Bird Density and Diversity by Habitat Type at Van Curler Preserve in Scio Township.

By Allison Klonowski

ABSTRACT

There is limited information regarding the current site quality of Van Curler Preserve, located in Scio Township, Michigan, and its potential impact on bird species density and diversity. The objective of this research is to understand the current density and diversity of birds at the site by habitat type and to utilize this information to propose management recommendations that aim to enhance the habitat quality and biodiversity of Van Curler Preserve. Field studies were conducted to estimate the current site quality and document the variations in habitat, followed by a three-month bird survey. Studies found that the preserve is currently being dominated by invasive species, including, but not limited to, Amur Honeysuckle (*Lonicera maackii*), Autumn Olive (*Elaeagnus umbellate*), Common Buckthorn (*Rhamnus cathartica*), and Garlic Mustard (*Alliaria petiolata*). Additionally, there is a large population of the nonnative Norway Spruce (*Picea abies*). Research found that the area dominated by Norway Spruce had less success for bird populations. There is also great concern for the number of invasive species present. In this paper, I propose management actions including hybrid selection cutting, continued invasive species removal, and seeding/planting to increase habitat quality and biodiversity throughout the preserve. Additionally, I propose continued bird research for creating a long-term, sustainable study to help understand population trends over time.

KEY WORDS: Density, diversity, bird, Van Curler Preserve, Norway Spruce, habitat, management, invasive species, *Picea abies*.

INTRODUCTION

When thinking about wildlife, many people are likely to mention birds as something they often see and are welcoming of; somewhere around 38 million Americans consider themselves bird watchers (Long 2020). While birds are enjoyed by many, they also play an important role in different ecosystems through aiding in methods of decomposition, pollination, and seed dispersal. However, bird populations are in trouble due to factors such as climate change, habitat loss, and the increasing numbers of invasive species. Some studies suggest that around 6-14% of all bird species may be extinct, and another 7-25% may be functionally extinct by the year 2100 (Şekercioğlu et al. 2004). Given concerns about future bird populations and the absence of current studies, understanding primary bird density and diversity at Van Curler Preserve, as well as current habitat types and features, is important when considering future management decisions. Since most of the preserve is forested, it is notable that the total forested area has decreased globally in recent decades (Keenan et al., 2015). Through my research, I am hoping to decrease the gap in information around Van Curler Preserve's habitat and current bird populations. Additionally, I will complete a brief literature review to better understand the primary research to propose management recommendations that will best fit the current needs of the site.

STUDY AREA

The study was conducted at Van Curler Preserve in Dexter, Michigan, located within Scio Township in Washtenaw County. It falls between Joy Road and Huron River Drive, west of Zeeb Road. The land began being utilized for recreational use at least ten years before the township's purchase in 2014. The preserve is around 90 acres and is dominantly wooded, but there is a 6.5-acre section of prairie that is currently undergoing a restoration project (Hunman 2024). Historically, the site was listed as being a Black Oak Barren (Circa 1800 N.D.). The average climate of Dexter typically features warm summers followed by freezing winters, with average temperatures varying from 17°F to 83°F. The wet season ranges from late March to early October, with the most wet days often occurring in June. The growing season typically occurs from late April through mid-October (Weather Spark 2025). The site features varying slopes, and the soil is predominantly loam with adequate drainage (Appraisal 2014).

METHODS

The North American Breeding Bird Survey (BBS) was used as an initial guideline for creating the study methods. From the BBS, the “sky condition codes” and “wind speed codes” were used directly, as well as the “how to count” and “what to count” sections. Other areas of this instruction manual were altered to meet the criteria of the study. Instead of utilizing the preferred 0.5-mile distance between points, a 0.12-mile distance was used to better fit the existing trails. In total, the study had 10 points, covering 1.2 miles of trails starting from the trailhead, which was recorded on AllTrails. Each point was deemed an individual “site” labeled 1-10, which was then used for recording purposes throughout the study.

An initial plant survey was conducted at each site to categorize each point into a “habitat type”. Habitat types, which were named to simply categorize an area and not follow scientific accuracy, included “Mixed Hardwood Forest”, “Dry-Mesic Prairie”, and “Norway Spruce Dominated”. The “Mixed Hardwood Forest” points typically featured native trees, including Black Cherry (*Prunus serotina*), American Elm (*Ulmus americana*), Red Oak (*Quercus rubra*), White Oak (*Quercus alba*), and herbaceous species like Mayapple (*Podophyllum peltatum*). The “Dry-mesic Prairie” had few woody species and was dominated by Canada Goldenrod (*Solidago canadensis*), with sections of native grasses including Indiangrass (*Sorghastrum nutans*) and Big Bluestem (*Andropogon gerardii*). The “Norway Spruce Dominated” area is dominantly covered by the nonnative Norway Spruce (*Picea abies*) and invasive Garlic Mustard (*Alliaria petiolata*). The entire 90-acre site has high densities of woody invasives, including Amur Honeysuckle (*Lonicera maackii*), Autumn Olive (*Elaeagnus umbellate*), and Common Buckthorn (*Rhamnus cathartica*). There is also a high density of the herbaceous invasive Dame’s Rocket (*Hesperis matronalis*).

Bird surveys took place from the 16th of June to the 25th of August in 2025, typically conducted on Monday and Friday each week. Each survey began by recording the preserve name, site number (1-10), year, month, date, observer name, temperature, sky conditions, and wind speed. These recordings were completed before each site survey, meaning it was completed a total of 10 times during each survey period. Site surveys were completed over three-minute intervals, timed and recorded with the Merlin Bird ID App. New bird species observations were recorded,

followed by using a tally system to mark each bird seen and heard during the three minutes. Birds were sighted using binoculars. The Merlin recordings were reviewed after each survey period to ensure species recordings were accurate and no additional bird species were missing. At the end of the survey season, all data were compiled into Microsoft Excel for review. After the review was completed, a small-scale literature review was conducted to better understand the results of the research and what can be inferred about the current site quality at Van Curler Preserve.

RESULTS

Combined Data

Of all ten sites, five were categorized into "Mixed Hardwood Forest" (sites 1, 2, 4, 5, and 8), one was categorized in the "Dry-Mesic Prairie" (site 3), and the remaining four were categorized into the "Norway Spruce Dominated" (6, 7, 9, and 10). Throughout the entirety of the study period, there were 59 bird species and 1429 individuals recorded (Table 1). Of the 1429 individuals, 756 of them (comprised of 43 species), were observed in the "Mixed Hardwood Forest", 330 (comprised of 38 species) were observed in the "Dry-Mesic Prairie", and the remaining 343 (comprised of 13 species) were observed in the "Norway Spruce Dominated" habitat areas (Table 1). The total number of birds recorded by habitat type was visually compared in Figure 2, and the total number of species recorded by habitat type was visually compared in Figure 1. It is notable that the "Mixed Hardwood Forest" outdid both other habitat types for both individuals and species observed, which was originally hypothesized due to the number of sites. Oppositely, the numbers for the "Norway Spruce Dominated" areas seemed low, given four total points, and were hypothesized to have more recordings.

Sky conditions were most often recorded as "0-2"; however, on July 25th, it was recorded as "5/8", indicating a rain event (Table 2). Wind speeds were typically low, being recorded as 1-3, with a rare occasion on July 7th of it being recorded as a 4 (Table 3). Temperatures varied most throughout the season, with data often changing. However, on August 25th, it was the only time a "1" was recorded for the lowest temperature range (Table 4).

