

# Bird Frequency in Illinois



A case study of bird sightings using Pandas,  
Plotly and Dash, with data from eBird

William Bush

# What is Frequency?



Northern Cardinal

# What is a Checklist?

A list of all the birds you observe while birding (birdwatching) including the count of each species, sex, age, behavior and other details, stored in the eBird database

CHECKLIST S82973859


Sun 7 Mar 2021 2:20 PM [Edit date and effort](#)

Montrose Point, Lincoln Park, Chicago [Cook County, Illinois, United States](#) [Edit location](#)

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Traveling Complete [i](#)

2 1 hr, 54 min 3.73 km



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Submitted from eBird for iOS, version 2.4.35

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[Same location and date](#)  
Montrose Point, Lincoln Park, Chicago, Cook County, Illinois, US on Sun Mar 07, 2021


[Same location](#)  
Montrose Point, Lincoln Park, Chicago, Cook County, Illinois, US

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Another location near Montrose Point, Lincoln Park, Chicago, Cook County, Illinois, US on Sun Mar 07, 2021

[Same area](#)  
Another location near Montrose Point, Lincoln Park, Chicago, Cook County, Illinois, US

[Same date](#)  
Sun Mar 07, 2021

[Different location and date](#)

 17 **Species observed** +1 other taxa 418 individuals

67 [Canada Goose](#)

49 [Mallard](#)

1 Mallard (Domestic type)

1 [Bufflehead](#)

Need to confirm with pic

8 [Common Goldeneye](#)

6 [Red-breasted Merganser](#)

140 [Ring-billed Gull](#)

1 [Herring Gull](#)

1 [Downy Woodpecker](#)

7 [Black-capped Chickadee](#)

32 [European Starling](#)

2 [American Robin](#)

50 [House Sparrow](#)

8 [American Tree Sparrow](#)

3 [Dark-eyed Junco \(Slate-colored\)](#)

26 [Red-winged Blackbird](#)

8 [Common Grackle](#)

8 [Northern Cardinal](#)

# So What is Frequency?

According to eBird, "...how often a species is reported on complete checklists within a specified date range and region, measured by percent of checklists reporting the species"

( Checklists Including A Species )

( All Checklists )



Bald Eagle

# Frequency of Common Grackle





# Irruptive Species

Species that usually do not migrate very far, but in some years (especially during winter) migrate well outside of their normal range

## Commonly cited irruptive species

- Common Redpoll
- Pine Siskin
- Red-breasted Nuthatch
- Hoary Redpoll
- White-winged Crossbill

# Most irruptive species found by transforming and visualizing data

Found species with the greatest ratio between the year with highest frequency and the year with lowest frequency, excluding species where the max frequency was less than 0.5%

RANK	COMMON NAME	MAX MIN RATIO	MAX	MIN	DIFF
1	White-winged Crossbill	864.79	0.86479	0.001	0.86379
2	Piping Plover	787.7	0.7877	0.001	0.7867
3	Black-necked Stilt	660.74	0.66074	0.001	0.65974
4	Black Vulture	637.38	0.63738	0.001	0.63638
5	Snowy Owl	622.14	0.62214	0.001	0.62114
6	Mallard (Domestic type)	115.77	1.84306	0.01592	1.82714
7	Monk Parakeet	83.45	8.0091	0.09598	7.91312
8	White-winged Scoter	25.26	2.23573	0.08852	2.14721
9	Common Redpoll	24.83	1.36537	0.05499	1.31038
10	Long-eared Owl	19.78	0.90016	0.04551	0.85465
11	Carolina Chickadee	19.7	7.99553	0.40595	7.58958
12	Fish Crow	16.03	0.90978	0.05677	0.85301
13	Glaucous Gull	14.35	1.01093	0.07046	0.94047
14	Red-breasted Nuthatch	12.19	9.00521	0.73904	8.26617
15	Blue Grosbeak	12.06	0.86989	0.07216	0.79773
16	Long-tailed Duck	11.57	0.64345	0.0556	0.58785
17	Eurasian Collared-Dove	10.91	1.64984	0.15118	1.49866
18	Trumpeter Swan	10.13	0.92847	0.09164	0.83683
19	Pine Siskin	9.59	4.78464	0.4989	4.28574
20	Greater White-fronted Goose	9.31	1.71475	0.18422	1.53053

