

# Pack Monadnock Raptor Observatory Fall 2022 *Final Report*



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## Introduction

The fall 2022 season — our 18th consecutive year — of the Pack Monadnock Raptor Observatory was a resounding success! Our effort and hours were consistent, our visitors were numerous and happy, and folks got to experience quite a bit of migration. The 10,000th migrant raptor of the season was observed on September 25th, an appropriate date for an ‘average’ year. It’s amazing how the 10,000th bird brings a feeling of relief, as if we have something to do with this nearly annual milestone. The seasons without five digits of migrant birds of prey tend to feel long like we are missing something.



**Celebrating our 10,000th raptor with Daniel Lampe, Katrina Fenton, and Levi Burford (left to right). photo © Levi Burford**

The tradition of visiting “Pack” and seeing what flies by on its journey south is becoming nicely rooted in our region of New Hampshire. We see many of the same folks come up each year, and we always welcome many new faces, too. The “Pack Family Reunion” is a fun place to see old friends and hear how the past year went for each other. It’s a fun place to come learn the basics of raptor identification or discuss the finer points of identification at a distance. This year we enjoyed catching up and look forward to seeing everyone again next fall!

## Why Pack Monadnock?

Many raptors migrate long distances to their wintering grounds in Central and South America and shorter distances into interior North America. To conserve energy for the journey, they soar on updrafts created by favorable winds and thermals produced by heat rising from the landscape below. With the wind at their backs, many raptors can travel distances of 250-300 miles in a single day! It is this combination of geography and weather patterns that brings raptors to Pack Monadnock, a more northern and eastern mountain in the Appalachian Mountain range of North America. Because of its high elevation, location along a north-south ridgeline, ease of access with the auto road, and prominent views to the north and west, Pack Monadnock has long been known as an excellent vantage point for observing raptor migration.

## Site Description

The Pack Monadnock Raptor Observatory (PMRO) is located near the summit of Pack Monadnock (2,290 feet) within Miller State Park in Peterborough, NH. Situated in south-central New Hampshire along the scenic and rugged 22-mile long Wapack Range, the Observatory platform offers spectacular views to the north and west, including Mount Washington, the White Mountains, Crotched Mountain, Mount Kearsarge, Mount Cardigan, North Pack Monadnock, Mount Monadnock, and several summits in Vermont. Able to accommodate large crowds during peak season, the observation platform is accessed via a short trail from the parking lot atop the scenic summit. This parking lot can be reached from the 1.5-mile paved auto road that connects to the park's entrance at the base of the mountain from NH 101. For those seeking a less paved route, the observation platform can also be reached from several hiking trails along the mountain. Poor counting weather notwithstanding, the auto road is generally open through Veterans Day (conditions permitting) while the trails are open to hikers during all seasons.



**Harris Center Bird Conservation Director and Hawk Watch Coordinator Phil Brown releases a Broad-winged Hawk on Raptor Release Day (September 18th, 2022).** photo © Levi Burford

## History and Mission

Like many of New Hampshire's mountains, Pack Monadnock has a long and storied history, including hawk watching. However, it was not until 2005 that Pack saw regular coverage and staffing by NH Audubon and it was deemed an official hawk watch site. Founded by NH Audubon under the leadership of Iain MacLeod, with initial funding from the Samuel P. Hunt Foundation, the Monadnock Community Foundation, and the Putnam Foundation, PMRO has since become a fixture of the local community and widely renowned as one of the premier hawk watch locations in New England. In 2017, The Harris Center for Conservation Education partnered with NH Audubon to co-run the site, and in 2022, PRMO came fully under the umbrella of the Harris Center. The raptor observatory is fully funded by private donations by individuals and local businesses, raising enough to staff the hawkwatch with a full-time counter for the fall migration season. Having completed its 18th season, PMRO is one of at least 87 hawk watches located in the Eastern Flyway, which runs the length of the east coast of North America from New Brunswick, Canada all the way to Alabama. Hawk watches along this flyway and throughout North and Central America report data to the online database maintained by PMRO partner organization, the Hawk Migration Association of North America (HMANA): <http://hawkcount.org>. PMRO, owing to both its longevity and its standardized methodology, is now part of a select analysis, contributing data to the Raptor Population Index (RPI), a project of HMANA. The set of raptor migration monitoring sites chosen for the RPI analysis is the "gold standard" for hawk watches, as each contributes key data which are used by conservation biologists to make determinations about global populations of raptors and conservation strategies for them. In this way, PMRO plays a key regional role in this periodic analysis, the most recent of which was completed in 2019. For more information, see <https://www.rpi-project.org>. Along with data collection, PMRO reaches thousands of visitors every fall, introducing many to the grand spectacle of raptor migration and sharing the knowledge and passion of observatory staff and volunteers.

## Education and Outreach

One of the goals of the raptor observatory is to greet school groups and give them a live and direct learning experience with our seasonal migration. This year we introduced 250-300 students from area schools and greeted a few organizations to show off our raptor migration. On hand were several staff members and affiliates to meet and talk about migrating birds of prey and answer any questions the students had. Harris Center staff Teacher-Naturalist Ben King lead the charge along with Community Programs Director and Teacher-Naturalist Susie Spikol and Bird Conservation Director and Bird Conservation Director Phil Brown, making connections between our single location and its place in the eastern flyway and greater continent in terms of migration. Student Conservation Association Intern Kayla Drake and Bird Conservation Intern Will Stollsteimer also assisted with visiting groups.

## Visiting School Groups

- Peterborough Elementary School, Peterborough, NH
- Jaffrey Grade School, Jaffrey, NH
- Harris Center Homeschoolers
- Amherst, NH
- Captain Samuel Douglas Academy, Brookline, NH
- World Academy, Nashua

## Visiting Organizations

- NH Audubon Seacoast Chapter
- Appalachian Mountain Club, Worcester, MA Chapter
- Cub Scouts Pack 99, Goffstown, NH
- Several other unofficial groups

Schools and other organized groups are just a small percentage of the people who come to PMRO. Visitation by State Park patrons exceeded 6,000 folks again this year. The 6,076 visitors to the hawk watch made this the fourth-highest visitation season in the history of the project. Miller State Park's visitor reservation system appears to be giving access to most people who want to observe at the watch. Several of the busiest weekends presented difficulties for access, however, as parking spots at the summit are limited, and foliage season brings an influx of "leaf peepers" to the region. The vistas that make Pack so good for hawk watching also make it largely popular for viewing fall colors. Regardless of whether they came to Pack to hike, take in the scenery, or "raptor peep" with us, everyone who found their way to the raptor observatory was welcome to participate. Observatory staff and volunteers were on hand most days (weather permitting) to answer questions, teach raptor identification, talk about raptor migration and biology, and point out migrants. Informational signs and a board that was kept up to date with daily and season numbers were on display around the clock, giving visitors a chance to interact with the site even outside of the hours of the count.

## Events

### Raptor Release on September 18th

The Raptor Release was spectacular this year with five birds throwing off the shackles of their rehabilitation. About 80 folks were in attendance to see the two American Kestrels, two Broad-winged Hawks, and one Red-tailed Hawk take flight from the gloved hands of our staff and friends.



**Raptor Biologist Katrina Fenton releases a Red-tailed Hawk on Raptor Release Day.**

photo © Levi Burford

## **Big Sit! Birding for All on October 8th**

Once again, Team Paccipiters put in a twelve-hour effort, starting before dawn, and tallying a total of 29 species for the day. We had decent weather for our 14th consecutive year of holding the count from our platform. Historically, 29 species is about average in good weather and poor weather years tend to have below 15 species. Each year we get the choice of Saturday and Sunday but some years we just don't have good weather on either. This year we also held an event called *Birding for All* in conjunction with the Big Sit! We worked to promote an event dedicated to inclusive birding for people of all ages and abilities. The site is always wheelchair accessible and open to folks of all abilities and ages, but we looked to create a special day for it to reach out to folks who might not otherwise know that the hawk watch was open and accessible to them. There was some interest in this new event and hopefully next year will have more attendance.