Site Specific Data

At site 1, there was a total of 24 species and 200 individuals recorded, making up ~14% of all recordings, and the most individuals recorded for this site in one day was on August 1st, with 18 individuals (Figure 3; Table 5; Figure 13). For site 2, there was a total of 26 species and 148 individuals recorded, making up ~10% of all recordings, and the highest number of individuals recorded for this site in one day was on July 21st, with 12 individuals (Figure 4; Table 5; Figure 13). 23% of all recordings came from site 3 with a total of 38 species and 330 individuals recorded, and the most individuals recorded for this site in one day was both on July 11th and August 1st, each reaching 30 individuals (Figure 5; Table 5; Figure 13). A total of 31 species and 158 individuals (~11% of all recordings) were recorded at Site 4, with the most individuals recorded for this site in one day being on June 23rd at 17 individuals (Figure 6; Table 5; Figure 13). There were a total of 24 species and 136 individuals recorded at site 5 (~9% of all recordings), and the individuals recorded for this site in one day peaked at 14 on June 23rd

(Figure 7; Table 5; Figure 13). At site 6, there was a total of 22 species recorded and 108 individuals (~8% of all recordings), and the individuals recorded for this site in one day were the highest on July 21st, with 11 individuals (Figure 8; Table 5; Figure 13). Recorded at site 7, there was a total of 15 species and 85 individuals, making up 6% of all recordings, and there were 10 individuals recorded on August 8th, which was the highest in one day for this site (Figure 9; Table 5; Figure 13). 20 species and 114 individuals were recorded at site 8, making up ~8% of all recordings, and on August 18th, the most individuals per day for this site was recorded, reaching 17 individuals (Figure 10; Table 5; Figure 13). Around 6% of total individual recordings came from site 9, with a total of 17 species and 80 individuals, and the most individuals recorded for this site in one day was on July 14th, with 10 individuals (Figure 11; Table 5; Figure 13). Lastly, at site 10, there was a total of 15 species and 70 individuals recorded (~5% of all recordings), and the most individuals recorded for this site in one day was on June 23rd, with 9 individuals (Figure 12; Table 5; Figure 13). Notably, on July 25th, there were no recordings for sites 6-10. Additionally, there were no recordings at site 10 for July 21st or July 28th.

DISCUSSION

During this study, I acknowledge that there are some factors that could cause bias in observations recorded. The survey was done during the breeding season, and the prairie has 6 nest boxes that were actively used for breeding by Tree Swallow (*Tachycineta bicolor*), Eastern Bluebird (*Sialia sialis*), Black-Capped Chickadee (*Poecile atricapillus*), and House Wren (*Troglodytes aedon*). This likely explains the high number of recordings for some of these species throughout the entirety of the study. However, this bias was ignored, and it is instead assumed that recordings are independent of the presence of nest boxes. Additionally, it is assumed that all recorded observations are independent of one another and that there were no repeated recordings. I also assumed that recordings were independent of weather, though weather trends were recorded. Lastly, it is also assumed that there is no human bias present.

When comparing the observations to the sky conditions, wind speeds, and temperature ranges, I discovered that in times of high temperatures, high winds, and rain events, the number of recordings decreased. This is likely indicative of the species' climate preferences for when they will be most active. Understanding that different species have different needs means habitats will not be one-size-fits-all, which is important when analyzing the research results. For example, Red-breasted Nuthatch (*Sitta canadensis*) prefers conifers, even in mixed deciduous forest (Red-breasted N.D). Oppositely, the Yellow-throated Vireo (*Vireo flavifrons*) is often not found in areas that are mixed or coniferous, favoring only deciduous woodlands and shade trees (Yellow-throated N.D.). Red-tailed Hawks (*Buteo jamaicensis*) are generalists and can thrive in many different habitats that have high perches and open ground for hunting (Red-tailed N.D.). Pileated Woodpeckers (*Dryocopus pileatus*) favor a wide variety of forest types but notably require dead trees for nesting (Pileated N.D.). Some species, like the Eastern Bluebird (*Sialia sialis*), favor open sites like farm country and forest clearings, especially during the breeding season (Eastern N.D.). With many birds having different preferences and needs, it is important to consider the different habitat characteristics available, like deadwood, canopy cover, canopy openness, and height (Bitani et al. 2023). Additionally, one study found that variations in height diversity and density throughout a stand correlate with greater diversity in bird populations, with vegetation in

lower layers being more accurate in predicting species diversity compared to only using the canopy height (Observatory 2019). With this information, it can be assumed that the "Mixed Deciduous Forest" stand, which features the greatest height diversity, would likely have the greatest species diversity. The study shows this to be correct, as seen in Figure 1, with this habitat type having the highest number of species recorded.

This information also confirms that the "Norway Spruce Dominated" habitat is less desirable for bird species overall, as evidenced by the low numbers of both species observed and total individuals observed throughout the study. With this habitat having four total points categorized into it, numbers were expected to be more like those of the "Mixed Hardwood Forest" category; however, the opposite was observed. The numbers for the species recorded in the "Norway Spruce Dominant" area were lowest compared to both other habitats (Figure 1). Additionally, when looking at the total number of individuals recorded, numbers were closer to the "Dry-Mesic Prairie", which only had 1 site (Figure 2). These results are likely directly correlated to the lack of height diversity and biodiversity in this habitat area. After presenting this information, conversations confirmed that the goal of this site is to increase the overall biodiversity and presence of native plant species. Having this conifer stand does not benefit our current conservation goals at Van Curler Preserve, so coming up with solutions on how to best manage the area was important.

I would propose that management of the preserve start with decreasing the number of nonnative conifers present, namely the Norway Spruce. There are also Scots Pine (*Pinus sylvestris*) present in the area, which are an invasive species in the state of Michigan, also making them a target species (Scots N.D.). In Washtenaw County, convection weather, followed by severe winter weather hazards, are the top natural disturbances that can occur (Washtenaw N.D.). These weather events will not be enough to handle the conifer populations alone over time. Other studies noted that natural disturbances like fires, windbreaks, and insect invasions may also lead to a mass increase in invasive species as the stand dies back. The dieback may temporarily increase biodiversity by allowing the growth of shade-intolerant species, but it is likely that many of them will be invasive (Schirmel et al. 2015). To manage the conifers and have more control over which areas experience disturbance, I would recommend single selection and group selection cuts. Using both at the same time, dubbed hybrid selection cutting, will be the most effective for plant regeneration and increasing biodiversity. However, when making these cuts, the number of large trees in the stand will likely be negatively impacted, decreasing overall canopy height. Consideration of height diversity in the stand will be important when determining which trees and areas the implement cutting (Raymond et al. 2018).

It is important to understand that invasive species are one of the greatest economic and ecological threats to natural areas in the US, posing considerable harm to native ecosystems and biodiversity, since there are concerns that invasive species numbers will increase due to stand clearing (DiTomaso et al. 2016; Tobin 2018). The increased invasive species will likely hinder the goal of increasing biodiversity. It was reported that a single invasive species being present can lead to a 16.6% decrease in species richness in both aquatic and terrestrial habitats (Tobin 2018). Currently, the preserve is severely overrun by invasive plants, which are said to strongly impact birds and insects. This is likely due to the bottom-up trophic cascade surrounding insects, which are herbivores, decreasing in numbers, causing a decrease in the food source for birds

(Schirmel et al. 2015). Some suggest that invasive species may not be that bad and they should be treated on an individual species basis in each ecosystem before management is considered (Hayes and Holzmueller 2012). When considering the current management goals, we should aim to eradicate invasive species to the best of our ability, replacing them with native species.

This past management season, the Natural Areas Technicians have been continuously managing invasives through hand-pulling, cutting, herbicide use, and scorching. These methods of integrative pest management have been successful in the primary treatment year, but there is still much work to do in the following years. The presence of Garlic Mustard underneath the Norway Spruce stand has been a major focus area. One study found that hand-pulling, herbicide, and/or scorching are ineffective in reducing garlic mustard abundance and may inadvertently increase the success of garlic mustard while negatively impacting native understory species when only done over one year. It will likely take years of treatment, fall herbicide application, and consideration of recolonization of native understory plants. There is also the potential for seeds of invasive plants to last in the soil for many years, which makes continued management important (Shartell et al. 2012). Studies found invasive plants had a noticeable effect on the trophic structure of wetlands and woodlands, but no noticeable effect on the trophic structure of grasslands (McCary et al. 2016). This would imply that focusing first on the "Mixed Hardwood Forest" and "Norway Spruce Dominated" areas may be the most beneficial. This may be impacted due to the ongoing prairie restoration, but considering this project has been ongoing since 2023, it may make changing gears to forested areas easier. Overall, managing the invasive plants is necessary for improving habitat quality and biodiversity throughout the preserve, but there may be concerns about the effectiveness of treatments, how this may influence species use of an area due to assumed primary decrease in species and height diversity, and the existing seedbank.

