

NOCTURNAL MIGRATION RADAR AND AVIAN ACOUSTIC SURVEY FOR PROPOSED WIND SITE NEAR NUTTBY, NOVA SCOTIA

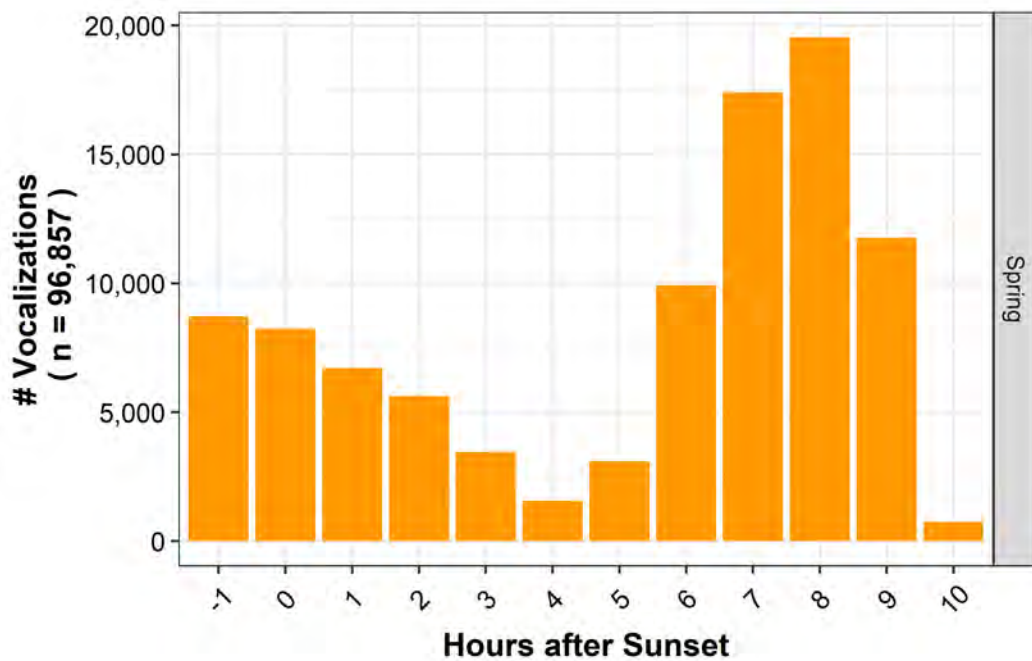


Figure 3.15 Total Number of Vocalizations by Hour after Sunset During Spring 2022 Avian Acoustic Surveys



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The number of vocalizations per detector-night were graphed by night of survey, to look for seasonal trends within the spring survey period and among the nights that these two survey techniques were used simultaneously (Figure 3.16). In this case, a 'detector-night' represents any night that any individual detector was operating successfully. The number value along the horizontal axis (above the date) in Figure 3.16 represents the number of detector-nights available for analysis for each night of survey. For example, on April 22, 3 of the 5 detectors operated successfully and combined recorded 2,024 vocalizations, equating to a detection rate of 675 vocalizations per detector-night (2,024 divided by 3). These results, which include all species, show an increase in vocalizations as the season progressed, peaking in mid-May then decreasing at the end of May.