## **Methods**

Data collection at PMRO has remained largely unchanged over the years. By standardizing the data collection process through a series of established protocols, PMRO has been able to ensure that the data that is collected is of a consistent quality. These protocols have been handed down by each official counter to the next, through the years. The standardization of protocols eliminates unnecessary variables which could impart negative and unforeseen influences on subsequent analyses. What follows is a general accounting of the protocol used for this year's surveys.

An official counter was present daily at the count site from September 1 through November 20, when there was enough visibility to see North Pack Monadnock. The count took place between the hours of 8 a.m. EST and 4 p.m. EST from September 1 through November 5th, then from 9 a.m. EST to 3 p.m. EST from November 6th through November 20th. The switch from Daylight Savings Time to Eastern Standard Time was the marker for the change in hours (which was on the late side this year). On days where the weather forecasts were favorable for good flights the count was extended past the regular hours and an observer made the effort to be there, early and/or late. While some migrating raptors are first detected with the unaided eye, the use of optics is integral to the project; without them, only a small portion would ever be spotted and correctly identified. Thus, most raptors are spotted with the use of 8X or 10X binoculars. Spotting scopes (20X-60X) are also employed and are necessary for scanning distant horizons for "speck birds" that would otherwise slip past undetected. They are also critical for correctly identifying distant migrants, particularly those with challenging IDs (e.g. Accipiters and small falcons). Most of the time, observers scanned with binoculars or the unaided eye and used spotting scopes to confirm identifications. Counters also tune in to the alarm calls of resident songbirds to alert them to raptors that might be slipping through undetected by human observers.

For this project, only raptors deemed actively migrating are counted. This important distinction is determined from a variety of factors including known migration periods for a given species at this site, knowledge of the local individuals based on early season viewing, and finally, the behavior of the individual bird or kettle that is being monitored. Nevertheless, this distinction can be tricky, particularly for such species where local, non-migratory individuals are regularly seen throughout parts of the season. Troublesome species in this regard include Turkey Vulture, Bald Eagle, Northern Goshawk, Red-tailed Hawk, and Merlin. Other challenges occur when individual raptors pause their migration for an hour or a few days to hunt the ridge. All migratory raptor data is collected on an hourly basis for the duration of

the count. This information, along with hourly weather data and a daily summary, is submitted to HawkCount (<https://www.hawkcount.org>), the online hawk watch database for the Hawk Migration Association of North America (HMANA). Copies of this daily report are also submitted to the NH Birds Google Group listserv.

In addition to migrating raptors, daily checklists (including numbers) are kept for other species of birds. This information, along with the raptor total, is then submitted to eBird (<https://ebird.org>), an online database of bird observations that provides scientists, researchers, and amateur naturalists with real-time data about bird distribution and abundance. All checklists are submitted to the 'Miller SP-Pack Monadnock' hotspot (<https://ebird.org/hotspot/L450946>) and some statistics can be viewed on Pack Monadnock's eBird profile (<https://ebird.org/profile/NTM2NDc2>). Daily counts are also made of Monarch Butterflies and to a lesser extent, other migrant butterflies and dragonflies. These numbers are included in the HawkCount daily reports.

## **The 2022 Season**

Once again, we had our usual countable weather for September. Our first month of effort totaled 223 hours of observation time, coming in slightly above average when compared to years with the same season length. Only two days were lost completely to poor weather. Broad-winged Hawks boosted our September total up over 10,000 migrants, the 7th time we've hit that milestone so early in the year. It was the strongest September on record for Bald Eagle migration, and the second-highest for Red-shouldered Hawks and Merlin. Conversely, Ospreys had their poorest showing, with one fewer than the record low set in 2020.

We lost six days in October due to poor visibility which is about average for uncountable days. October tends to be one of our rainier months so our hourly observation time still came in at about average. Turkey Vultures dominated October, though the 400 individuals counted was still well below last year's record-shattering 611. Bald Eagles tied with 2020 for their best October ever. The highlight of the month was the unprecedented Red-shouldered Hawk flight. Throughout the month 246 Red-shouldered were counted, 86 of them on October 29th alone. If you were looking at the region, you might note that Quaker Ridge in Connecticut also had a record red-shouldered flight this season.

November had a lot of southwest wind but had higher than average observation time. The wind direction didn't bring precipitation like the south and southeast winds tend to, but it did bring warmth, haze, and a lack of migrant raptors. Still, the 330 birds counted was above average for the 11 years that the month has had consistent coverage. It was the best November for Northern Goshawks that Pack has had since 2016, with higher numbers of adults than in most years recently. We also had the second-highest Golden Eagle and third-highest Red-tailed Hawk counts for the month for the project. Most noteworthy, a Broad-winged Hawk was photographed on November 2nd, a new late date for the species at the hawk watch and one of the latest dates for this species in New Hampshire overall.



## Species Accounts

With the 18th season under our belt, Pack's growing dataset continues to gain value. For many of the below accounts we compare the current season numbers to the complete dataset since 2005. At some point we will break up the dataset into time periods to look at short-term trends vs. long-term trends. This is the true value of long-term datasets and our data gains more value each year.

### **Black Vulture (*Coragyps atratus*)**

Season Total: 1

High Count: 1 (September 3rd)

18-year Mean: <1      18-year Median: <1

RPI (2009-2019): N/A

Last year we counted our first two Black Vultures in the official history of the count. This year we had another migrant on September 3rd. The bird was in heavy molt and was quite distinctive and was headed southeast. A bird had been observed from the platform earlier in the summer as well. We'll see if this becomes an annual occurrence as we had predicted more than a decade ago.



**Surprisingly airborne even after losing all those feathers, the Black Vulture graced the platform on day three of the regular season of the count.** photo © Levi Burford

### **Turkey Vulture (*Cathartes aura*)**

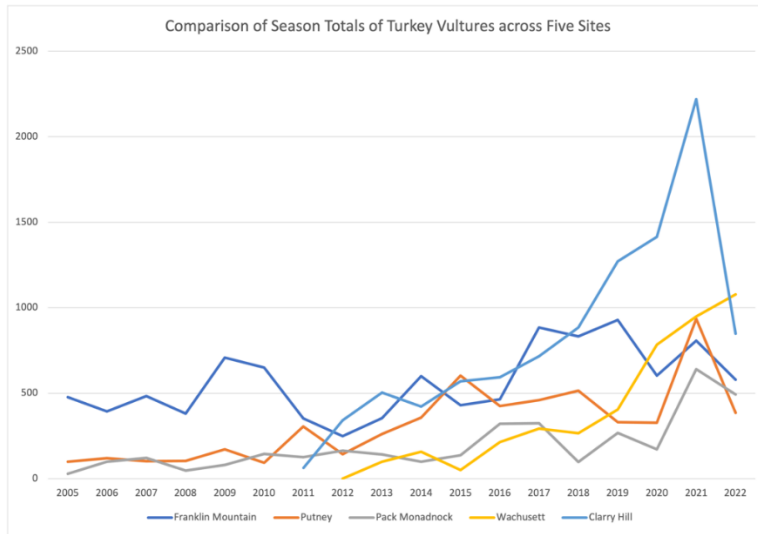
Season Total: 493

High Count: 123 (Oct. 3rd)

18-year Mean: 194      18-year Median: 139

RPI (2009-2019): +8.65% per year

It was, once again, a big year for Turkey Vulture migrants at Pack Monadnock. The season total of 493 comes in at the second highest season total in the history of our project and continues the trend of increasing numbers generally, despite the large decrease from last year's season total. Regionally, sites are showing increasing numbers in the last decade, which are probably signs of an increasing population. Most sites in the northeast United States showed a decrease from the season before but overall, the trends are still increasing.



graph © Levi Burford. (Data taken from Hawkcount.org.)