One study found that the most promising mechanism to control the invasion was increasing the number of native plants and seeds present, which can lead to a 50% decrease in invasive species. Early introduction of native seeds and plants to disturbed sites is the best practice (Halassy 2023). Seeding or planting is also a great method to speed up the regeneration process of the site after stand removal. While planting can be great for reestablishing habitat, it has some concerns that should be considered. A literature review completed by Brancalion and Holl (2020) mentions how there can be changes in water cycles, and potential problems if reforestation projects occur in areas where there was not historically a forest. These authors strongly advocate planting that will allow for natural regrowth to occur. For our management goals, planting will be a helpful method in giving native species a hopeful head start. Seeding can be done quickly over large areas at a low cost, but there are low seed establishment rates (around 20%), and they are also slower to grow than seedlings. The addition of seedlings may increase the chances of successful regeneration (Grossnicle and Ivetić 2017). Other studies mention that planting can increase and maintain species, and the planting of conifers will benefit species like the Red-breasted Nuthatch, which have a strong preference for them. Adding conifers to the hardwood forest will also create habitat for overwintering birds and can be a great option for increasing the height diversity (Crick 2015).

When planting, picking species that are native to the county is important for aiming to restore the site to something that is more historically accurate. Holly can replace invasive shrubs and provide habitat for animals from winter weather conditions. Winterberry (*Ilex verticilata*),

specifically, is native to the county and is a good option for this. We can also consider shrubs like alternate-leaved dogwood, which is shade-tolerant and would thrive in the existing understory conditions (Crick 2015; Rain Garden Plant List N.D.). Additional plants that should be considered for planting to increase the existence of native conifers would be beneficial. The White Pine (*Pinus strobus*) is native to the county, and it is possible to buy transplants of these trees. Similarly, the Eastern Red Cedar (*Juniperus virginiana*) is good for windbreaks, wildlife habitat, erosion control, and is drought-tolerant (Washtenaw County Conservation District 2025). Both are good examples of native conifers that would make adequate options for the site to be planted in areas where Norway Spruce stand removal occurs.

I acknowledge that there are species that may be negatively impacted by these management practices. Throughout my research, I often saw raccoons and squirrels browsing on or near the Norway Spruce, with the squirrels often eating the cones. Despite potential concerns for these species, replacing the conifers with White Pine could provide a new food source. Additionally, the surrounding area already has a plethora of food options, like the acorns from the White Oak (*Quercus alba*) or Red Oak (*Quercus rubra*). If we aim to create an area that still has conifers present and increase native shrubs, I do not believe there will be any significant negative consequences to the proposed management actions. I personally believe the actions will increase the amount of suitable habitat for bird and mammal species in the area.

The overall research supports the need for improved management at Van Curler Preserve. Utilizing this research, continued research, and the proposed management recommendations, a long-term management plan can be implemented. Additionally, continued research of bird communities at the preserve could aid in understanding population and species trends over time. To create this long-term, sustainable research around these trends, studies should be done continually for a minimum of ten years (White 2019). Lastly, there is a lack of research on our preserves around mammal, amphibian, bird, and plant populations. Filling in these gaps will be important for the long-term health of all preserves currently owned by Scio Township.

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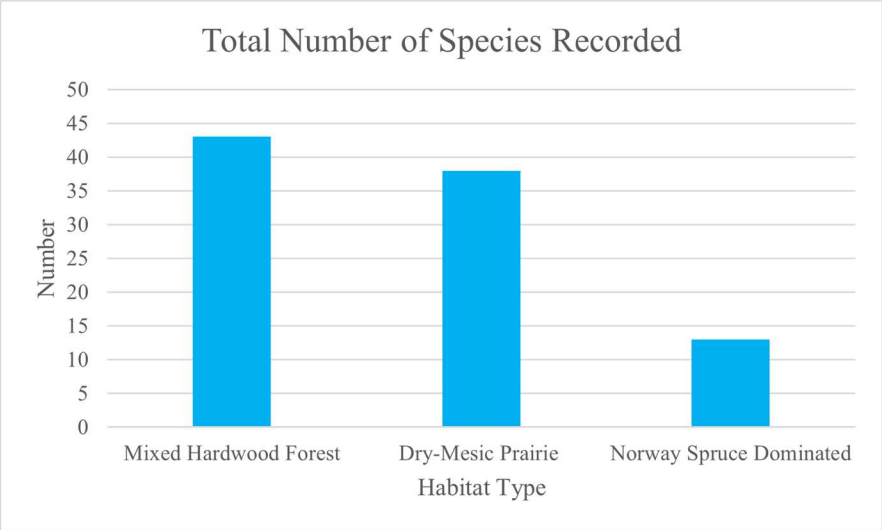

Figure 1. Comparison between "Habitat Types" of the total number of bird species recorded between 16th June and 25th August 2025 at Van Curler Preserve in Scio Township, MI. The "Mixed Hardwood Forest" contained 5 sites, the "Dry-Mesic Prairie" contained 1 site, and the "Norway Spruce Dominated" contained 4 sites.

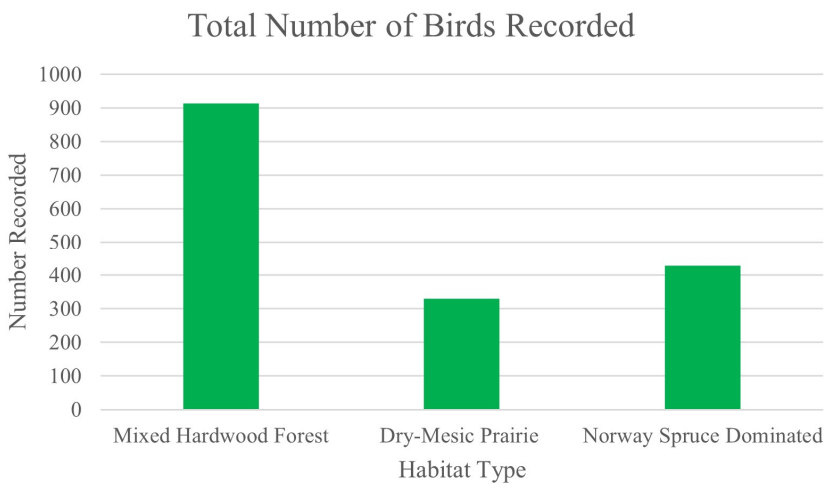

Figure 2. Comparison between "Habitat Types" of the total number of birds (individuals) recorded between 16th June and 25th August 2025 at Van Curler Preserve in Scio Township, MI. The "Mixed Hardwood Forest" contained 5 sites, the "Dry-Mesic Prairie" contained 1 site, and the "Norway Spruce Dominated" contained 4 sites.