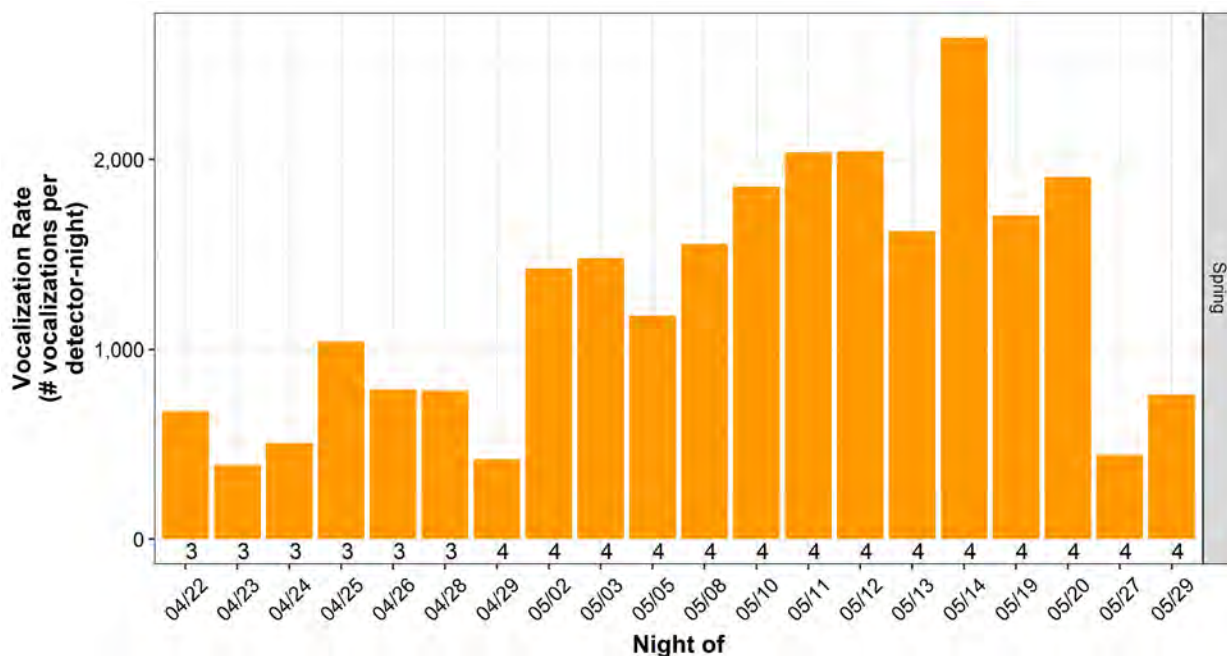


Figure 3.16 Vocalizations per Detector-night by Date During Spring 2022 Avian Acoustic Surveys



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Vocalization results by date are shown for each species in Appendix B. These data indicate how frequently each species occurred on the nights that acoustic surveys were completed in conjunction with radar surveys. Some species were rarely recorded, including SAR: Chimney Swift and Olive-sided Warbler. These species were only recorded on one or two nights. Many other species were recorded throughout the spring migration period, some with temporal trends similar to the temporal trend for all species combined. These include resident species: American Goldfinch, Black-capped Chickadee, and Dark-eyed Junco, as well as some migratory species: American Woodcock and Hermit Thrush which both likely breed in the area. Some species were recorded throughout the survey period but with peaks throughout, including Winter Wren (migrant/breeder) and golden-crowned Kinglet (resident/breeder).

Fall Surveys

Overall, 6,951 vocalizations were identified as bird vocalizations in the fall and 6,689 (96%) of those were identified to species. A total of 60 species were identified, including waterfowl, raptors, gamebirds, shorebirds, and landbirds (Appendix B Table 2). Of these, 21 species are year-round residents, and the remaining 39 species are migrants. The most frequently recorded species were resident species and included Golden-crowned Kinglet (n = 1,781; 26%), Great-horned Owl (n = 829; 12%), Barred Owl (n = 682; 10%), and Hairy Woodpecker (n = 602; 9%). Other commonly recorded migrant species included Hermit Thrush (n = 421; 6%) and White-throated Sparrow (n = 206; 3%).

Of the 60 species identified in fall acoustic surveys, 3 were SAR and 8 were SOCC. SAR included Canada Warbler (n = 182 vocalizations; 3% of total vocalizations), Eastern Wood-Pewee (n = 2; <1%), and Evening Grosbeak (n = 27; <1%). Ninety-nine percent of the Canada Warbler vocalizations (n = 180) were recorded at a single detector (N4) between the nights of August 26 and August 30, 2022. SOCC included Boreal Chickadee (n = 18; <1%), Boreal Owl (n = 5; <1%), Canada Jay (n = 17; <1%), Greater Yellowlegs (n = 3; <1%), Least Sandpiper (n = 2; <1%), Pine Siskin (n = 2; <1%), Red-breasted Nuthatch (n = 105; 2%), and Rose-breasted Grosbeak (n = 1; <1%).

Total vocalizations of all species are graphed against time after sunset in Figure 3.17. The average number of vocalizations per hour decrease from approximately sunset then pick up and are greatest during hours 10 through 12 after sunset, decreasing afterwards. Timing of vocalizations was also mapped for individual species; these graphs are presented in Appendix B. Timing of vocalizations was variable among species in the fall.