### Osprey (*Pandion haliaetus*)

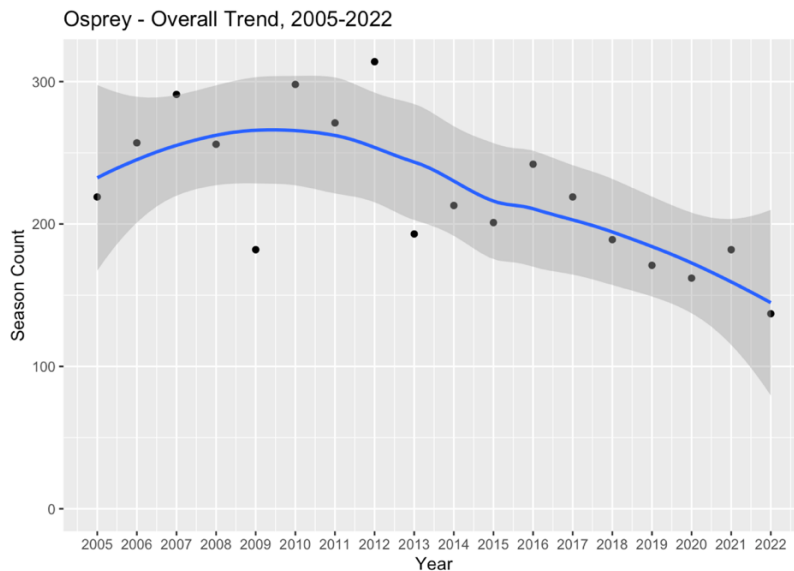
Season Total: 137

High Count: 20 (September 17th)

18-year Mean: 222      18-year Median: 216

RPI (2009-2019): -2.76% per year

While Osprey numbers have been declining at regional hawk watches for the last decade and half at least, this year marked a big decline in numbers observed at Pack Monadnock. This year's total of 137 is the lowest year since the beginning of the count in 2005 and was 45 birds fewer than the year before (25% fewer).



The steady decline in numbers continues. graph © Levi Burford

The suspicion is that the steady increase in Bald Eagle numbers has something to do with the steady decrease in Osprey numbers. Bald Eagles tend to outcompete the Osprey for territory space, predate the young, and steal the Osprey's fish. There is little doubt that the strength of the Bald Eagle population has a strong effect on the Osprey population.

**Bald Eagle (*Haliaeetus leucocephalus*)**

Season Total: 210

High Count: 20 (September 8th)

18-year Mean: 118      18-year Median: 112

RPI (2009-2019): +12.08% per year

For the first time in the last decade, PMRO did not set a season total record for migrant Bald Eagles. The trend has finally been broken. However, November was comparatively mild and there is suspicion that Bald Eagles probably migrated in some numbers after November 20th when we weren't there to observe them. So, the question (as always) is how does the migration data compare to population numbers? In the case of this year, we may not know how many snuck by us after the season ended, but the numbers are still indicative of a strong population in general.



**A young Bald Eagle flies by in November trying to pretend to be a Golden Eagle.**

photo © Levi Burford

## Northern Harrier (*Circus hudsonius*)

Season Total: 84

High Count: 10 (October 30th)

18-year Mean: 85      18-year Median: 86

RPI (2009-2019): -3.15% per year

PMRO's Northern Harrier numbers came in at about average this year and for the third year in a row we made a good effort to age and sex our harrier migrants. Counters were able to age over 85% of the birds, keeping our three-year average above 80% aged/sexed.

Year	Of the Season Total		Of Those Aged		
	% Aged	% Brown	% AHY Male	% Adult Female	% Juvenile
2020	78.7	4.6	16.47	10.59	72.94
2021	80	9.4	23.53	13.24	63.24
2022	85.7	3.6	13.89	8.33	77.78

**Table comparing the last three years' efforts to age Northern Harriers. AHY means "After Hatch Year" as it is still suspected that second year males often have a mostly gray plumage but aren't quite sexually mature (hence the reason we aren't calling it "adult.")**

Looking at our percentage of juveniles this year's proportion was higher than last year by a significant margin (77% in 2022, 63% in 2021). We have been noticing an alignment between the good years of breeding in northern New Hampshire and the overall proportion of juveniles that we see in migration at Pack Monadnock. 2021 was a relatively poor year for productivity in New Hampshire and our juvenile percentage was quite a bit lower than 2020 and 2022 which were better years for productivity. The hypothesis is that years of good productivity in NH might correlate well with regional productivity and years of good regional productivity are shown in a higher percentage of juveniles observed flying by the site. This is still a very small dataset so time will tell if this is approximately correct or if it is a giant reach. What would be helpful is efforts to gauge productivity in Maine and Quebec during the breeding season to tell for sure.

## Sharp-shinned Hawk (*Accipiter striatus*)

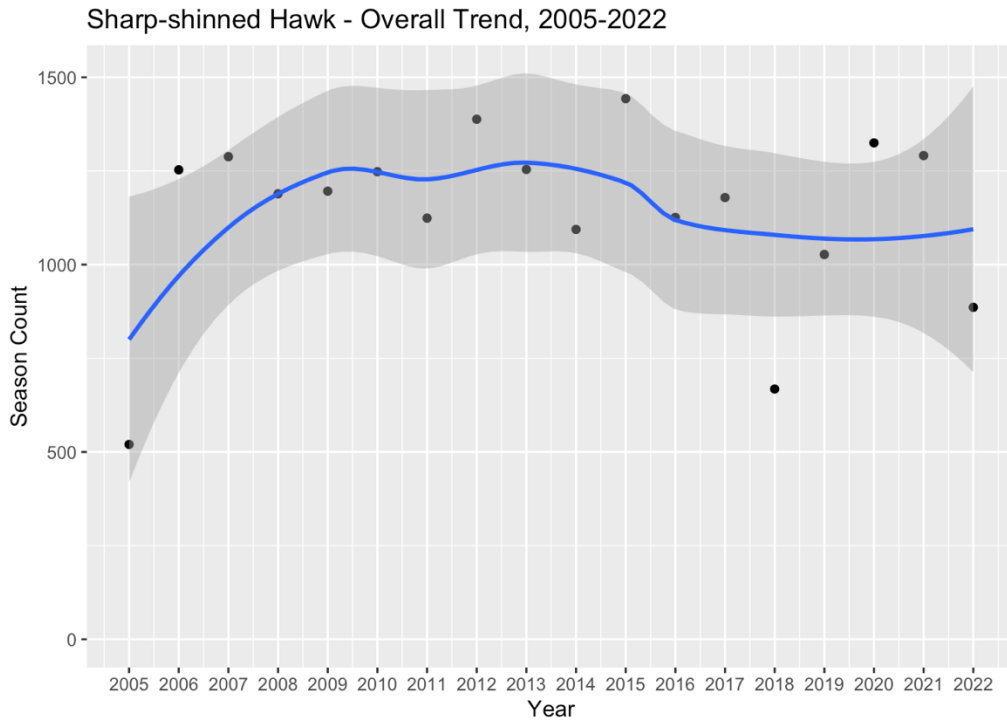
Season Total: 886

High Count: 71 (September 12th)

18-year Mean: 1,138      18-year Median: 1,192

RPI (2009-2019): -2.47% per year

This was a low year for Sharp-shinned Hawk numbers. Our observations seemed to shut down in November which might reflect the southwest wind that was attacking the region, making migration at ridge level difficult. The many days of good wind direction (winds from the west through north) had wind strengths a bit too strong for decent Sharp-shinned Hawk flights. We suspect that we probably missed a lot of "Sharpies" flying below the observation height of the observatory in the lighter winds at lower elevation.