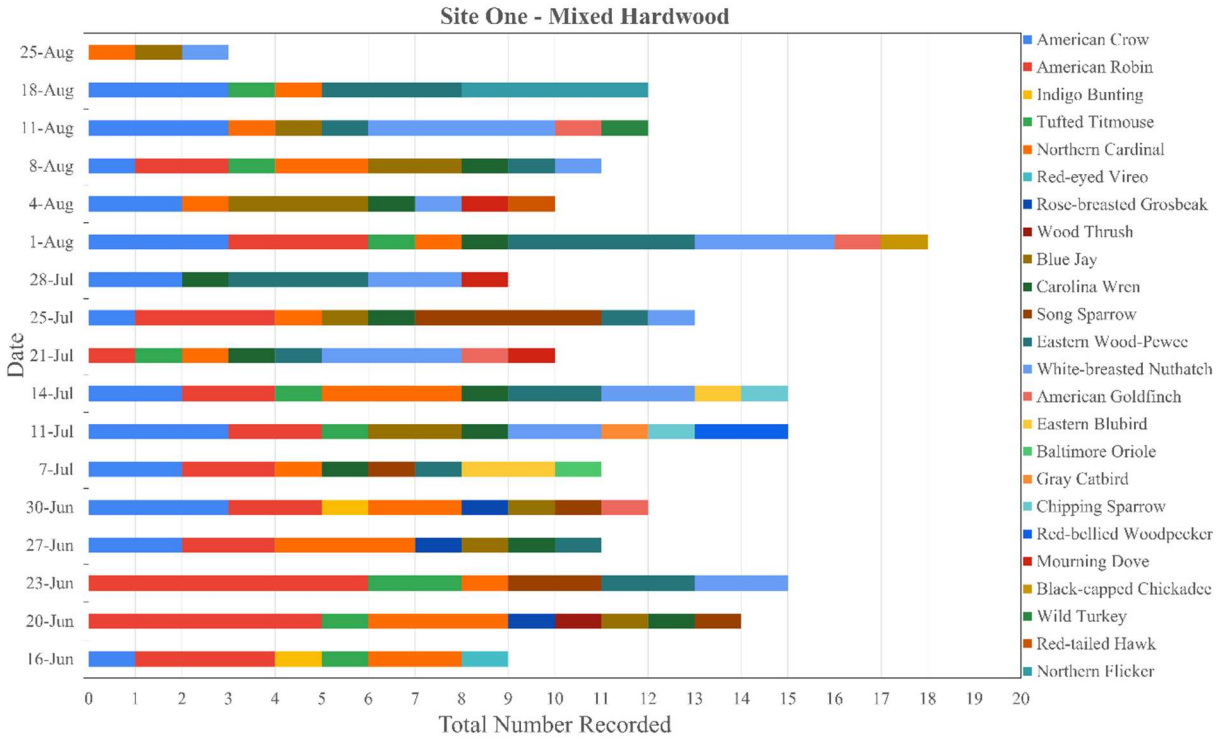

Figure 3. Summary of all recordings from site one at Van Curler Preserve in Scio Township, MI.

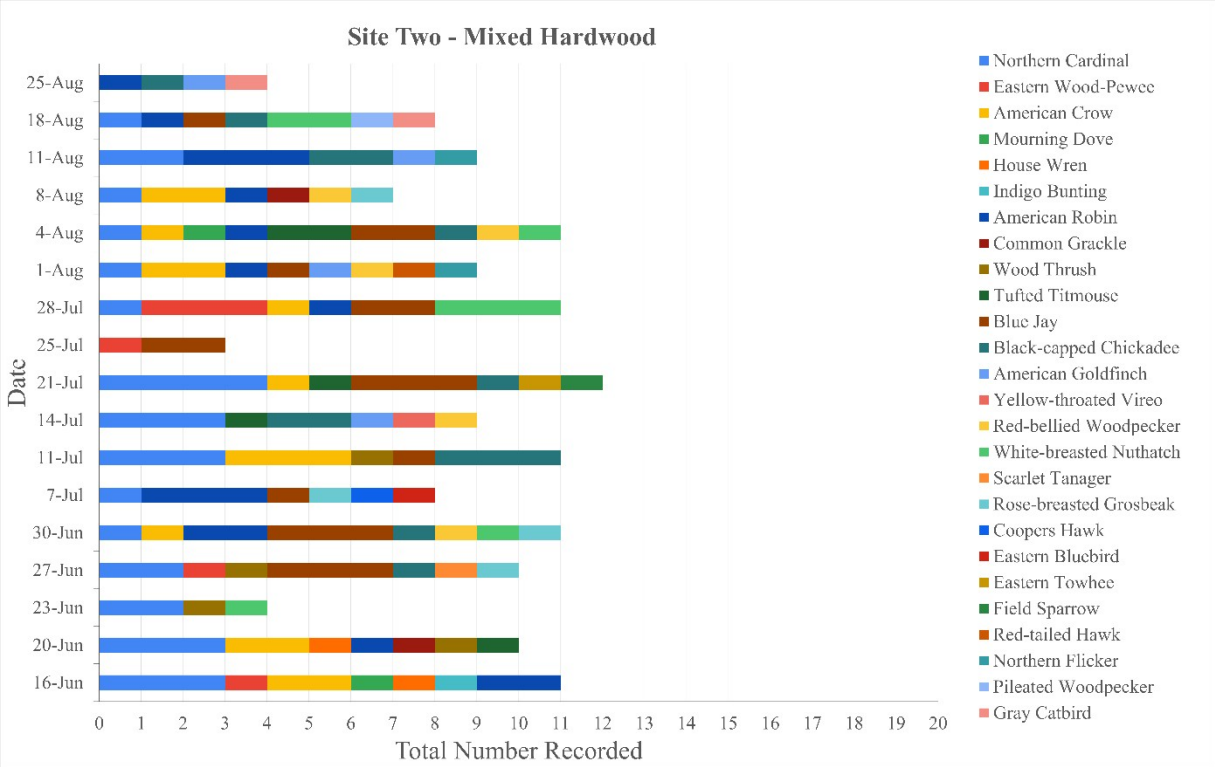

Figure 4. Summary of all recordings from site two at Van Curler Preserve in Scio Township, MI.

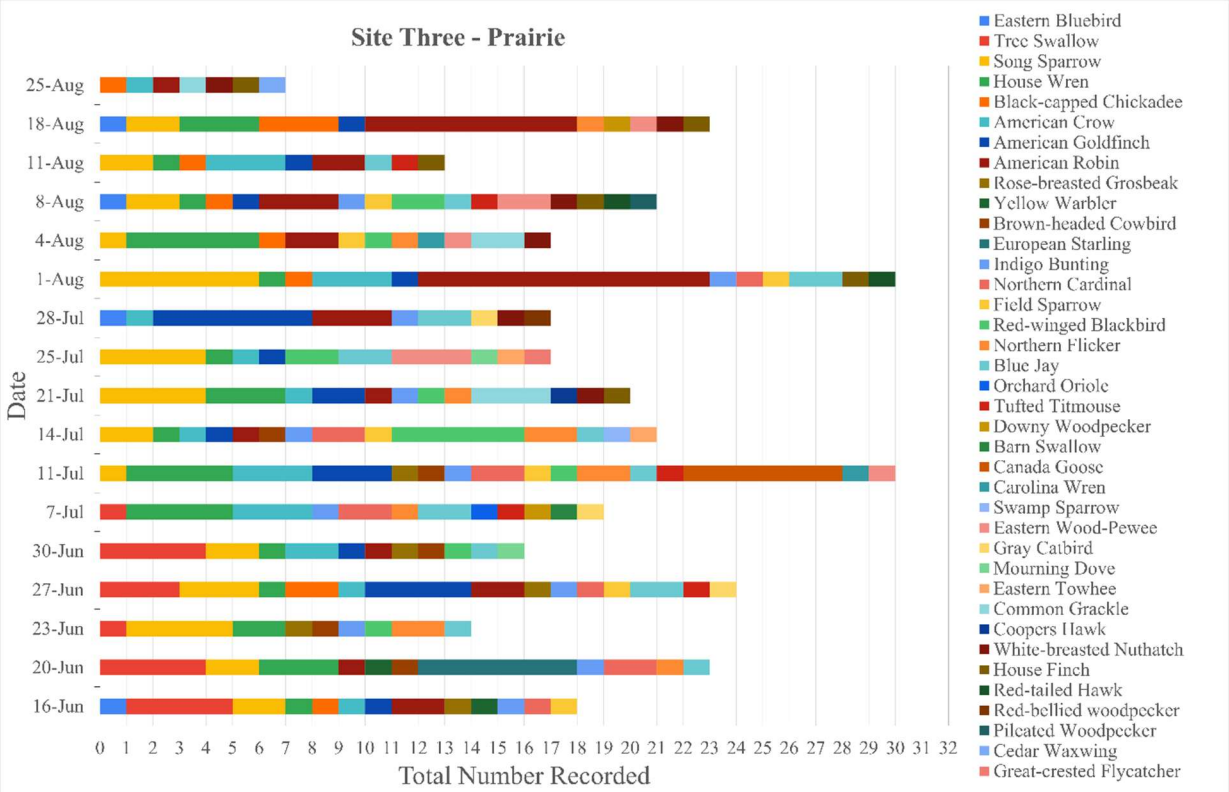

Figure 5. Summary of all recordings from site three at Van Curler Preserve in Scio Township, MI.