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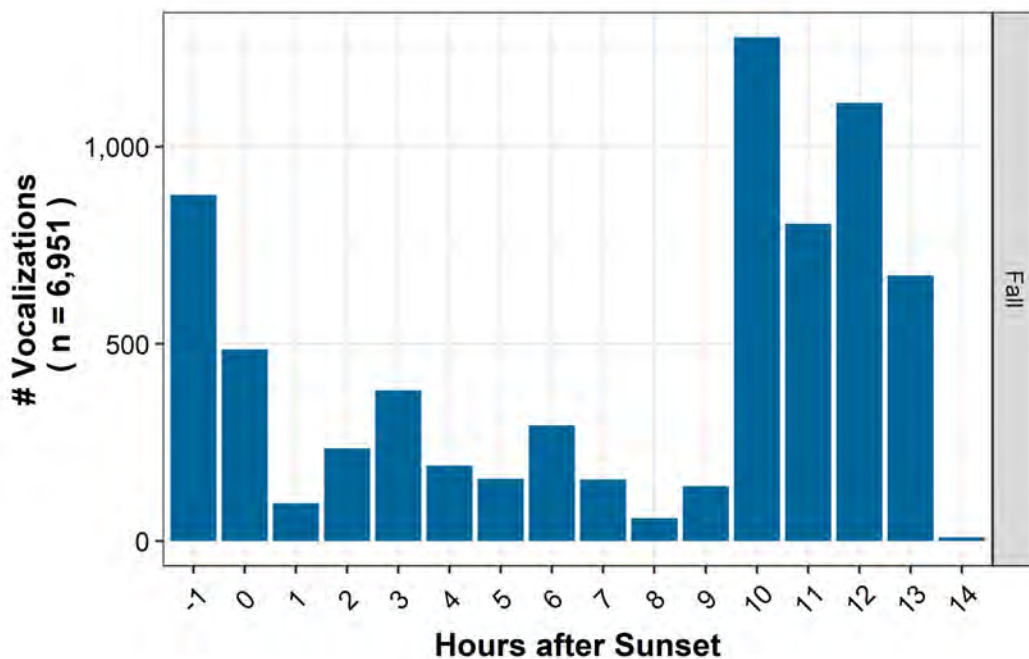


Figure 3.17 Total Number of Vocalizations by Hour after Sunset During Fall 2022 Avian Acoustic Surveys

The number of vocalizations per detector-night were graphed by night of survey, to look for seasonal trends within the nocturnal radar/avian acoustic fall survey period (Figure 3.18). Note that detectors did not operate on August 20–25 and October 20. These results, which include all species, show peaks in activity throughout the survey period with an overall peak in recorded vocalizations in early October.



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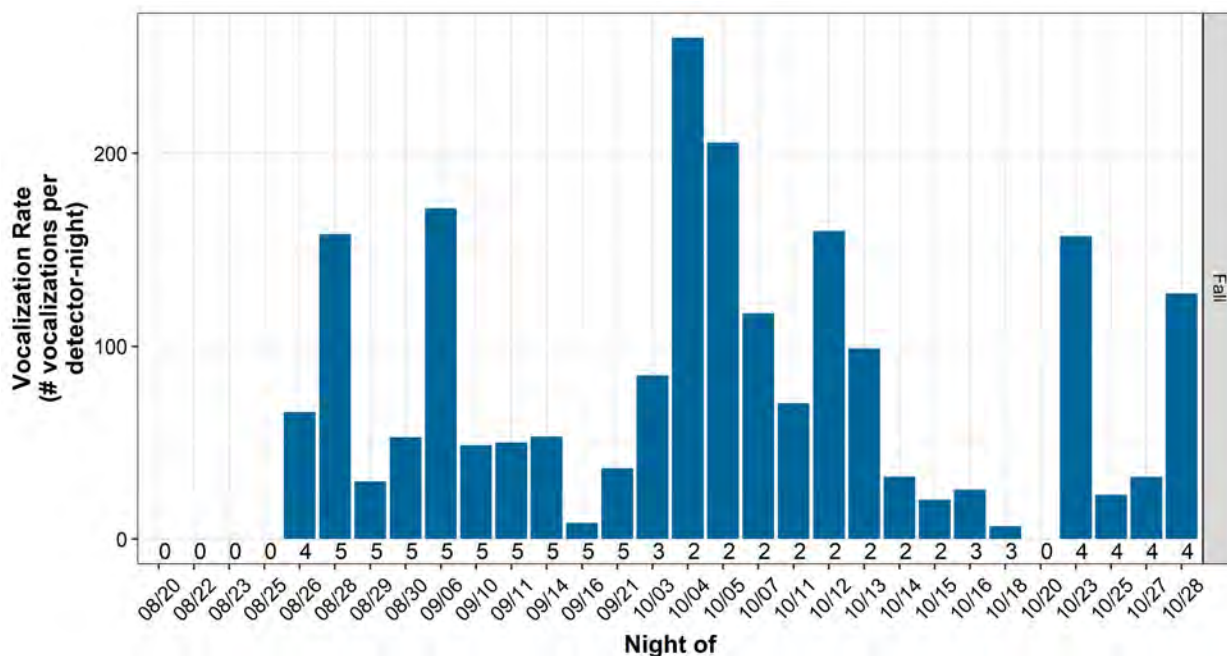


Figure 3.18 Vocalizations per Detector-night by Date During Fall 2022 Avian Acoustic Surveys

Vocalization results by date are shown for each species in Appendix B. These data indicate how frequently each species occurred. Some species were rarely recorded, including SAR: Eastern Wood-Pewee and SOCC: Least Sandpiper, Pine Siskin, and Rose-breasted Grosbeak. These species were only recorded on one or two nights. Many other species were recorded throughout the fall migration period, with varying temporal trends. This includes resident species: Black-capped Chickadee, Dark-eyed Junco, Golden-crowned Kinglet, and Hairy Woodpecker, as well as migratory species: Brown Creeper, Hermit Thrush, and White-throated Sparrow.