graph © Levi Burford

**Cooper’s Hawk (*Accipiter cooperii*)**

Season Total: 149

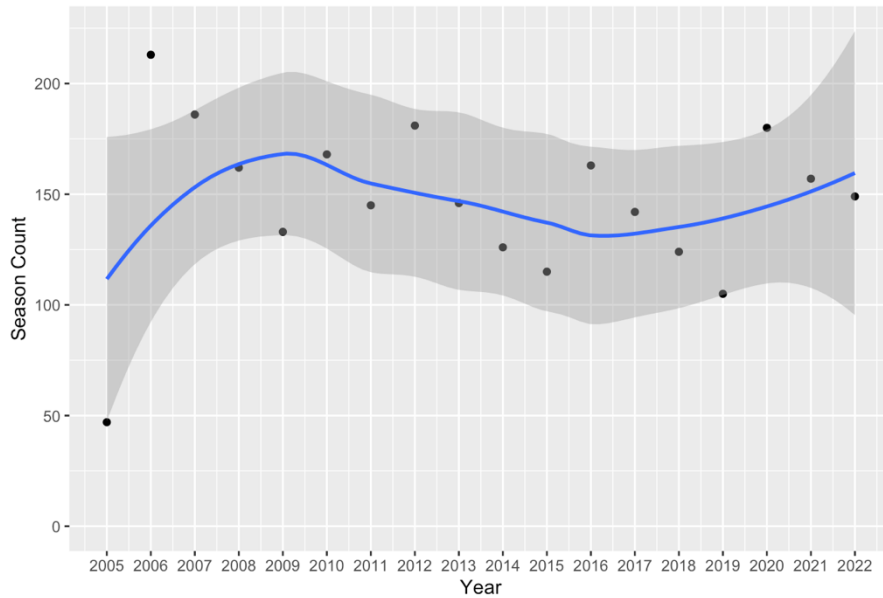
High Count: 11 (September 16th and 21st)

18-year Mean: 146      18-year Median: 147

RPI (2009-2019): -1.98% per year

Admittedly, it was a little harder to determine whether birds were migrants this year. The counter had to keep track of individual differences as it seemed like birds were hanging around to hunt near the platform more than usual. The locals needed to be communicated from one counter to another. But our best attempt at keeping track of the migrants came out to a hair above our 18-season average. It will be interesting to see what the next RPI number crunch brings in terms of a trend. It seems like the 10-year trend is still continuing slightly downward.

Coopers Hawk - Pack Monadnock Overall Trend, 2005-2022



graph © Levi Burford

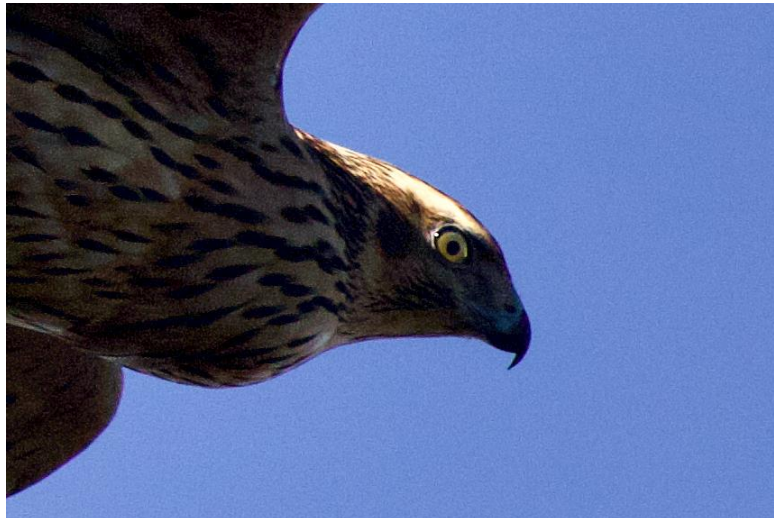
### Northern Goshawk (*Accipiter gentilis*)

Season Total: 22

High Count: 3 (October 29th and 30th)

18-year Mean: 30      18-year Median: 23

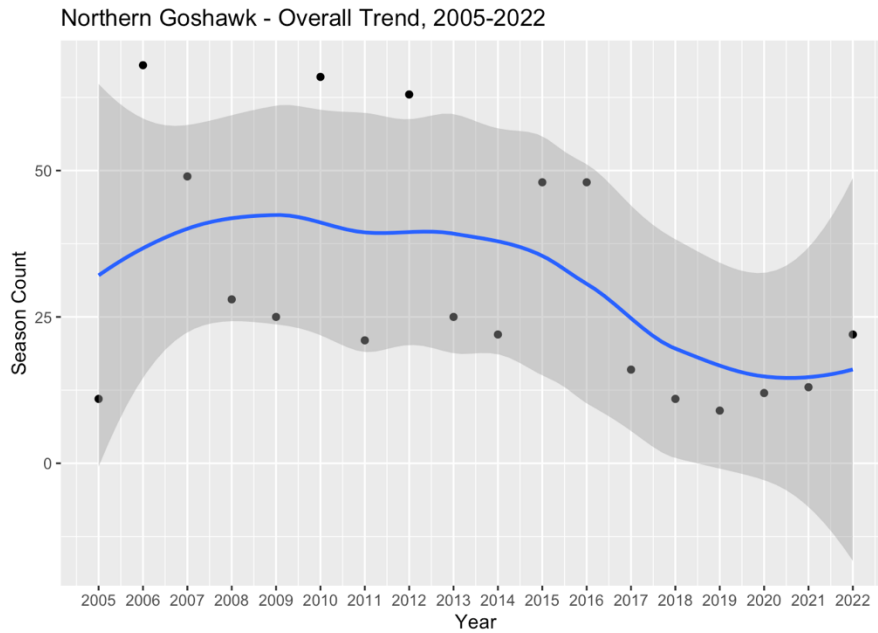
RPI (2009-2019): -11.49% per year



**The striking eye-stripe of a juvenile Northern Goshawk. The full crop indicates a bird that is no longer hungry.** photo © Mark Timmerman

This year's Northern Goshawk count was the highest it's been since 2016 (when we had drastically more migrants, 48 counted). Still, it was heartening to have as many as we did after five years of 9 to 16 birds counted each year. It was noted, anecdotally, that in northern New Hampshire and western Maine there

was an abundance of Snowshoe Hare and Ruffed Grouse this year. Perhaps there was good productivity this year. Most Northern Goshawk migrants this year were juveniles, though we did have a small push of adults in November which likely continued after our season ended.



**While this year's count was a little higher than the last few, the overall trend is still downward. Both the 18- and 10- year trends show this.** graph © Levi Burford

**Red-shouldered Hawk (*Buteo lineatus*)**

Season Total: 301 \*Season high  
 High Count: 86 (October 29th) \*Single-day high  
 18-year Mean: 137      18-year Median: 124  
 RPI (2009-2019): +3.46% per year



**This juvenile Red-shouldered Hawk shows itself off in nice lighting.** photo © Mark Timmerman

After two years in a row of 223 Red-shouldered Hawks we cruised through to break the 300-bird mark with a total of 301 migrants observed this year! This is the first time in the history of the project that we have counted more Red-shouldered Hawks than Red-tailed Hawks as migrants. More than half of the flight (174 birds) was concentrated in a three-day window between 10/28 and 10/30. It felt like an aftershock of Broad-winged week, with kettles of up to nine “Shoulders” bubbling up at a time, taking advantage of a string of days with excellent migration weather.

### **Broad-winged Hawk (*Buteo platypterus*)**

Season Total: 9,369

High Count: 4,987 (September 17th)

18-year Mean: 8,486      18-year Median: 8,030

RPI (2009-2019): +3.25% per year

We like to look at New England Hawk watches together when considering Broad-winged Hawk migration. From west to east lie Putney Mountain, Pack Monadnock, Mount Watatic, and Mount Wachusett. Some years the mass of Broad-winged Hawk migration is to the west and Putney has a great count, while other years the mass is to the east and Wachusett sees great numbers. Pack Monadnock, being a ridge site in between the west and the east tends to have the most consistency from year to year. This year the strong west and northwest winds from September 14th through 16th set up the eastern hawk watches nicely for the kettles. On September 17th (our historically best day of the season) Pack Monadnock came shy of breaking the single-day record set back in 2011 by just a few hundred birds. Most of the action came from the east and the following few days proved to be tremendous at Watatic (breaking their single-day high) and Wachusett.



Also of note was a new record for the latest Broad-winged Hawk at Pack Monadnock! On November 2nd a solitary juvenile tried to sneak by the platform but was well documented by Mark Timmerman. October 25th of 2020 was the latest date upon which we'd observed a Broad-winged Hawk (there were two that day!) at Pack Monadnock prior to this new record.