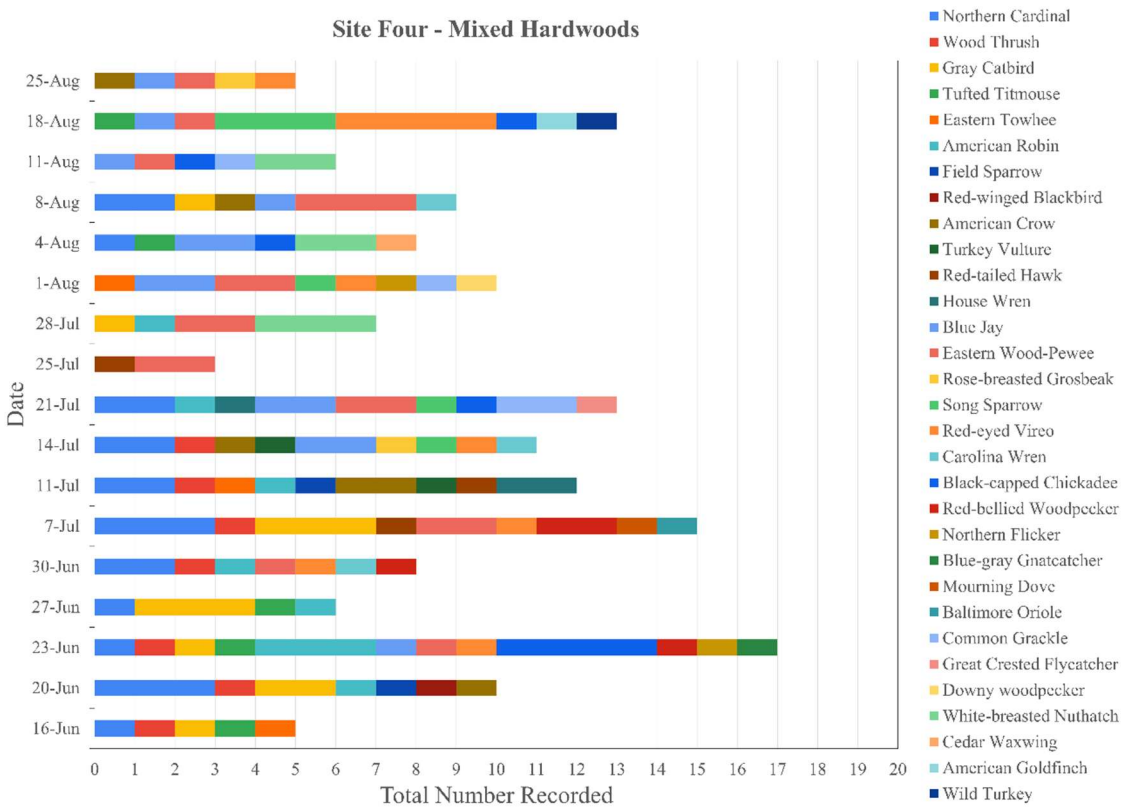

Figure 6. Summary of all recordings from site four at Van Curler Preserve in Scio Township, MI.

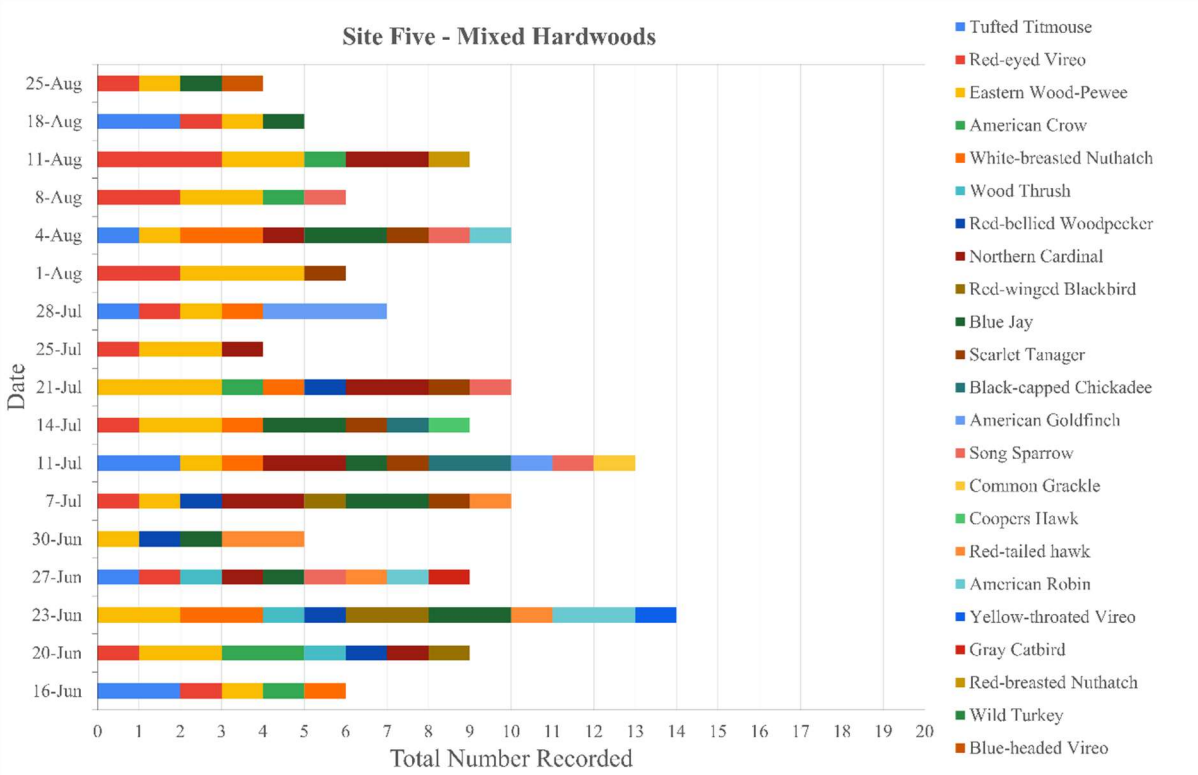

Figure 7. Summary of all recordings from site five at Van Curler Preserve in Scio Township, MI.

