and Eastern Pheobe, left to right. By comparing the ratio of young to adults, we get a sense of productivity of the site.

BEAT Bioblitz Banding Demo

On September 17th we participated in the annual Berkshire Bioblitz organized by Berkshire Environmental Action Team (BEAT) and The Nature Academy of the Berkshires. This community event is both scientific and educational. The aim of the Bioblitz is to document as many species as possible within a 24-hour time frame and increase awareness of the diversity of life all around us. To help meet this aim, we conducted a bird banding demonstration at Brattle Brook Park in Pittsfield. Over the course of the morning, we banded 31 birds from 9 species (Table 6). For most of our visitors, this was their first time seeing a bird in the hand which was very exciting for them. We showcased our Berkshire avian biodiversity by giving people up-close views—from the brick-red undertail coverts of the Gray Catbird to the subtle beauty of the House Wren (Figure 16).

Gray Catbird	7
Common Yellowthroat	5
Lincoln's Sparrow	5
Swamp Sparrow	4
Black-capped Chickadee	3
Northern Cardinal	2
Rose-breasted Grosbeak	2
House Wren	1
Purple Finch	1
Tufted Titmouse	1

Table 6. All birds captured during our banding demo for BEAT. We were very excited to catch a Purple Finch.

Figure 16. Seeing backyard birds up close, like House Wren (left) and Gray Catbird (right) drew big smiles.

Mountain Breeding Bird Point Count Surveys

As part of our long-term monitoring effort, we conduct avian point count surveys along the forested peaks and slopes of the South Taconic Massif. This area is a haven for forest birds and is considered a regionally important biodiversity hotspot due to the extent of contiguous forest, variety of forest cover types and topographic complexity. Our aim is to determine the distribution and relative abundance of birds that depend on these mountains for breeding sites. This will serve as an important baseline for our area and allow us to model occupancy in relation to features in the landscape such as vegetation cover and elevation. Over successive years, we will be able to estimate population trends.

Our summer point count season ran from June 5th through July 22nd. This year we surveyed a total of 208 points spanning an area of approximately 40 square miles (25,600 acres), more than doubling our coverage from last year. Our points are spaced out ~200 m from one another, placed along both the South Taconic and Appalachian Trails as well as many of their access trails (Appendix 2). We surveyed each of these points three times throughout the season to account for detection probability.

Hudson Valley from Alander Mtn.

Overall, our top two most-detected species were Ovenbird and Red-eyed Vireo. These species are common in forested areas throughout the Eastern US, and since our sample area is almost entirely forested, it is no surprise to see them well-represented in our dataset. Other commonly encountered forest birds include Scarlet Tanager, Black-throated Blue Warbler, Veery and Black-throated Green Warbler. Interestingly, Eastern Towhee was our third most frequently detected species despite being considered a bird of successional scrub habitat. In our mountains, however, Towhees almost exclusively occupy the unique Bear Oak/Pitch Pine cover that dominates ridgelines. Though much less-frequently encountered, Myrtle Warblers also depend on Oak/Pine scrub and could be considered ridgeline specialists in our area. Some unexpected encounters include a couple of Acadian Flycatchers in the Jug End Valley and on the east slope of Undine and a Red Crossbill flying over the Jug End Ridge. In Appendix 3 we report an overall summary of detections for the entire study area and indicate the highest density site for each species.

Motus Wildlife Tracking System

Motus is an international collaborative research network that uses coordinated automated radio telemetry to help us understand and conserve migratory animals, such as birds. Motus combines individual research projects into a hemispheric network of VHF nanotag receiver stations, allowing researchers to track the movements of flying animals. Since 2017, the Northeast Motus Collaboration has been working to create a Motus array that covers much of New England and the central Appalachians—allowing tracking of any animal wearing a nanotag that passes through this major migration corridor. We are thrilled that a Motus receiver station was installed in the Jug End Valley—well within range of our banding station—on November 15th (Figure 17). This tower will automatically detect any nano-tagged birds moving through our area, sending data to a repository that can be accessed by anyone online. This also opens up opportunities for BBO to deploy Motus tags in support of movement ecology research projects.