4.0 DISCUSSION

4.1 NOCTURNAL RADAR SURVEY

The 2022 radar surveys characterized the abundance and timing of nocturnal migratory activity of birds and bats through the Project during the spring and fall migration periods. Approximately 2–5% of targets were determined to have been potential bats, with the remainder presumably being birds or bats flying along straight flightlines. Mean flight height of targets during spring was 371 m ± 4 m and during fall was 322 m ± 1 m, well above potential turbine heights between 180 m and 200 m. The seasonal mean passage rate in spring was 230 ± 21 t/km/hr and during fall was 591 ± 36 t/km/hr.

Comparative data sets of nighttime bird migration using radar from eastern Canada are generally lacking. Two available data sets collected for proposed wind energy projects, one from Prince Edward Island (Wood Environment and Infrastructure Solutions 2019) and the other from Nova Scotia (Hemmera



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Envirochem Inc. 2021), used notably different equipment and methods of analysis, making meaningful comparisons with results from the Project not possible. However, data from wind energy projects in the northeastern United States, where Stantec has completed approximately a dozen surveys at 10 different sites in Maine between 2005 and 2016, are available and comparable (Appendix A Table 9).

In general, nighttime bird migration for the Project during spring was lower than other sites surveyed using identical equipment and analysis methods. Specifically, the spring migration passage rate for the Project was less than 9 of the 10 sites studied in Maine using identical equipment and analysis methods. During fall migration, passage rates for the Project were within the range of passage rates for those 10 sites studied in Maine. Fall migration does bring some landbird species to the east and southeast, out of the boreal forest and to the north Atlantic coastline. Individuals of some species, such as the blackpoll warbler (*Setophaga striata*), are known to leave the north Atlantic coastline (including Atlantic Canada) and make a single southern flight over the Atlantic Ocean to the tropics. Other species are believed to follow a more coastal route south or make shorter open ocean flights along the east coast of the continent. Therefore, greater passage rates in the fall would be expected in Atlantic Canada compared to springtime passage rates.

Nightly variation in the magnitude and flight characteristics of nocturnal migrants is not uncommon and is often attributed to weather patterns such as cold fronts and winds aloft (Hassler et al. 1963, Gauthreaux and Able 1970, Richardson 1972, Able 1973, Bingman et al. 1982, Gauthreaux 1991). In spring, the night with the lowest passage rate (April 24) was characterized by weather patterns unfavorable for migration (i.e., low temperatures and high wind speeds from the north-northeast). Conversely, the night with the highest passage rate in spring (May 11) was characterized by weather patterns favorable for migration (i.e., warm temperatures and low wind speeds from the southwest). Nightly variation of migration activity during fall followed this same pattern related to weather. The night with the lowest passage rate in fall (October 25) was characterized by average nightly temperature and wind speed from the southwest. The night with the highest passage rate in fall (September 6), was characterized by favorable conditions, with average temperatures and low winds from the north-northeast. Overall flight direction at the Project supported migration trends along the Nova Scotia Atlantic coastline in spring (east-northeast) and fall (westward).

Radar surveys are not capable of quantifying the level of collision risk involving nocturnal migrants at a particular project. Statistical analysis of publicly available radar survey data with bird mortality data for wind projects in Maine has shown no relationship between pre-construction passage rate and post-construction level of mortality (the correlation is very low, with no significant trend ([Stantec 2017])). Fatality data collected at operational wind projects have shown that the cause of fatality events involving multiple passerine individuals has occurred during the migratory season and either a) when weather conditions have caused migratory fall-out behavior (i.e., when birds dramatically reduce migratory flight heights in response to sudden, inclement weather), or b) when lighting at facility structures proximal to turbines disorients or attracts night migrants, resulting in them colliding with the nearby turbines or succumbing to exhaustion. The limitations of the radar to effectively sample nocturnal migration activity during inclement weather events (e.g., steady precipitation) limits our ability to characterize potential fall-out events resulting from poor weather.