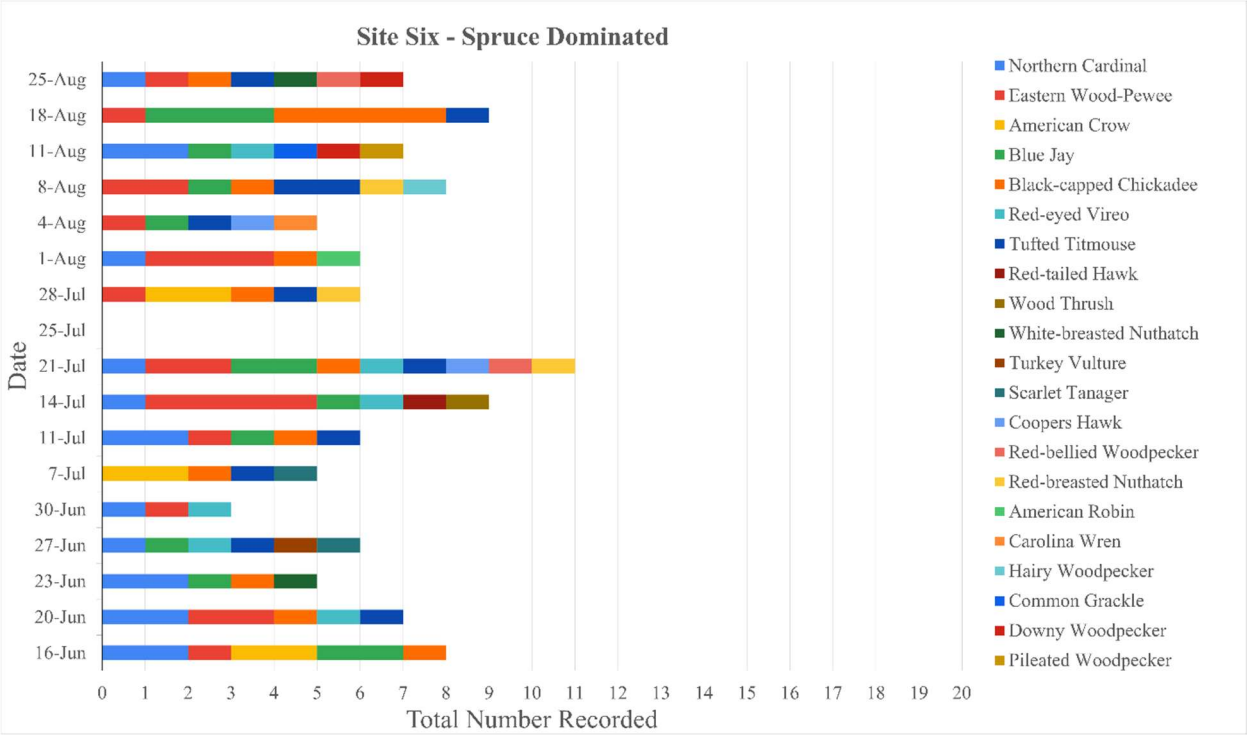

Figure 8. Summary of all recordings from site six at Van Curler Preserve in Scio Township, MI.

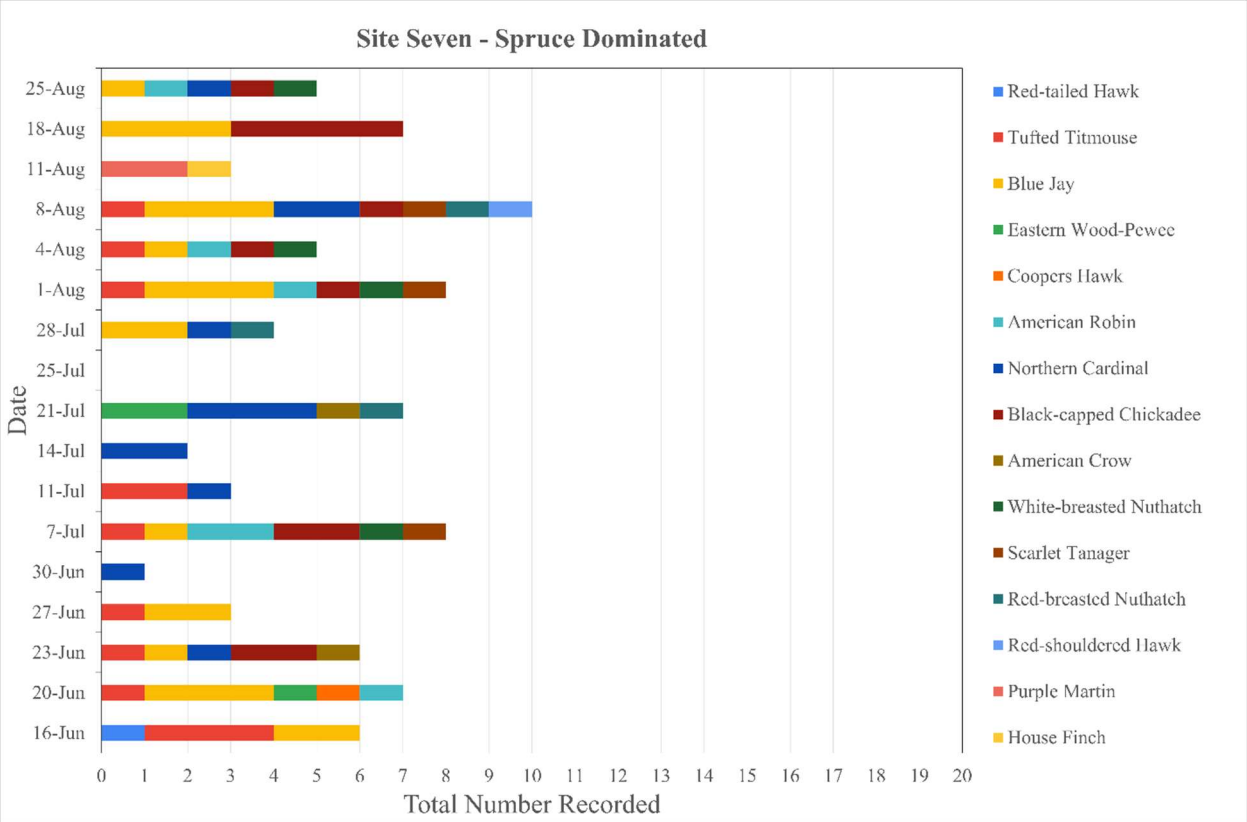

Figure 9. Summary of all recordings from site seven at Van Curler Preserve in Scio Township, MI.

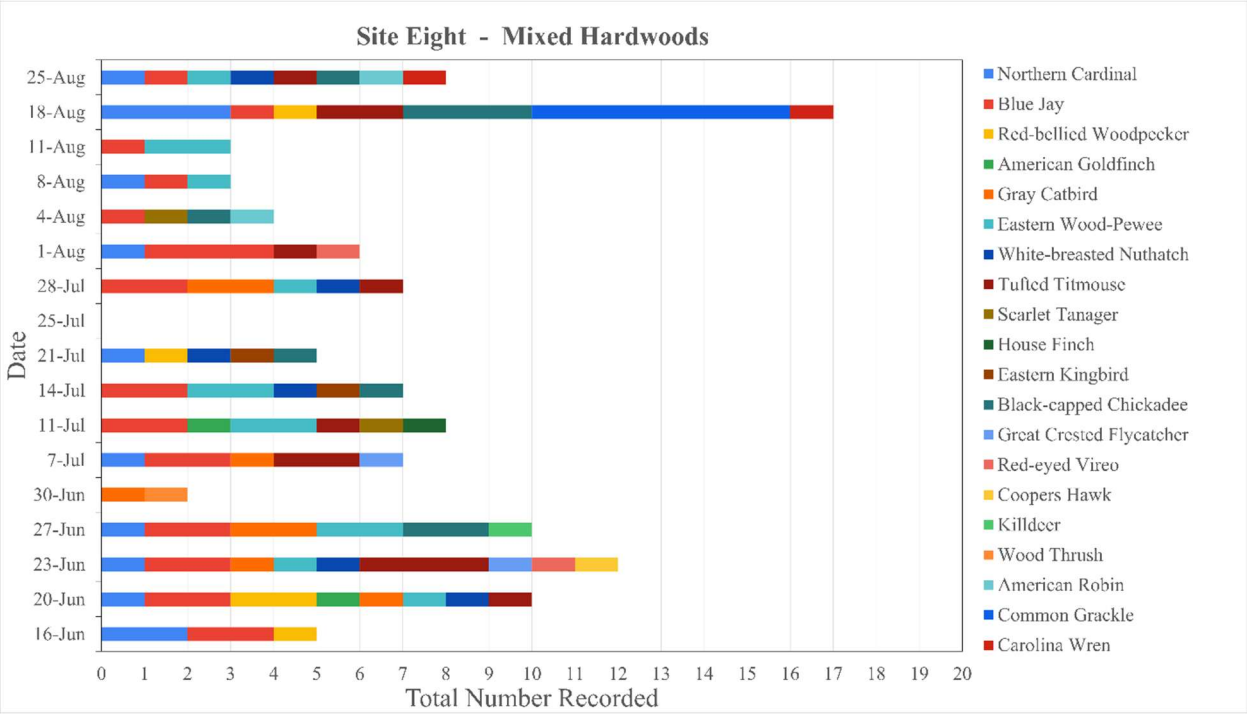

Figure 10. Summary of all recordings from site eight at Van Curler Preserve in Scio Township, MI.