**A juvenile Broad-winged Hawk flies to the west of the platform on November 2nd. The latest we've observed a Broad-winged Hawk at the watch.** photo © Mark Timmerman

### **Red-tailed Hawk (*Buteo jamaicensis*)**

Season Total: 299

High Count: 56 (November 7th)

18-year Mean: 327      18-year Median: 314

RPI (2009-2019): **-8.79% per year**

This year, PMRO came in just shy of 300 migrant Red-tailed Hawks. This continues the steady decline that we have been documenting at Pack Monadnock (and throughout the northeastern United States as well). The finger of suspicion still points at decreased numbers of migrants and not at a decreasing population. Mild winters have made for better hunting possibilities for this lover of open areas.

Red-tailed Hawk migration is always hit or miss, hence the need for long-term datasets. The largest variable affecting Red-tailed migration seems to be snow to our north. In years when there is early snow to our north, hunting rodents is difficult and we see greater numbers of migrants. This year we had a mild first half of November, and the unanswered question is how many Red-tailed Hawks migrated after our November 20<sup>th</sup> end date when conditions to our north deteriorated for their hunting?

### **Rough-legged Hawk (*Buteo lagopus*)**

Season Total: 0

High Count: N/A

18-year Mean: <1      18-year Median: 0

RPI (2009-2019): N/A

We missed out on getting a Rough-legged Hawk at the hawk watch again this year. These somewhat "irruptive" migrants aren't quite annual at Pack Monadnock.

## **Golden Eagle (*Aquila chrysaetos*)**

Season Total: 11

High Count: 2 (November 2nd)

18-year Mean: 8            18-year Median: 7

RPI (2009-2019): N/A



**Nice close Golden Eagle on November 12th. See the photo of the Bald Eagle for a good comparison in profiles from this angle.** photo © Levi Burford

It is always a good year to have more than our average of Golden Eagles. This year we kicked things off earlier than usual with our first Golden migrating through on September 21st. This is the earliest in the history of the project that we have had a representative of the 'True Eagles'. PMRO also closed out the year right with a Golden Eagle one each of the last four days of the count. The counters didn't complain. While we average eight a year, Golden Eagles are the "spice" that keeps November tasting so good.

## **American Kestrel (*Falco sparverius*)**

Season Total: 175

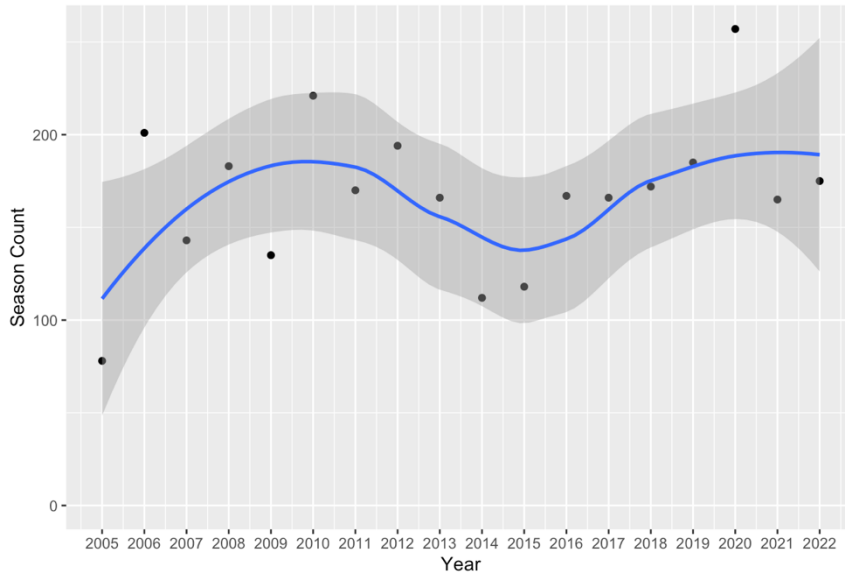
High Count: 28 (October 2nd)

18-year Mean: 167            18-year Median: 168

RPI (2009-2019): +1.01% per year

It was a slightly above-average year for American Kestrels. Our high day on October 2nd was the fifth highest count in the history of the count since 2005 and the sixth highest since 2003. Over the years there has been a lot of fluctuation with kestrel numbers.

American Kestrel - Pack Monadnock Overall Trend, 2005-2022



graph © Levi Burford

Similar trends are noted in regional hawk watch sites as well. We expect the next Raptor Population Index will show a 10-year increasing trend once again, perhaps in response to increased conservation efforts.

**Merlin (*Falco columbarius*)**

Season Total: 130

High Count: 9 (September 8th)

18-year Mean: 89      18-year Median: 89

RPI (2009-2019): -0.60% per year



**A Merlin cruising for a junco snack.** photo © Levi Burford

It was another good year for Merlin. With 130 counted, this was the third-highest year in the history of the project. While the 2009-2019 RPI shows a decreasing trend, it should change to an increasing trend on the next big crunch of the numbers. Trends for regional hawk watches show a 10-year increase in migrant Merlin as well. It would seem that the Merlin population is doing well regionally, which anecdotal evidence supports as well, as this species has been found breeding further to the south in recent years.

**Peregrine Falcon (*Falco peregrinus*)**

Season Total: 44

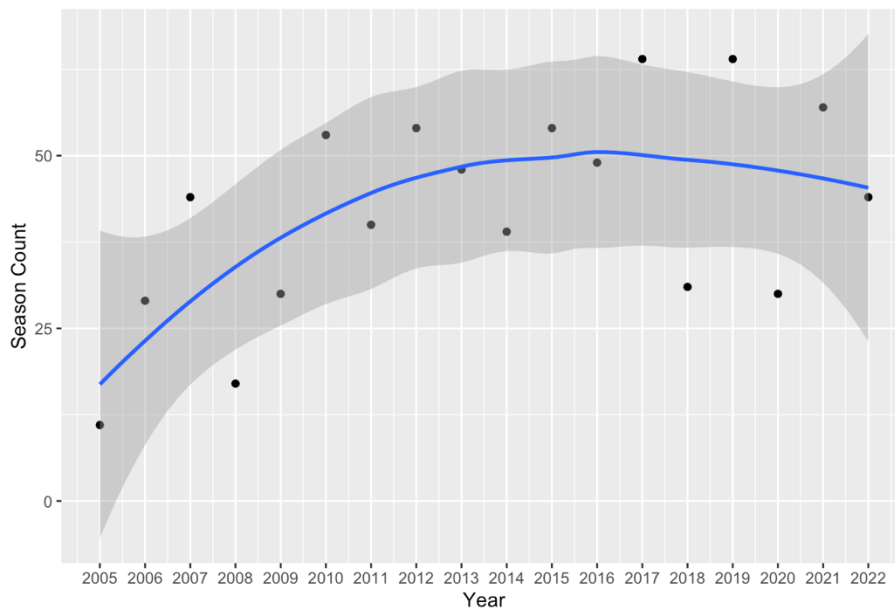
High Count: 6 (October 15th)

18-year Mean: 42      18-year Median: 44

RPI (2009-2019): +3.56% per year

The 2022 season total of 44 Peregrine Falcons weighs in at slightly above average. In the last few years there have been large swings in the season totals that we have tallied each year.

Peregrine Falcon - Overall Trend, 2005-2022



graph © Levi Burford

We’re not really sure what is going on, but possibilities are the usual population swings, weather issues, or sneaking by late in the day after the observers leave. Peregrines are strong fliers and can migrate in adverse weather as well so they can migrate on days when we aren’t observing due to lack of visibility. Still, with a mean average of 42 birds it doesn’t take too many birds to make a difference anyway.

## Non-Raptor Species

The 2022 season was a good year for the observation of other species of birds as well. All told, a sum of 96 non-raptor species were viewed from the platform which is on the high side for a yearly species total.

This year's specialties include our first count records for Baltimore Oriole and Red-throated Loon. Both flew right over the platform, providing the observers with excellent views. The Red-throated Loon was in a group with four Common Loons, which provided good comparison of size and shape.