4.2 AVIAN ACOUSTIC SURVEYS

The acoustic surveys completed in 2022 provide insight on the birds that were present at the project site during the course of the two migration seasons monitored. This includes identification of which species were present, when within the migration seasons they were present, and when within each night sampled were they actively producing sounds. However, it is important to identify some of the limitations of the acoustic data to properly interpret the results. First, due to the near ground-level (up to 2 m) placement of detectors, there is a recording bias towards birds at or near ground level over higher-flying birds, particularly for those flying at high altitudes (more than 100 m above the ground). Not all recorded vocalizations can be identified to species due to the brevity or quality of recorded calls and, therefore, not all species actually present at, or flying over, the site were necessarily identified as present with the recordings. There is also overlap of species migrating past the site with other species starting their nesting season locally (or even overlap of individuals of the same species) such that some breeding-related territorial and display calls were recorded at the same time as nighttime flight calls during active migration. In addition, the type of calls produced by many bird species in migration are more difficult to identify to the species level and migrating birds may tend to vocalize less than non-migrating birds at ground level. In fact, some species may not produce flight calls at all when they are undertaking nighttime movements – these species would not be represented in acoustic recordings at night, even if the migrant population is very large. These factors lead to a bias in the data towards resident species and birds at ground level, rather than an acoustic data set that consists exclusively of migratory flyover calls.

During the 2022 avian acoustic surveys, the majority of vocalizations were recorded in the spring with 96,857 vocalizations recorded, represented by 77 species (as well as vocalizations that could not be identified to species) with only 6,951 vocalizations recorded in the fall and represented by 60 species (in addition to the unidentifiable bird vocalizations). The greater number of vocalizations recorded in the spring is result of a higher level of vocalization activity during the breeding period. The majority of species recorded in spring and fall were landbirds, but waterfowl, raptors, gamebirds, and shorebirds also were also recorded. The most frequently recorded species in the spring was American Woodcock, representing 54% of recorded vocalizations during the spring. These birds migrate through the area but also breed locally. Given the nocturnal display flights and frequent calling performed by male woodcock, it is apparent that they are nesting at the site. Owls were other species that were recorded in relatively high numbers, indicating their presence in the project area as year-round, resident species. The most frequently recorded species in the fall included Golden-crowned Kinglet (26%), Great-horned Owl (12%), Barred Owl (10%), and Hairy Woodpecker (9%).

SAR observed during the 2022 avian acoustic surveys included Canada Warbler, Chimney Swift (spring only), Common Nighthawk (spring only), Eastern Wood-Pewee (fall survey only), Evening Grosbeak, Olive-sided Flycatcher (spring only), and Rusty Blackbird (spring only). SAR vocalizations comprised only 2% of total recorded vocalizations in the spring and 3% in the fall. Canada Warbler made up 97% of the SAR recorded in the spring and 86% of the SAR recorded in the fall. In both spring and fall, 99% of Canada Warbler vocalizations occurred at single detector located along the eastern edge of the Project Boundary (N4, Figure 1.1) over approximately a one week period in the spring (May 19 and May 29) and in the fall (August 26 to August 30).



4.3 COMPARISON: NOCTURNAL RADAR AND AVIAN ACOUSTIC SURVEY

Nocturnal radar surveys allowed us to document migration trends at the Project while avian acoustic surveys allowed us to identify some of the bird species occurring in the Project Boundary during the same nights when radar sampling occurred. The nocturnal radar surveys and avian acoustic surveys, while completed simultaneously on most nights, sampled the migrant (and locally breeding nocturnal species) bird community in different ways. As such, data from the two sources of migration information aren't directly comparable with respect to relative numbers of calls recorded and migration activity recorded by the on-site radar system. However, during the spring survey period, we observed a similar temporal trend between nocturnal radar survey and avian acoustic survey activity results with nocturnal passage rates determined using radar and number of bird vocalizations peaking in mid-May. During the fall survey period, however, the bird vocalization peak in early October was not reflected by target passage rates recorded during nocturnal surveys. Peaks in activity did occur throughout the fall survey period during both surveys but did not occur at the times between surveys.

These two sources of data may best be used to complement each other to form a broader, though not complete, picture of the progression of migration at the site. This includes not only the magnitude and flight characteristics of migration over the area relative to the proposed wind turbines (as determined with radar) but also the progression of different species' arrival at, departure from, or migratory passage through the project site. Additionally, the avian acoustic survey data provide an indication of the presence of SAR species, which radar data cannot provide on a wide scale basis.