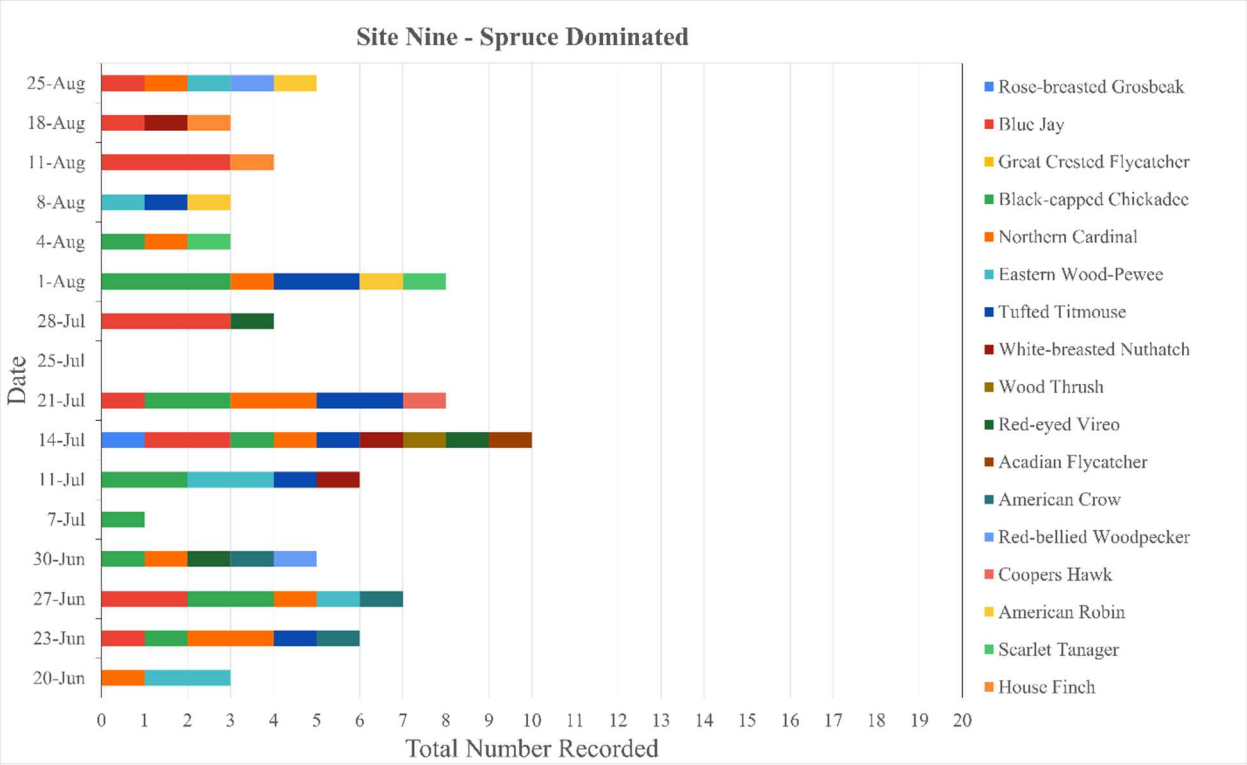

Figure 11. Summary of all recordings from site nine at Van Curler Preserve in Scio Township, MI.

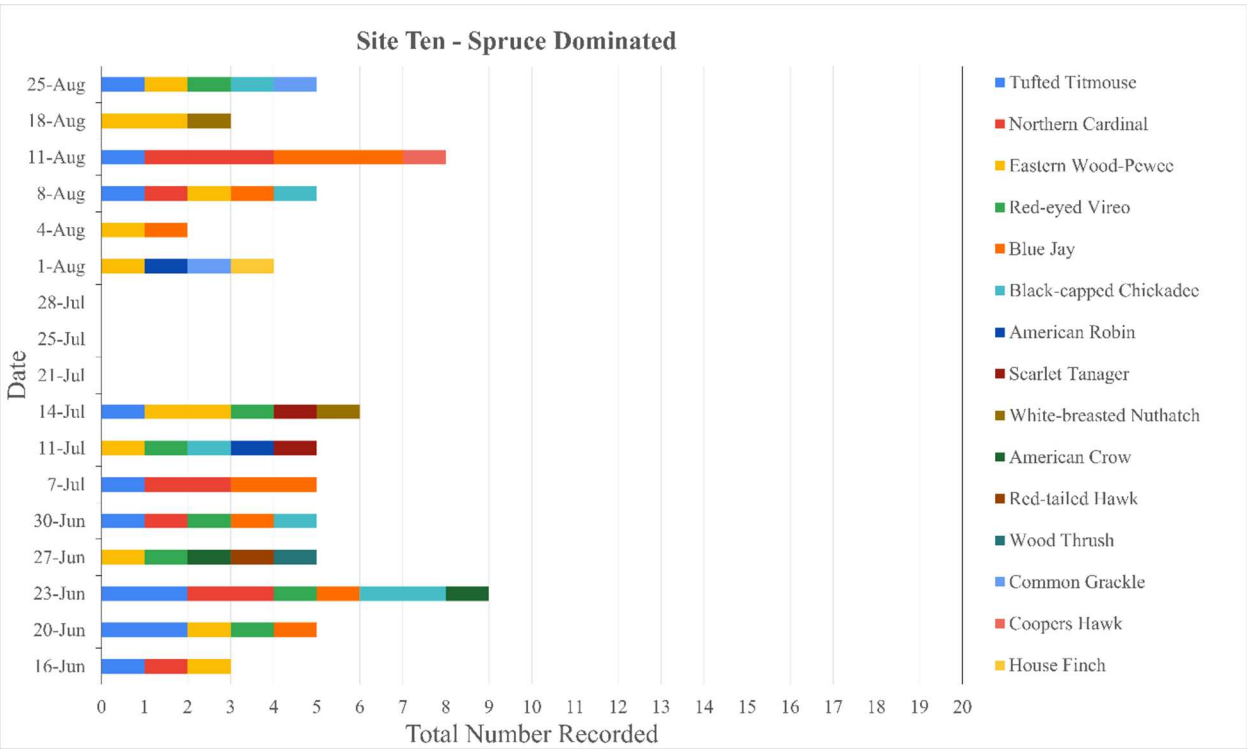

Figure 12. Summary of all recordings from site ten at Van Curler Preserve in Scio Township, MI.