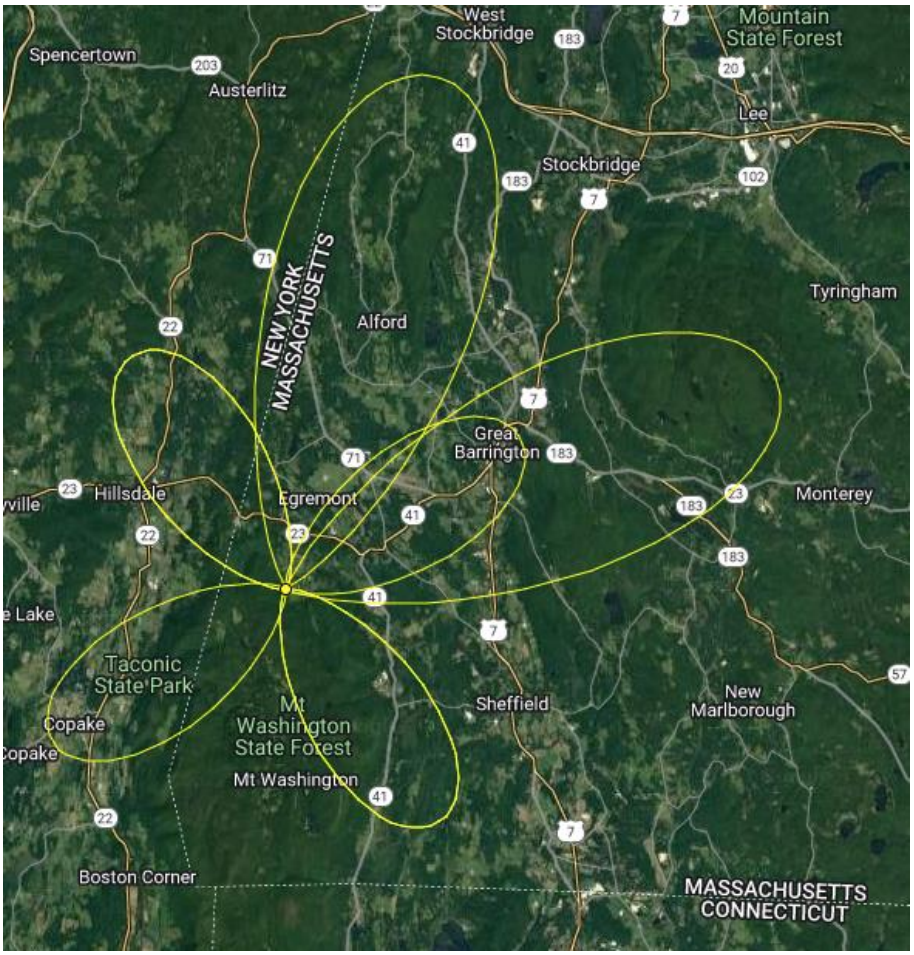


Figure 17. Range of the six antennae on the Motus tower at Jug End. This tower will detect nano-tagged birds as they fly through the Taconics.

Acknowledgements

This pilot year would not have been possible without the support of MassWildlife. Mark Tisa, Eve Schlüter, Drew Vitz and Andrew Madden supported our idea to monitor migration at Jug End—an ideal spot to sample birds as they pass through the south Taconics. Drew Vitz also guided us through the banding permitting process at the state level and provided valuable advice on many aspects of our various projects. Andrew Madden and his crew helped us get set up at Jug End, coming out on multiple days to help clear net lanes. We also thank Kim Peters for consulting with us on our monitoring efforts.

The University of Vermont awarded us a Forest Ecology and Monitoring Cooperative (FEMC) grant. Thank you, Virginia Akabane, Bonnie Costello, Marty Gottron and John Felton, Andrea Panaritis, The Christopher Reynolds Foundation and Eve Waterman for your donations.

We received enthusiastic support from our Berkshire community for our American Kestrel nest box project. Thank you to all of our partners for hosting boxes: Bard College at Simon's Rock, Berkshire Natural Resources Council, Greenagers, Indian Line Farm, MassWildlife, The Schumacher Center for New Economics, Taft Farms, The Nature Conservancy, The Trustees of Reservations, Town of Great Barrington, Town of Tyringham, Turner Farms, John Alexander, the Becker family, Julia Rasch and Carla Turner. Ben Barrett, Carl Nelson and John Tower made us expertly crafted boxes. John Tower, Ben Barrett and Rene Wendell also helped us install boxes and connect with local people interested in helping Kestrels. Art Gingert advised us and designed the kestrel box plans that we use. Thanks again to Drew Vitz for sending us MassWildlife boxes.

Thank you to Berkshire Environmental Action Team (BEAT), the Berkshire Natural History Conference (BNHC), Berkshire Natural Resources Council (BNRC) and The Hoffmann Bird Club (HBC) for inviting us to give a talk at their respective events. You helped us get the word out about BBO.