# Why are some bird species irruptive?

Large variations in food availability caused by tree masting, pests, blight, weather and other factors



Red-breasted Nuthatch



# Which species have declining frequencies?

Found species with greatest percent decrease in frequency between 2001–2003 and 2018–2020

250 out of 289 species (87%) have decreasing frequency among species with a frequency  $> 0.05\%$  in 2001–2003

RANK	COMMON NAME	FREQUENCY PCT DECREASE
1	Monk Parakeet	97.7
2	Glaucous Gull	83.2
3	Ring-necked Pheasant	81.1
4	Surf Scoter	79.7
5	Iceland Gull	78.1
6	Connecticut Warbler	77.8
7	Grasshopper Sparrow	77.6
8	Lesser Black-backed Gull	75.4
9	Yellow-headed Blackbird	75.1
10	Sedge Wren	74.9
11	Sharp-shinned Hawk	74
12	Common Tern	72.9
13	Mourning Warbler	72.6
14	Forster's Tern	72.3
15	Cape May Warbler	72.1
16	Bobolink	70.7
17	Rock Pigeon	70.1
18	Little Blue Heron	69.5
19	Northern Waterthrush	69.5
20	American Black Duck	69.2

# Which species have increasing frequencies?

Species with greatest percent increase in frequency between 2001–2003 and 2018–2020

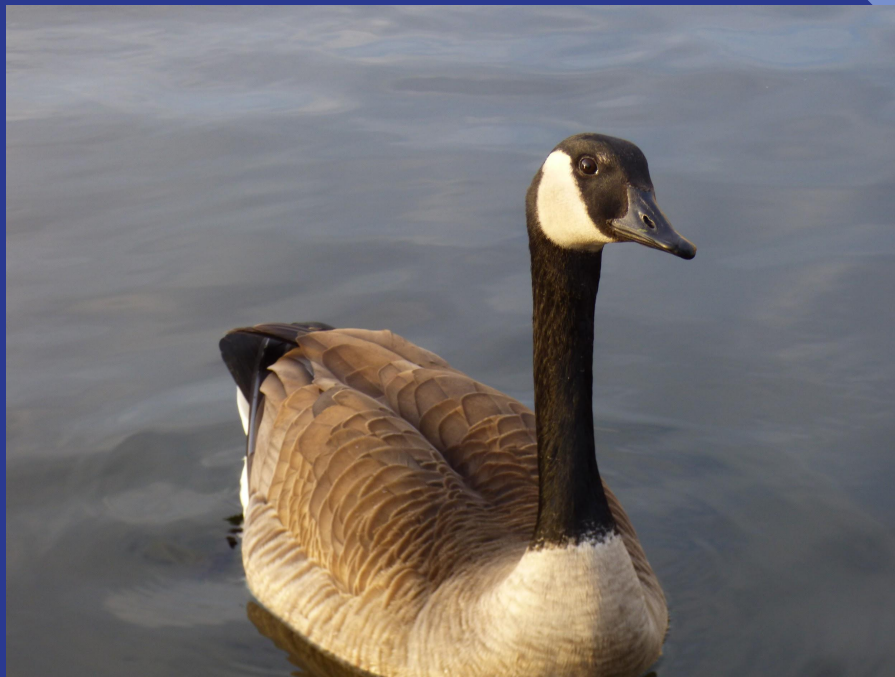
39 out of 289 species (13%) have increasing frequency among species with a frequency > 0.05% in 2001–2003

RANK	COMMON NAME	FREQUENCY PCT INCREASE
1	Black-necked Stilt	391.2
2	Mississippi Kite	290.4
3	Trumpeter Swan	260.9
4	European Goldfinch	223.4
5	Snowy Owl	201.4
6	Black Vulture	185.5
7	Piping Plover	174.3
8	Eurasian Collared-Dove	173.7
9	Mallard (Domestic type)	162.1
10	Pine Siskin	125.1
11	White-winged Scoter	123.1
12	Greater White-fronted Goose	122
13	American Avocet	121.4
14	Red-shouldered Hawk	106.5
15	Common Redpoll	101.2
16	Blue Grosbeak	98.9
17	Bald Eagle	92.8
18	Least Bittern	75.1
19	Pileated Woodpecker	65
20	Fish Crow	58