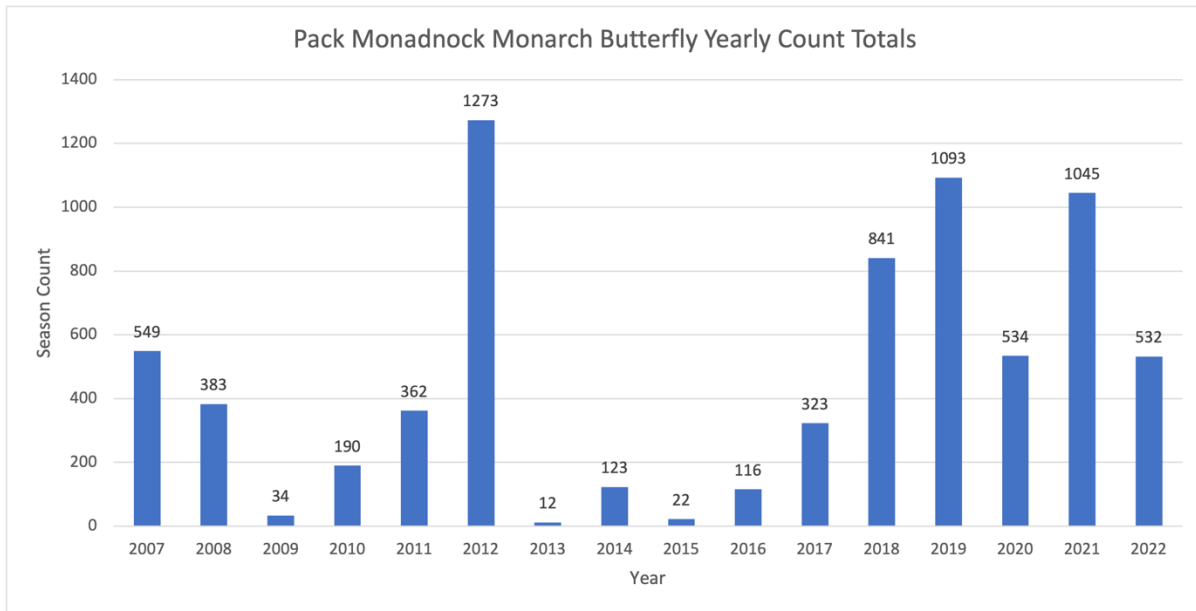


**The Boreal Chickadee made a brief appearance at the watch.** photo © Levi Burford

One more special bird of the year was the observation on several days of a Boreal Chickadee. It is interesting to note that we have had one or more Boreal Chickadees observed in three out of the last five seasons (2018, 2020, 2022). This makes the fifth season since 2005 that we have had a Boreal Chickadee at the hawk watch (the other two seasons being 2005 and 2008).

PMRO had a light irruption year for finches and other 'irruptives' like a solitary Bohemian Waxwing that landed in a tree next to the watch. We had small numbers of Red and White-winged Crossbill, Pine Grosbeaks, Evening Grosbeaks, Pine Siskins, American Goldfinches, and single Common Redpoll.

A total of 532 Monarch Butterflies were observed in migration at Pack Monadnock this year. This was far from any sort of record. It sits around middle of the pack in terms of season totals. The local drought to southern New Hampshire is suggested as a possible reason for the low migration numbers. Migrant Monarchs weren't able to nectar efficiently and were delayed a little longer than if the flowers had been fresh around September 9<sup>th</sup> when the beginning of the peak of Monarch migration is expected.



graph © Levi Burford

## Acknowledgements

First and foremost, thank you to the many organizations and entities involved with the continued success of this project, especially the Harris Center for Conservation Education, Miller State Park, and the NH Division of Natural and Cultural Resources, Department of Parks and Recreation. Thanks goes to our project supporters and champions, those ‘sustaining donors’ who have contributed time and time again, and to those who made their first gift this year. The pool of community and other business sponsors continues to grow and strengthen as well. As in past years, major support came from the Gilbert Verney Foundation, without whom it would be difficult to provide dedicated outreach and education each year. Many thanks to Nature’s Green Grocer, which again selected the PMRO as a seasonal recipient of their Green Giving Program. Finally, to all who made donations onsite, and leveraged funds in other ways, we thank you greatly.

Furthermore, many thanks to Phil Brown for coordinating this site and for serving as the driving force for its continued success. Thank you to Julie Brown for sharing the duties of official counter with Phil on Tuesdays. Thank you to Norma Reppucci, Park Manager at Miller State Park, for her heartfelt support of Pack Monadnock Raptor Observatory. Things wouldn’t have run as smoothly at the Observatory without the procedures the State Park and its staff were following.

More very special thanks to Iain MacLeod and Henry Walters for being the official counters on Mondays, and to Mark Timmerman and Will Stollsteimer for their coverage of Wednesdays through the entire season, and to Tom Delaney for filling in as much as possible. They each had some good days and bad days up there and we are grateful that we still have experienced past-counters willing to come up for a few days every year and help with the data collection.

Finally, the strength of the numbers comes from the number of dedicated volunteers who come out and help spot and identify the birds. We would like to extend a heartfelt thank you to those below for your diligence and good company through both the good times and the bad:

Holly Bauer, Julie Brown, Phil Brown, Laurel & Alden Brown, Levi Burford, Michael Burgess, Meade Cadot, Chuck Carlson, Jack and Cathy Carson, Betsy Chadwick, Alan Chretien, Glen Chretien, Lori-Ann Chretien, Jerry Coffey, Zeke Cornell, Erin Costello, Karen Creegan, Dot Currier, Ben Davis, Janet Delaney, Tom Delaney, Kim Dupuis, David Fenton, Katrina Fenton, Sandy Fenton, Miki Foley, Rich Frechette, John Garrison, Mike Gebo, Melanie Haber, Nora Hanke, Mary Hoffheimer, Bob and Malcolm Holt, Karen Kambol, Ben King, Danielle Lampe, Nick Landers, Kat Lauer, Eric Masterson, Amy Maurer, Jim McCoy, Chris McPherson, Steve Mirick, Tom Momeyer, Andre Moraes, Nancy Moreau, Millie Mugica, Judd Nathan, Lisa Nelson, Quinn Nial, Cynthia Nichols, Kevin O'Neill, Nan O'Neill, Pauline Otterson, Cal Peterka, Jeannie Peterka, Jim Pinfold, John Ranta, Jason Ruckdeshel, Brian Rusnica, Bill Ryerson, Cliff Seifer, Hillary Siener, Betsy Smith, Gordon Smith, Kim Snyder, Scott Spangenberg, Susie Spikol, Will Stollsteimer, David Teubner, Mark Timmerman, Francie Von Mertens, Henry Walters, Tom Warren, Barry Wicklow, Mark Wilson, Chad Witko, Jon Wolf, and Van Zimmer.