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APPENDIX A

Nocturnal Radar Survey Tables

Appendix A Table 1 Summary of Survey Dates, Results, and Level of Effort During Spring 2022 Nocturnal Radar Surveys

Night of	Sunset	Sunrise	# of Hours Analyzed	Passage Rate (targets/km/hr)	Flight Direction (°)	Flight Height (m)	% Below 180 m	% Below 200 m	Average Nightly Temperature (°C)	Average Nightly Wind Speed (m/s)	Average Nightly Wind Direction (°)
04/22/22	20:08	6:14	10	247	105	152	78%	80%	2	9	346
04/23/22	20:09	6:13	10	28	95	318	41%	45%	-3	9	356
04/24/22	20:10	6:11	10	5	218	317	45%	45%	-1	14	21
04/25/22	20:12	6:09	9	87	76	451	34%	35%	6	7	148
04/26/22	20:13	6:08	9	46	35	452	18%	22%	3	8	207
04/28/22	20:15	6:04	10	62	101	290	42%	46%	2	4	66
04/29/22	20:17	6:03	8	8	188	206	44%	50%	1	7	34
05/02/22	20:21	5:58	7	245	96	196	71%	73%	0	7	32
05/03/22	20:22	5:57	10	306	71	375	25%	28%	5	6	207
05/05/22	20:24	5:54	8	208	109	198	65%	67%	2	7	343
05/08/22	20:28	5:50	8	131	74	266	42%	43%	3	6	76
05/10/22	20:31	5:47	8	196	60	314	58%	59%	5	7	129
05/11/22	20:32	5:46	6	989	62	496	15%	18%	15	5	235
05/12/22	20:33	5:45	6	808	161	421	39%	41%	16	5	96
05/13/22	20:34	5:44	7	695	78	352	30%	34%	13	13	245
05/14/22	20:35	5:42	9	532	54	309	42%	46%	10	5	151
05/19/22	20:41	5:37	9	245	70	322	44%	45%	10	5	173
05/20/22	20:42	5:36	9	168	48	384	27%	29%	7	8	206
05/27/22	20:50	5:30	9	10	27	610	15%	18%	14	9	222
05/29/22	20:52	5:28	9	152	66	258	37%	46%	14	10	264
Entire Season			171	230	78	371	34%	37%			

**Appendix A Table 2 Summary of Passage Rates by Hour, Night, and For Entire Season During Spring 2022
Nocturnal Radar Surveys**

Night of	BirdCast Migration Rate Category	Passage Rate (targets/km/hr) by Hour After Sunset										Entire Night			
		1	2	3	4	5	6	7	8	9	10	Mean	Median	Stdev	SE
04/22/22	None	21	61	289	371	450	439	425	207	136	68	247	248	170	54
04/23/22	None	4	43	36	64	29	25	29	11	7	29	28	29	18	6
04/24/22	None	0	0	7	0	4	14	0	4	7	18	5	4	6	2
04/25/22	Medium/High	29	68	46	93	125	89	93	129	114	NA ¹	87	93	34	11
04/26/22	Low	86	96	Rain	18	18	43	14	7	39	93	46	39	36	12
04/28/22	None	86	157	143	136	36	32	7	18	4	4	62	34	62	20
04/29/22	None	11	7	7	7	11	Rain	14	4	7	Rain	8	7	3	1
05/02/22	Medium/High	36	243	246	343	368	246	232	NA ¹	NA ¹	NA ¹	245	246	107	40
05/03/22	Low/Medium	121	289	329	546	493	425	357	275	218	11	306	309	163	52
05/05/22	None	118	164	214	300	NA ¹	NA ¹	418	311	136	7	208	189	130	46
05/08/22	Medium	68	225	211	150	143	143	71	39	NA ¹	NA ¹	131	143	67	24
05/10/22	Low/Medium	189	539	354	139	114	57	39	132	NA ¹	NA	196	136	169	60
05/11/22	Low/Medium	1,118	1,221	811	1,000	793	989	NA ¹	NA ¹	NA ¹	NA	989	995	168	69
05/12/22	Medium/High	857	875	561	707	968	882	NA ¹	NA ¹	NA ¹	NA	808	866	148	60
05/13/22	Medium	664	782	550	664	771	636	800	NA ¹	NA ¹	NA	695	664	92	35
05/14/22	Medium	368	1,164	754	609	568	546	436	196	143	NA	532	546	308	103
05/19/22	Low/Medium	75	311	239	311	293	368	271	211	129	NA	245	271	94	31
05/20/22	Medium	268	246	218	200	121	150	132	129	47	NA	168	150	70	23
05/27/22	Low/Medium	11	21	7	7	7	4	4	21	5	NA	10	7	7	2
05/29/22	Low	57	225	243	229	229	129	139	104	11	NA	152	139	85	28
Entire Season		209	337	277	295	292	290	193	112	72	33	230	132	274	21

0 indicates no targets counted for that hour; NA indicates no or only partial data for that hour; NA¹ indicates equipment failure during that hour

Appendix A Table 3 Mean Nightly Flight Direction During Spring 2022 Nocturnal Radar Surveys

Night of	Mean Flight Direction (°)	Circular Stdev (°)
04/22/22	105	52
04/23/22	95	89
04/24/22	218	130
04/25/22	76	122
04/26/22	35	63
04/28/22	101	114
04/29/22	188	77
05/02/22	96	66
05/03/22	71	64
05/05/22	109	67
05/08/22	74	72
05/10/22	60	65
05/11/22	62	53
05/12/22	161	98
05/13/22	78	36
05/14/22	54	97
05/19/22	70	106
05/20/22	48	68
05/27/22	27	45
05/29/22	66	60
Entire Season	78	74