We are especially grateful to all our volunteers. Cheryl Barrett, Marty Gottron and Barb Sylvester made us beautiful bird bags. Eve Waterman helped us enter data. Will Nickley designed our logo. We were the envy of all other banding operations thanks to the unending supply of delicious homemade treats provided by Cheryl & Ben Barrett, Anne O'Connor, Caroline Pierce, Momo Pierce and others. In addition to those mentioned above, the following kept us company at the banding station and/or helped our operation in various ways: Ann-Elizabeth Barnes, Abigail Dustin, John Felton, Eileen Fielding, Sonja Friman, Nancy Fay, Lynne Harding, Lauren Nicole, Jonathan Pierce, Laura Tabaka, Greg Ward and Rene Wendell. Thank you to anyone we've left out.

Finally, we thank Eleanor Tillinghast and the board of Green Berkshires, Inc. for funding our work and making BBO a reality.

How you can help

All bird observatories depend on the generosity of their supporters to continue operating in the long-term. To help us in our mission to promote bird conservation through sound science and community engagement, please consider making a donation.

$5	Allows us to band a bird
$50	Purchases a Kestrel box post
$150	Replaces a damaged mist-net
$500	Buys a Motus tag
$5,000	Supports an intern for a season
$10,000	Supports a bander for a season
Housing	We are always looking for housing for our seasonal staff

Checks can be made out to Green Berkshires, Inc., P.O. Box 342, Great Barrington, MA 01230. Be sure to specify BBO in any contribution. Green Berkshires is a 501(C)(3) non-profit organization - EIN: 90-0161585.

For more information about giving, please contact Ben Nickley at ben@berkshirebirds.org.

Figure 18. Yellow-throated Vireo (Rowan), Warbling Vireo (Ben) and Blue-headed Vireo (Anna), left to right. Thanks for your support!!!

Appendix 1

Banding totals

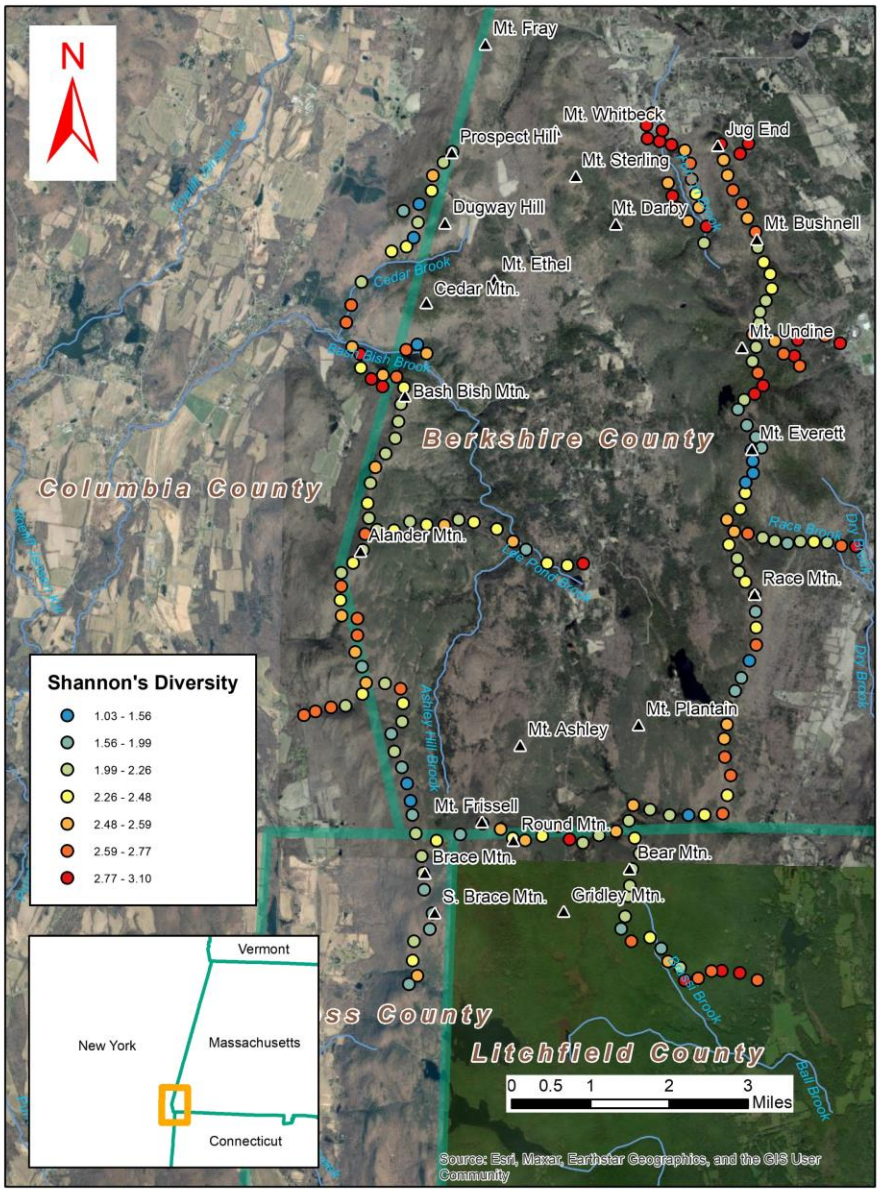
Common_Name	Spring	Summer	Fall	Total
American Goldfinch	22	4	12	38
American Redstart	28	11	49	88
American Robin	27	6	35	68
American Woodcock	0	0	1	1
Baltimore Oriole	19	1	2	22
Barn Swallow	1	0	0	1
Bay-breasted Warbler	2	0	7	9
Belted Kingfisher	1	0	2	3
Black-and-white Warbler	27	8	35	70
Black-billed Cuckoo	4	0	0	4
Black-capped Chickadee	16	6	297	319
Black-throated Blue Warbler	13	4	30	47
Black-throated Green Warbler	6	0	21	27
Blackburnian Warbler	2	0	4	6
Blackpoll Warbler	9	0	10	19
Blue Jay	13	0	28	41
Blue-headed Vireo	3	0	15	18
Blue-winged Warbler	17	3	1	21
Blue-winged Warbler Hybrid	1	0	0	1
Brown Creeper	0	0	5	5
Brown Thrasher	0	0	1	1
Brown-headed Cowbird	3	0	0	3
Canada Warbler	22	0	17	39
Cape May Warbler	0	0	3	3
Carolina Wren	1	4	7	12
Cedar Waxwing	39	2	7	48
Chestnut-sided Warbler	37	1	34	72
Common Yellowthroat	68	39	192	299
Connecticut Warbler	0	0	3	3
Downy Woodpecker	5	5	10	20
Eastern Bluebird	0	0	2	4
Eastern Phoebe	3	2	42	47
Eastern Towhee	7	3	12	22
Eastern Wood-Pewee	0	1	9	10