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## Appendix

**Table I – All Seasonal Data from Pack Monadnock Raptor Observatory**

Year	Obs. Hrs	B V	TV	OS	BE	NH	SS	CH	NG	RS	BW	RT	RL	GE	AK	ML	PG	UA	UB	UF	UE	UR	S W	S E	Yearly Total
2005	330	0	29	219	52	24	520	47	11	23	3978	122	0	5	78	40	11	4	7	5	4	42	0	0	5221
2006	408	0	99	257	55	77	1253	213	68	46	7595	407	0	11	201	48	29	7	4	2	1	62	0	0	10,435
2007	430	0	121	291	53	121	1288	186	49	112	7776	263	0	5	143	90	44	9	2	3	0	68	0	0	10,624
2008	436	0	47	256	50	87	1189	162	28	67	6835	254	0	3	183	59	17	5	8	2	2	20	0	0	9274
2009	421	0	80	182	51	88	1196	133	25	129	4322	421	0	6	135	56	30	8	14	8	2	77	0	0	6963
2010	628	0	145	298	85	115	1248	168	66	109	7606	410	0	10	221	147	53	17	10	5	3	70	0	0	10,786
2011	368	0	127	271	54	58	1124	145	21	43	11831	202	0	9	170	68	40	14	6	4	0	69	0	0	14,256
2012	601	0	164	314	105	91	1388	181	63	209	8848	522	1	7	194	108	54	7	4	2	2	59	1	0	12,324
2013	575	0	142	193	101	100	1254	146	25	118	8221	378	1	11	166	89	48	10	2	1	3	20	0	1	11,030
2014	497	0	99	213	120	85	1094	126	22	123	11043	348	1	7	112	80	39	5	6	6	2	34	0	0	13,565
2015	587	0	137	201	132	124	1443	115	48	141	16593	546	1	13	118	120	54	3	5	5	2	42	1	0	19,844
2016	527	0	322	242	136	92	1126	163	48	117	10530	294	1	5	167	96	49	6	4	3	2	63	0	0	13,466
2017	515	0	324	219	163	82	1179	142	16	181	8744	341	2	7	166	106	64	6	6	4	1	51	0	0	11,804
2018	455	0	98	189	176	64	668	124	11	126	6756	246	2	22	172	58	31	16	18	10	1	63	0	0	8851
2019	558	0	268	171	180	54	1027	105	9	181	7840	220	0	4	185	64	64	15	14	4	0	95	0	0	10,500
2020	558	0	172	162	185	108	1325	180	12	223	8815	293	0	5	257	143	30	11	25	2	2	82	0	0	12,032
2021	548	2	641	182	227	85	1291	157	13	223	6055	329	1	11	165	100	57	7	5	2	4	48	0	0	9605
2022	553	1	493	137	210	84	886	149	22	302	9368	300	0	11	175	130	44	2	12	1	0	43	0	0	12,370
<b>Total</b>	<b>8993</b>	<b>3</b>	<b>3508</b>	<b>3997</b>	<b>2135</b>	<b>1539</b>	<b>20499</b>	<b>2642</b>	<b>557</b>	<b>2472</b>	<b>152757</b>	<b>5896</b>	<b>10</b>	<b>152</b>	<b>3008</b>	<b>1602</b>	<b>758</b>	<b>152</b>	<b>152</b>	<b>69</b>	<b>31</b>	<b>1008</b>	<b>2</b>	<b>1</b>	<b>202,950</b>
<b>Avg.</b>	<b>500</b>	<b>0</b>	<b>194</b>	<b>222</b>	<b>118</b>	<b>86</b>	<b>1138</b>	<b>146</b>	<b>31</b>	<b>137</b>	<b>8486</b>	<b>328</b>	<b>0</b>	<b>8</b>	<b>167</b>	<b>89</b>	<b>42</b>	<b>8</b>	<b>8</b>	<b>4</b>	<b>2</b>	<b>56</b>	<b>0</b>	<b>0</b>	<b>11,275</b>



**Table 2 – All Avian Observations from Pack Monadnock Raptor Observatory**

	<b>Common Name – <i>Scientific Name</i></b>	<b>First Seen</b>	<b>Last Seen</b>	<b>High Count</b>	<b>High Date</b>	<b>Total Obs.</b>
1	Canada Goose - <i>Branta canadensis</i>	9/15/22	11/20/22	787	9/24/22	2667
2	Common Merganser - <i>Mergus merganser</i>	11/17/22	11/19/22	4	11/19/22	6
3	Wild Turkey - <i>Meleagris gallopavo</i>	10/23/22	10/23/22	4	10/23/22	4
4	Ruffed Grouse - <i>Bonasa umbellus</i>	10/6/22	10/6/22	1	10/6/22	1
5	Rock Pigeon (Feral Pigeon) - <i>Columba livia</i> (Feral Pigeon)	9/24/22	9/24/22	1	9/24/22	1
6	Mourning Dove - <i>Zenaidura macroura</i>	8/27/22	9/21/22	5	9/7/22	34
7	Common Nighthawk - <i>Chordeiles minor</i>	9/7/22	9/7/22	2	9/7/22	2
8	Chimney Swift - <i>Chaetura pelagica</i>	8/13/22	9/18/22	15	9/12/22	40
9	Ruby-throated Hummingbird - <i>Archilochus colubris</i>	9/1/22	9/18/22	9	9/10/22	61
10	Greater/Lesser Yellowlegs - <i>Tringa melanoleuca/flavipes</i>	9/11/22	9/11/22	2	9/11/22	2
11	shorebird sp. - <i>Charadriiformes sp.</i>	9/17/22	9/17/22	4	9/17/22	4
12	Herring Gull - <i>Larus argentatus</i>	9/8/22	11/8/22	13	10/30/22	30
13	gull sp. - <i>Larinae sp.</i>	10/2/22	10/2/22	2	10/2/22	2
14	Red-throated Loon - <i>Gavia stellata</i>	10/29/22	10/29/22	1	10/29/22	1
15	Common Loon - <i>Gavia immer</i>	9/17/22	11/18/22	8	10/29/22	18
16	Double-crested Cormorant - <i>Nannopterum auritum</i>	9/7/22	10/15/22	30	10/2/22	53
17	Black Vulture - <i>Coragyps atratus</i>	9/3/22	9/3/22	1	9/3/22	1
18	Turkey Vulture - <i>Cathartes aura</i>	8/13/22	11/19/22	123	10/3/22	719
19	Osprey - <i>Pandion haliaetus</i>	8/13/22	10/30/22	20	9/17/22	137
20	Golden Eagle - <i>Aquila chrysaetos</i>	9/21/22	11/20/22	2	11/2/22	11
21	Northern Harrier - <i>Circus hudsonius</i>	9/1/22	11/20/22	10	10/30/22	84
22	Sharp-shinned Hawk - <i>Accipiter striatus</i>	8/13/22	11/7/22	71	9/12/22	891
23	Cooper's Hawk - <i>Accipiter cooperii</i>	8/13/22	11/14/22	12	9/16/22	153
24	Sharp-shinned/Cooper's Hawk - <i>Accipiter striatus/cooperii</i>	9/7/22	9/7/22	1	9/7/22	1
25	Northern Goshawk - <i>Accipiter gentilis</i>	8/27/22	11/19/22	4	10/29/22	26
26	Accipiter sp. - <i>Accipiter sp.</i>	9/10/22	11/9/22	1	11/9/22	2
27	Bald Eagle - <i>Haliaeetus leucocephalus</i>	8/27/22	11/20/22	20	9/8/22	237
28	Red-shouldered Hawk - <i>Buteo lineatus</i>	9/1/22	11/20/22	86	10/29/22	309
29	Broad-winged Hawk - <i>Buteo platypterus</i>	8/13/22	10/3/22	4987	9/17/22	9375
30	Red-tailed Hawk - <i>Buteo jamaicensis</i>	8/13/22	11/24/22	56	11/7/22	441
31	Buteo sp. - <i>Buteo sp.</i>	9/28/22	11/19/22	3	11/19/22	11
32	hawk sp. - <i>Accipitridae sp. (hawk sp.)</i>	11/8/22	11/8/22	2	11/8/22	2
33	Barred Owl - <i>Strix varia</i>	9/9/22	10/8/22	1	10/8/22	3
34	Yellow-bellied Sapsucker - <i>Sphyrapicus varius</i>	9/17/22	9/17/22	1	9/17/22	1
35	Downy Woodpecker - <i>Dryobates pubescens</i>	9/7/22	11/18/22	1	11/18/22	19
36	Hairy Woodpecker - <i>Dryobates villosus</i>	9/3/22	11/19/22	2	9/17/22	35
37	Pileated Woodpecker - <i>Dryocopus pileatus</i>	9/3/22	11/19/22	1	11/19/22	18
38	Northern Flicker - <i>Colaptes auratus</i>	9/12/22	9/30/22	7	9/29/22	24
39	American Kestrel - <i>Falco sparverius</i>	8/27/22	10/22/22	28	10/2/22	176
40	Merlin - <i>Falco columbarius</i>	8/27/22	11/1/22	9	9/8/22	133
41	Peregrine Falcon - <i>Falco peregrinus</i>	9/3/22	10/27/22	6	10/15/22	46
42	Peregrine Falcon (Tundra) - <i>Falco peregrinus calidus/tundrius</i>	10/22/22	10/22/22	1	10/22/22	1
43	falcon sp. - <i>Falco sp.</i>	10/2/22	11/8/22	1	11/8/22	2