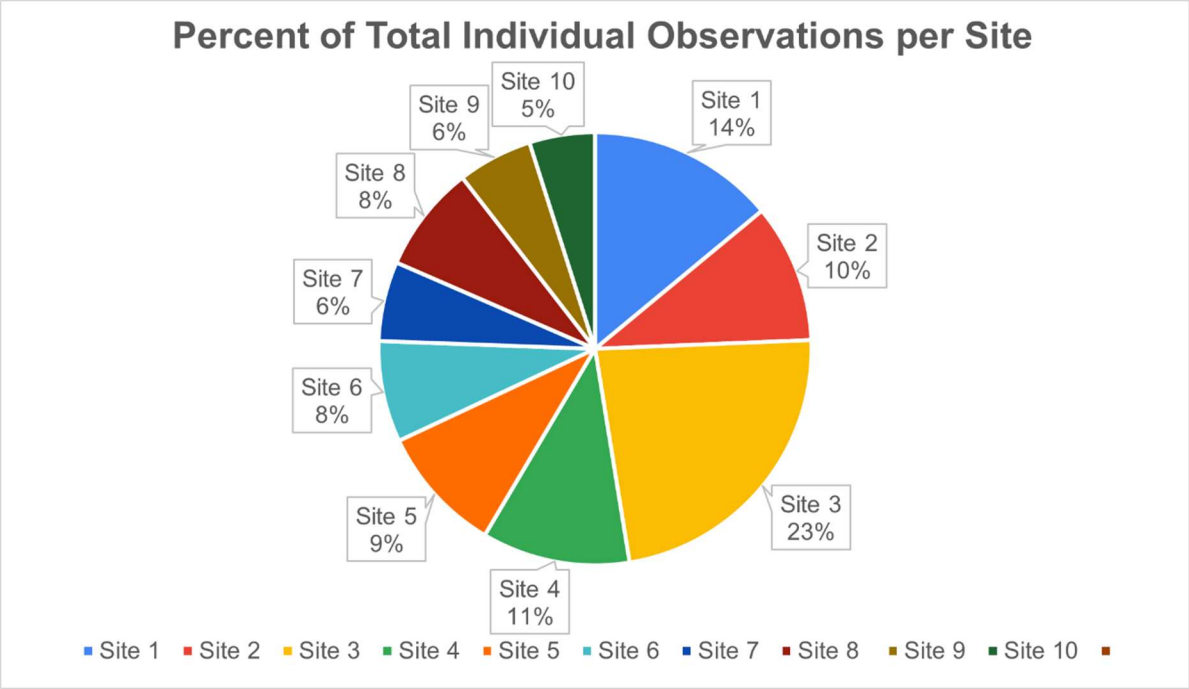

Figure 13. The percentage of how many birds there were per site out of the total individual observations (1429) recorded between 16th June and 25th August 2025 at Van Curler Preserve in Scio Township, MI.

Table 1. Total number of recordings between habitat types by species and individuals recorded between 16th June and 25th August 2025 at Van Curler Preserve in Scio Township, MI.

	Total Number Recorded	
	Species	Individuals
All Habitat's Combined	59	1429
Mixed Hardwood Forest	43	756
Dry-mesic Prairie	38	330
Norway Spruce Dominated	13	343

Table 2. Sky condition recordings from between 16th June and 25th August 2025 at Van Curler Preserve in Scio Township, MI. "0" = Clear or few clouds, "1" = Partly cloudy (scattered) or variable sky, "2" = Cloudy (broken) or overcast, "4" = Fog or smoke, "5" = Drizzle, "7" = Snow, "8" = Showers.

	Sky Conditions									
Site Number	1	2	3	4	5	6	7	8	9	10
Date										
June 16th	1	2	2	2	2	2	2	2	2	2
June 20th	0	0	0	0	0	0	0	0	1	1
June 23rd	0	0	0	0	0	0	0	0	0	0
June 27th	2	2	1	1	1	1	1	1	1	1

June 30th	2	2	2	2	5	5	5	5	5	5
July 7th	2	2	2	2	2	2	2	2	2	2
July 11th	2	2	2	2	2	2	2	1	1	1
July 14th	0	0	0	0	0	0	0	0	0	0
July 21st	0	0	0	0	0	0	0	0	0	0
July 25th	2	5	8	8	8	8	8	8	8	8
July 28th	2	2	2	2	1	1	1	1	1	1
August 1st	0	0	0	0	0	0	0	0	0	0
August 4th	1	2	1	1	1	1	1	1	1	1
August 8th	0	0	0	0	0	0	0	0	0	0
August 11th	0	0	0	0	0	0	0	0	0	0
August 18th	0	0	0	0	0	0	0	0	0	0
August 25th	1	1	1	2	2	2	2	2	2	2

Table 3. Wind speed recordings from between 16th June and 25th August 2025 at Van Curler Preserve in Scio Township, MI. "0"= Smoke rises vertically (<1mph, <2kph), "1" = Wind direction shown by smoke drift (1-3 mph, 2-5 kph), "2" = Wind felt on face, leaves rustle (4-7 mph, 6-12 kph), "3" = Leaves, small twigs in constant motion (8-12 mpg, 13-19 kph), "4" Dust rises, small branches move (13-18 mph, 20-29), "5" Small trees in leaf begin to sway (19-24 mph, 30-38 kph).

	Wind Speed									
Site Number	1	2	3	4	5	6	7	8	9	10
Date										
June 16th	1	1	1	1	1	1	1	1	1	1
June 20th	1	1	1	1	1	1	1	1	1	1
June 23rd	1	1	1	1	2	2	2	2	3	3
June 27th	1	1	1	1	1	2	2	2	2	3
June 30th	1	1	1	1	2	2	2	2	2	2
July 7th	2	3	3	4	3	3	3	3	3	3
July 11th	1	1	1	2	1	1	1	1	1	1
July 14th	2	2	2	2	2	2	2	2	2	2
July 21st	2	2	2	2	2	2	1	1	1	1
July 25th	1	1	1	1	1	1	1	1	1	1
July 28th	3	3	3	2	1	1	1	1	1	1
August 1st	2	2	2	2	2	2	2	2	2	2

August 4th	2	2	1	1	1	1	1	1	1	1
August 8th	2	2	2	2	2	2	2	2	2	2
August 11th	2	2	2	2	2	2	2	2	2	2
August 18th	2	2	2	2	2	2	2	2	2	2
August 25th	2	2	2	2	2	2	2	2	2	2

Table 4. 5. Temperature range recordings from between 16th June and 25th August 2025 at Van Curler Preserve in Scio Township, MI. "1" = 50-54°F, "2" = 55-59°F, "3" = 60-64°F, "4" = 65-69°F, "5" = 70-74°F, "6" = 75-79°F.

	Temperature Range									
Site Number	1	2	3	4	5	6	7	8	9	10
Date										
June 16th	2	2	2	2	2	2	3	3	3	3
June 20th	2	2	2	3	3	3	3	3	3	3
June 23rd	5	5	5	5	5	5	5	5	5	5
June 27th	5	5	5	5	5	5	5	5	5	5
June 30th	4	5	5	5	5	5	5	5	5	5
July 7th	4	4	4	4	4	4	4	4	4	4
July 11th	3	4	4	4	4	4	4	4	4	4
July 14th	3	3	3	3	3	3	3	3	3	4
July 21st	2	2	2	2	2	2	2	2	2	2
July 25th	5	5	5	5	5	5	5	5	5	5
July 28th	5	5	5	5	5	5	5	5	5	5
August 1st	2	2	2	2	2	2	2	2	2	2
August 4th	2	2	2	2	2	2	2	3	3	3
August 8th	4	4	4	4	4	4	4	4	4	4
August 11th	5	5	5	5	5	5	5	5	5	5

August 18th	2	2	2	2	2	2	2	2	2	3
August 25th	1	1	1	1	1	1	1	1	1	1

Table 5. Total number of recordings per site by species and individuals recorded between 16th June and 25th August 2025 at Van Curler Preserve in Scio Township, MI.

	Total Number of Recordings	
Site Number	Species	Individuals
1	24	200
2	26	148
3	38	330
4	31	158
5	24	136
6	22	108
7	15	85
8	20	114
9	17	80
10	15	70