Field Sparrow	6	0	1	7
Fox Sparrow	3	0	6	9
Golden-crowned Kinglet	7	0	44	51
Gray Catbird	121	40	135	296
Gray-cheeked Thrush	1	0	2	3
Great Crested Flycatcher	1	0	1	2
Hermit Thrush	3	0	52	55
Hooded Warbler	0	0	1	1
House Wren	5	1	20	27
Indigo Bunting	11	0	2	13
Least Flycatcher	8	1	25	34
Lincoln's Sparrow	2	0	9	11
Louisiana Waterthrush	9	1	1	11
Magnolia Warbler	36	0	102	138
Mourning Warbler	4	0	0	4
Myrtle Warbler	3	0	14	17
Nashville Warbler	3	0	18	21
Northern Cardinal	11	2	13	26
Northern Parula	3	0	2	5
Northern Waterthrush	5	0	11	16
Ovenbird	20	15	41	76
Philadelphia Vireo	4	0	15	19
Pileated Woodpecker	1	0	0	1
Prairie Warbler	2	0	4	6
Purple Finch	0	1	0	1
Red-bellied Woodpecker	1	0	0	1
Red-breasted Nuthatch	0	0	1	1
Red-eyed Vireo	26	13	104	143
Red-shouldered Hawk	0	0	1	1
Red-winged Blackbird	22	0	0	22
Rose-breasted Grosbeak	22	8	19	49
Ruby-crowned Kinglet	74	0	171	245
Scarlet Tanager	3	2	1	6
Sharp-shinned Hawk	0	0	1	1
Slate-colored Junco	9	0	17	26
Song Sparrow	26	21	39	86
Swainson's Thrush	17	0	144	161
Swamp Sparrow	12	1	11	24
Tennessee Warbler	5	0	16	21
Traill's Flycatcher	24	6	58	88

Tufted Titmouse	6	8	21	35
Veery	32	9	68	109
Warbling Vireo	4	0	2	6
White-breasted Nuthatch	0	0	1	1
White-throated Sparrow	22	0	60	82
Wilson's Snipe	0	0	1	1
Wilson's Warbler	0	0	5	5
Wood Thrush	11	15	26	52
Worm-eating Warbler	0	0	1	1
Yellow Palm Warbler	1	0	18	19
Yellow Warbler	13	7	1	21
Yellow-bellied Flycatcher	2	0	15	17
Yellow-bellied Sapsucker	12	1	7	20
Yellow-billed Cuckoo	2	1	0	3
Yellow-shafted Flicker	1	0	3	4
Yellow-throated Vireo	0	0	1	1

Appendix 2

Breeding bird survey map*



*Our 208 avian point count locations. The color ramp shows species diversity at each point using Shannon's diversity index.