44	diurnal raptor sp.- Accipitriformes/Falconiformes sp.	8/29/22	11/20/22	3	10/29/22	41
45	Eastern Wood-Pewee - Contopus virens	9/2/22	9/25/22	2	9/9/22	7
46	Empidonax sp. - Empidonax sp.	9/7/22	9/7/22	2	9/7/22	2
47	Eastern Phoebe - Sayornis phoebe	9/2/22	9/18/22	1	9/18/22	5
48	Blue-headed Vireo - Vireo solitarius	9/10/22	10/16/22	1	10/16/22	5
49	Philadelphia Vireo - Vireo philadelphicus	9/11/22	9/13/22	1	9/13/22	2
50	Red-eyed Vireo - Vireo olivaceus	9/1/22	9/11/22	3	9/11/22	8
51	Blue Jay - Cyanocitta cristata	8/13/22	11/19/22	78	9/25/22	399
52	American Crow - Corvus brachyrhynchos	8/27/22	11/18/22	293	10/28/22	466
53	Common Raven - Corvus corax	8/13/22	11/24/22	28	10/6/22	565
54	Black-capped Chickadee - Poecile atricapillus	8/13/22	11/24/22	15	11/18/22	392
55	Boreal Chickadee - Poecile hudsonicus	10/28/22	10/30/22	1	10/30/22	2
56	Tufted Titmouse - Baeolophus bicolor	9/27/22	11/9/22	1	11/9/22	16
57	Tree Swallow - Tachycineta bicolor	8/13/22	9/18/22	8	9/17/22	18
58	Bank Swallow - Riparia riparia	9/1/22	9/1/22	1	9/1/22	1
59	Barn Swallow - Hirundo rustica	9/10/22	9/11/22	1	9/11/22	2
60	swallow sp. - Hirundinidae sp.	9/14/22	9/14/22	4	9/14/22	4
61	Ruby-crowned Kinglet - Corthylio calendula	9/9/22	11/6/22	5	10/1/22	56
62	Golden-crowned Kinglet - Regulus satrapa	8/13/22	11/15/22	7	9/12/22	105
63	Red-breasted Nuthatch - Sitta canadensis	8/27/22	11/18/22	7	10/6/22	133
64	White-breasted Nuthatch - Sitta carolinensis	9/10/22	11/20/22	1	11/20/22	7
65	Brown Creeper - Certhia americana	9/17/22	11/3/22	1	11/3/22	7
66	House Wren - Troglodytes aedon	9/10/22	9/10/22	1	9/10/22	1
67	Winter Wren - Troglodytes hiemalis	9/2/22	11/7/22	1	11/7/22	6
68	Eastern Bluebird - Sialia sialis	10/22/22	11/11/22	8	10/28/22	12
69	Swainson's Thrush - Catharus ustulatus	10/1/22	10/1/22	1	10/1/22	1
70	Hermit Thrush - Catharus guttatus	9/25/22	10/30/22	1	10/30/22	7
71	American Robin - Turdus migratorius	8/13/22	11/3/22	21	9/7/22	66
72	Bohemian Waxwing - Bombycilla garrulus	10/28/22	10/28/22	1	10/28/22	1
73	Cedar Waxwing - Bombycilla cedrorum	8/13/22	10/4/22	10	9/9/22	69
74	American Pipit - Anthus rubescens	9/17/22	9/17/22	2	9/17/22	2
75	Evening Grosbeak - Coccythraustes vespertinus	10/23/22	11/18/22	3	11/5/22	10
76	Pine Grosbeak - Pinicola enucleator	11/7/22	11/10/22	3	11/7/22	4
77	Purple Finch - Haemorhous purpureus	9/7/22	10/28/22	32	10/16/22	72
78	Common Redpoll - Acanthis flammea	10/9/22	10/9/22	1	10/9/22	1
79	Red Crossbill - Loxia curvirostra	10/20/22	11/17/22	7	11/17/22	14
80	White-winged Crossbill - Loxia leucoptera	9/11/22	11/3/22	2	11/3/22	3
81	Pine Siskin - Spinus pinus	9/29/22	11/24/22	21	10/28/22	170
82	American Goldfinch - Spinus tristis	8/13/22	11/19/22	14	9/27/22	145
83	finch sp. - Fringillidae sp.	9/8/22	11/9/22	24	9/8/22	46
84	Snow Bunting - Plectrophenax nivalis	11/3/22	11/20/22	2	11/3/22	8
85	Chipping Sparrow - Spizella passerina	8/13/22	9/3/22	1	9/3/22	2
86	Fox Sparrow - Passerella iliaca	11/7/22	11/24/22	4	11/20/22	23
87	Fox Sparrow (Red) - Passerella iliaca iliaca/zaboria	10/31/22	11/8/22	1	11/8/22	2
88	Dark-eyed Junco - Junco hyemalis	8/13/22	11/20/22	19	10/31/22	523
89	White-throated Sparrow - Zonotrichia albicollis	9/25/22	10/23/22	6	10/23/22	51
90	Lincoln's Sparrow - Melospiza lincolni	9/7/22	9/26/22	1	9/26/22	2
91	Baltimore Oriole - Icterus galbula	8/13/22	9/14/22	1	9/14/22	2
92	Ovenbird - Seiurus aurocapilla	9/11/22	9/11/22	1	9/11/22	1
93	Black-and-white Warbler - Mniotilta varia	9/7/22	9/25/22	4	9/20/22	13
94	Tennessee Warbler - Leiothlypis peregrina	9/1/22	9/20/22	2	9/13/22	8

95	Nashville Warbler - <i>Leiothlypis ruficapilla</i>	9/8/22	9/27/22	1	9/27/22	3
96	American Redstart - <i>Setophaga ruticilla</i>	9/7/22	9/20/22	2	9/11/22	6
97	Cape May Warbler - <i>Setophaga tigrina</i>	9/1/22	9/30/22	10	9/11/22	50
98	Northern Parula - <i>Setophaga americana</i>	9/11/22	9/21/22	3	9/11/22	4
99	Magnolia Warbler - <i>Setophaga magnolia</i>	9/11/22	9/12/22	5	9/11/22	6
100	Bay-breasted Warbler - <i>Setophaga castanea</i>	9/11/22	9/20/22	1	9/20/22	2
101	Blackburnian Warbler - <i>Setophaga fusca</i>	9/4/22	9/27/22	2	9/7/22	6
102	Yellow Warbler - <i>Setophaga petechia</i>	9/7/22	9/11/22	3	9/7/22	4
103	Chestnut-sided Warbler - <i>Setophaga pensylvanica</i>	9/4/22	9/4/22	1	9/4/22	1
104	Blackpoll Warbler - <i>Setophaga striata</i>	9/11/22	10/12/22	4	9/11/22	12
105	Black-throated Blue Warbler - <i>Setophaga caerulea</i>	9/1/22	9/29/22	1	9/29/22	6
106	Palm Warbler - <i>Setophaga palmarum</i>	9/17/22	10/6/22	2	9/25/22	6
107	Pine Warbler - <i>Setophaga pinus</i>	9/2/22	10/21/22	5	9/7/22	11
108	Yellow-rumped Warbler - <i>Setophaga coronata</i>	9/1/22	11/8/22	32	10/11/22	291
109	Black-throated Green Warbler - <i>Setophaga virens</i>	9/1/22	10/12/22	3	9/11/22	20
110	new world warbler sp. - <i>Parulidae</i> sp.	9/7/22	10/4/22	13	9/7/22	20
111	Rose-breasted Grosbeak - <i>Pheucticus ludovicianus</i>	9/11/22	9/11/22	1	9/11/22	1
112	passerine sp. - <i>Passeriformes</i> sp.	9/12/22	9/29/22	30	9/12/22	34