Appendix A Table 4 Summary of Mean Flight Heights by Hour, Night, and For Entire Season During Spring 2022 Nocturnal Radar Surveys

Night of	Mean Flight Height (m) by Hour After Sunset										Entire Night				# of Targets Below 180 Meters	% of Targets Below 180 Meters	# of Targets Below 200 Meters	% of Targets Below 200 Meters
	1	2	3	4	5	6	7	8	9	10	Mean	Median	STDV	SE				
04/22/22	Rain	159	133	227	220	100	96	131	92	66	152	94	165	13	120	78%	123	80%
04/23/22	638	279	779	284	219	286	354	272	568	0	318	263	250	46	12	41%	13	45%
04/24/22	497	662	577	Rain	282	211	183	0	122	0	317	267	212	64	5	45%	5	45%
04/25/22	162	388	278	462	275	521	538	588	442	NA ¹	451	457	343	21	86	34%	90	35%
04/26/22	305	Rain	Rain	523	526	420	481	478	435	373	452	450	246	22	22	18%	26	22%
04/28/22	187	444	279	55	Rain	342	519	270	Rain	339	290	247	243	23	48	42%	52	46%
04/29/22	0	187	194	208	106	Rain	298	209	277	Rain	206	201	90	21	8	44%	9	50%
05/02/22	281	209	251	176	165	206	89	NA ¹	NA ¹	NA ¹	196	90	246	16	162	71%	167	73%
05/03/22	316	452	378	355	372	343	391	393	325	170	375	341	247	8	224	25%	247	28%
05/05/22	268	305	288	205	NA ¹	NA ¹	100	127	215	0	198	90	229	17	117	65%	122	67%
05/08/22	211	417	287	185	193	127	118	NA ¹	NA ¹	NA ¹	266	258	215	17	67	42%	69	43%
05/10/22	178	459	246	108	50	112	72	7	NA ¹	NA	314	107	373	25	130	58%	133	59%
05/11/22	250	448	574	608	522	370	NA ¹	NA ¹	NA ¹	NA	496	442	303	9	176	15%	202	18%
05/12/22	263	410	477	454	519	351	NA ¹	NA ¹	NA ¹	NA	421	271	375	13	325	39%	345	41%
05/13/22	283	397	367	393	345	368	355	280	NA ¹	NA	352	307	252	9	259	30%	290	34%
05/14/22	199	290	274	282	377	336	334	296	433	NA	309	240	256	11	237	42%	257	46%
05/19/22	301	454	287	367	441	258	189	220	156	NA	322	242	287	15	157	44%	161	45%
05/20/22	183	493	385	352	389	356	352	354	390	NA	384	341	274	15	91	27%	98	29%
05/27/22	597	188	626	547	713	644	758	607	696	NA	610	699	331	34	14	15%	17	18%
05/29/22	265	288	236	254	227	231	235	255	528	NA	258	210	152	10	93	37%	116	46%
Entire Season	266	403	402	392	410	341	321	324	342	196	371	298	299	4	2,353	34%	2,542	37%

-- indicates no targets counted for that hour; NA indicates no or only partial data for that hour; NA¹ indicates equipment failure during that hour

Appendix A Table 5 Summary of Survey Dates, Results, and Level of Effort During Fall 2022 Nocturnal Radar Surveys