Appendix 3

Mountain breeding bird survey totals

Common_Name	Most_dense_at	Detections
Acadian Flycatcher	Undine East	3
Alder Flycatcher	Jug End Valley	1
American Crow	Jug End Ridge	2
American Goldfinch	Prospect Hill	15
American Kestrel	Jug End Valley	5
American Redstart	Bear	50
American Robin	Bash Bish	37
Baltimore Oriole	Jug End Valley	8
Barn Swallow	Frissell	14
Black-and-white Warbler	Robert Brook	141
Black-billed Cuckoo	Cedar Brook	2
Black-capped Chickadee	Jug End Ridge	82
Black-throated Blue Warbler	Frissell	120
Black-throated Green Warbler	Race Brook	77
Blackburnian Warbler	Alander North	54
Blue Jay	Round	87
Blue-gray Gnatcatcher	Jug End Ridge	1
Blue-headed Vireo	Alander North	22
Blue-winged Warbler	Jug End Valley	1
Broad-winged Hawk	Undine East	7
Brown Creeper	Race Brook	5
Brown-headed Cowbird	Race Brook	4
Canada Goose	Jug End Ridge	1
Canada Warbler	Round	22
Carolina Wren	Jug End Ridge	1
Cedar Waxwing	Sunset Rock	53
Chestnut-sided Warbler	Frissell	37
Chimney Swift	Undine East	1
Chipping Sparrow	Alander East	6
Common Grackle	Everett	5
Common Raven	Race Ridge	9
Common Yellowthroat	Jug End Valley	32
Downy Woodpecker	Bash Bish	36
Eastern Bluebird	Race Brook	2

Eastern Phoebe	Undine East	19
Eastern Towhee	Brace	223
Eastern Wood-Pewee	Alander North	60
Field Sparrow	Brace	3
Gray Catbird	Round	29
Great Blue Heron	Race Brook	1
Great Crested Flycatcher	Jug End Valley	12
Hairy Woodpecker	Undine East	20
Hermit Thrush	Jug End Ridge	45
House Wren	Jug End Valley	2
Indigo Bunting	Jug End Valley	14
Least Flycatcher	Alander East	1
Louisiana Waterthrush	Cedar Brook	16
Magnolia Warbler	Alander East	1
Mourning Dove	Round	20
Myrtle Warbler	Alander Ridge	37
Nashville Warbler	Alander North	1
Northern Cardinal	Jug End Valley	4
Northern Parula	Jug End Valley	1
Ovenbird	Robert Brook	366
Peregrine Falcon	Bash Bish	1
Pileated Woodpecker	Bear	11
Pine Warbler	Jug End Ridge	9
Prairie Warbler	Alander East	3
Purple Finch	Bear	2
Red Crossbill	Jug End Ridge	1
Red-bellied Woodpecker	Bear	13
Red-breasted Nuthatch	Cedar Brook	13
Red-eyed Vireo	Robert Brook	286
Red-tailed Hawk	Jug End Valley	1
Red-winged Blackbird	Jug End Valley	6
Rose-breasted Grosbeak	Round	43
Ruby-throated Hummingbird	Robert Brook	18
Ruffed Grouse	Alander Ridge	7
Scarlet Tanager	Robert Brook	123
Slate-colored Junco	Undine	28
Song Sparrow	Jug End Valley	8
Tree Swallow	Race Ridge	3
Tufted Titmouse	Race Brook	32
Turkey Vulture	Race Ridge	11

Veery	Round	105
White-breasted Nuthatch	Robert Brook	42
Wild Turkey	Robert Brook	1
Winter Wren	Bash Bish	30
Wood Thrush	Alander North	34
Worm-eating Warbler	Robert Brook	5
Yellow Warbler	Jug End Valley	3
Yellow-bellied Sapsucker	Alander East	70
Yellow-billed Cuckoo	Frissell	20
Yellow-shafted Flicker	Prospect Hill	9
Yellow-throated Vireo	Robert Brook	15

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