# Which species have I seen the most often?

(species that appear most often in my checklists)

RANK	COMMON NAME	CHECKLISTS
1	House Sparrow	26
2	Canada Goose	24
3	Ring-billed Gull	19
4	American Robin	18
5	Mallard	14
6	Chimney Swift	14
7	Northern Cardinal	13
8	Rock Pigeon	13
9	American Crow	13
10	Cooper's Hawk	12
11	Golden-crowned Kinglet	10
12	Downy Woodpecker	9
13	Black-capped Chickadee	9
14	Dark-eyed Junco	9
15	Common Goldeneye	9
16	Palm Warbler	8
17	American Goldfinch	8
18	Yellow-rumped Warbler	8
19	Mourning Dove	7
20	Song Sparrow	7



Canada Goose

# What are the rarest birds I have seen?

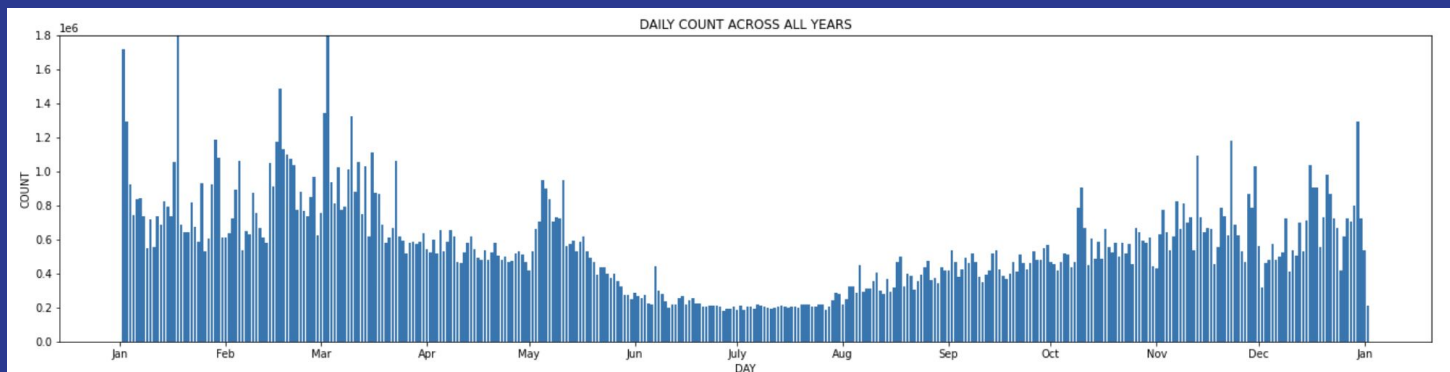
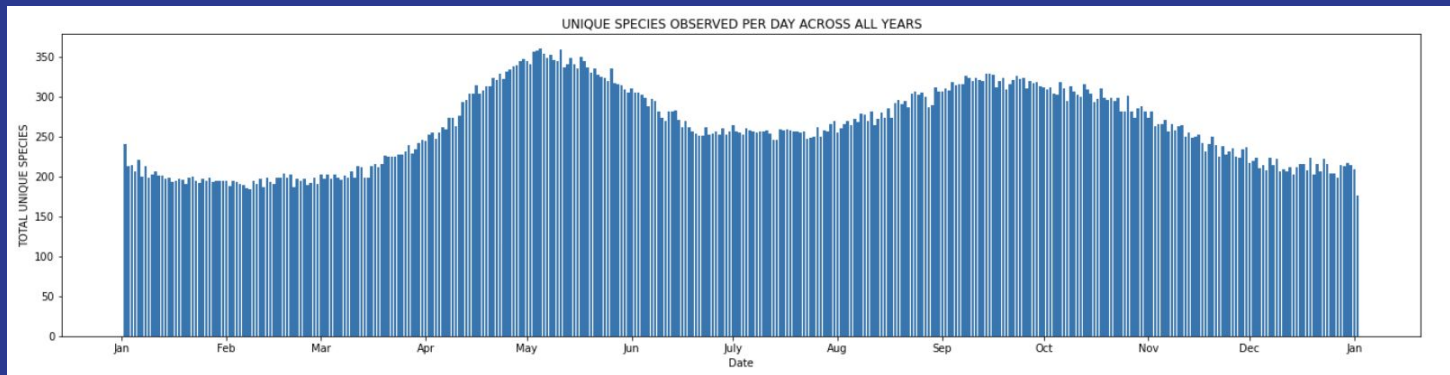
(species with lowest frequency in the year observed)



Clay-colored Sparrow

RANK	COMMON NAME	FREQUENCY
1	Clay-colored Sparrow	0.19
2	Black-bellied Plover	0.32
3	Snow Bunting	0.349
4	Mallard (Domestic type)	0.592
5	Sora	0.79
6	Semipalmated Plover	0.856
7	Orange-crowned Warbler	1.075
8	Lincoln's Sparrow	1.171
9	Common Nighthawk	1.198
10	Winter Wren	1.214
11	Bay-breasted Warbler	1.231
12	Ovenbird	1.531
13	Least Flycatcher	1.633
14	Black-crowned Night-Heron	1.705
15	Purple Martin	2.249
16	Black-and-white Warbler	2.295
17	Nashville Warbler	2.365
18	Savannah Sparrow	2.469
19	Magnolia Warbler	2.515
20	Yellow-bellied Sapsucker	2.691

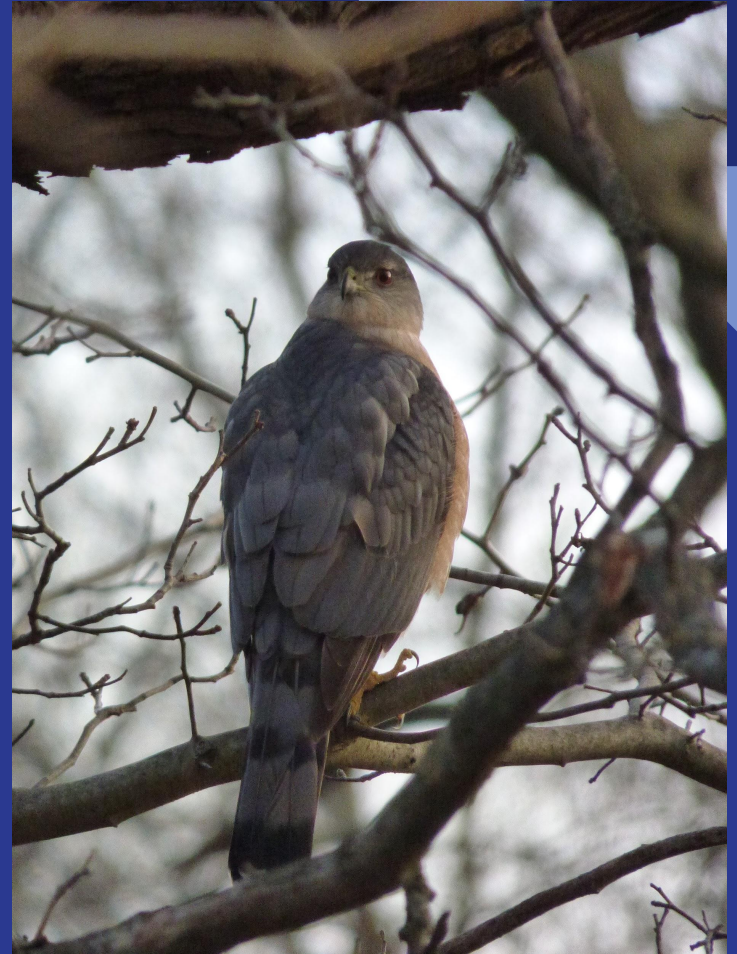
# Other Findings





# Further Study

- Expand dataset to include the entire US
- Examine correlation between frequency and data on tree masting, historical weather trends, pest population and other factors
- Group inputs by species family to see frequency trends of families of birds
- Extrapolate population numbers from frequencies



Cooper's Hawk