Night of	Sunset	Sunrise	# of Hours Analyzed	Passage Rate (targets/km/hr)	Flight Direction (°)	Flight Height (m)	% Below 180 m	% Below 200 m	Average Nightly Temperature (°C)	Average Nightly Wind Speed (m/s)	Average Nightly Wind Direction (°)
08/20/22	20:14	6:20	10	696	107	244	49%	53%	24	5	288
08/22/22	20:11	6:23	8	371	353	233	50%	54%	17	7	189
08/23/22	20:09	6:24	9	783	37	244	50%	54%	18	9	227
08/25/22	20:06	6:26	10	1,452	253	294	36%	40%	19	3	107
08/26/22	20:04	6:28	10	594	19	242	47%	51%	16	9	212
08/28/22	20:00	6:30	11	443	32	194	58%	62%	16	7	234
08/29/22	19:58	6:31	11	225	28	206	56%	59%	17	9	238
08/30/22	19:57	6:33	11	390	16	192	61%	65%	18	10	211
09/06/22	19:42	6:41	11	1,508	246	296	35%	39%	13	4	30
09/10/22	19:36	6:46	11	1,078	183	310	35%	38%	14	7	9
09/11/22	19:34	6:47	11	1,309	204	269	44%	47%	15	6	16
09/14/22	19:28	6:51	11	832	106	254	48%	50%	15	9	272
09/16/22	19:24	6:53	12	309	169	329	35%	38%	7	11	318
09/21/22	19:14	7:00	6	324	210	326	27%	31%	13	3	295
10/03/22	18:51	7:15	8	1,026	307	483	31%	35%	9	3	NA
10/04/22	18:49	7:16	8	476	342	278	59%	63%	10	8	NA
10/05/22	18:47	7:17	8	112	209	370	25%	26%	12	5	NA
10/07/22	18:44	7:20	11	154	26	348	45%	47%	11	10	NA
10/11/22	18:36	7:25	12	123	74	232	60%	61%	6	10	NA
10/12/22	18:34	7:26	12	470	283	383	42%	44%	10	7	NA
10/13/22	18:33	7:28	12	1,160	301	316	40%	43%	10	9	NA
10/14/22	18:31	7:29	12	1,215	291	231	64%	67%	13	11	NA
10/15/22	18:29	7:30	8	48	352	241	47%	55%	13	8	NA
10/16/22	18:27	7:32	10	654	231	308	36%	40%	13	3	NA
10/18/22	18:24	7:34	11	194	305	226	55%	56%	12	11	NA
10/20/22	18:20	7:37	12	423	247	396	39%	42%	7	8	NA
10/23/22	18:15	7:41	9	426	218	694	12%	14%	15	2	226
10/25/22	18:12	7:44	11	35	53	461	25%	27%	16	6	226
10/27/22	18:09	7:47	12	459	190	346	26%	29%	8	10	347
10/28/22	18:07	7:48	11	160	210	598	21%	22%	4	5	315
Entire Season			309	591	281	322	40%	44%			
NA indicates no data available											

Appendix A Table 6 Summary of Passage Rates by Hour, Night, and For Entire Season During Fall 2022 Nocturnal Radar Surveys

Night of	BirdCast Migration Rate Category	Passage Rate (targets/km/hr) by Hour After Sunset													Entire Night			
		1	2	3	4	5	6	7	8	9	10	11	12	13	Mean	Median	Stdev	SE
08/20/22	Low	725	1,032	968	889	725	661	754	532	489	182	NA	NA	NA	696	725	250	79
08/22/22	None	161	686	493	450	418	307	371	Rain	86	Rain	NA	NA	NA	371	395	190	67
08/23/22	Medium	943	1,200	846	500	Rain	536	486	479	1,050	1,004	NA	NA	NA	783	846	284	95
08/25/22	Medium/High	1,321	2,250	2,361	1,989	1,714	1,564	1,104	825	718	668	NA	NA	NA	1,452	1,443	625	198
08/26/22	Low	829	1,068	893	968	775	532	271	218	171	211	NA	NA	NA	594	654	352	111
08/28/22	None	525	889	832	690	529	350	229	246	279	254	50	NA	NA	443	350	271	82
08/29/22	None	321	607	568	575	250	39	29	46	18	25	0	NA	NA	225	46	252	76
08/30/22	None	493	775	407	361	229	293	429	300	289	579	134	NA	NA	390	361	178	54
09/06/22	Medium/High	1,632	3,057	2,514	1,861	2,111	1,804	711	504	736	829	829	NA	NA	1,508	1,632	847	255
09/10/22	Low/Medium	382	3,325	2,169	1,464	1,218	818	604	636	632	379	236	NA	NA	1,078	636	937	282
09/11/22	Low/Medium	1,054	3,143	2,471	1,375	1,479	1,411	1,164	807	579	564	350	NA	NA	1,309	1,164	843	254
09/14/22	Medium	532	918	1,371	1,493	1,571	771	779	575	400	407	336	NA	NA	832	771	454	137
09/16/22	Low/Medium	286	829	1,093	521	264	139	132	121	139	64	121	0	NA	309	139	337	97
09/21/22	Low	143	429	125	346	432	468	NA ¹	NA ¹	NA ¹	NA ¹	NA ¹	NA ¹	NA	324	388	152	62
10/03/22	Low	186	775	1,054	1,246	1,404	1,432	1,246	868	NA ¹	NA ¹	NA ¹	NA ¹	NA	1,026	1,150	414	146
10/04/22	Low/Medium	218	582	621	954	654	407	186	189	NA ¹	NA ¹	NA ¹	NA ¹	NA	476	495	275	97
10/05/22	None	Rain	Rain	Rain	211	132	200	107	57	104	29	54	NA ¹	NA ¹	112	105	67	24
10/07/22	Low/Medium	350	389	275	143	64	61	54	75	64	143	75	NA ¹	NA ¹	154	75	125	38
10/11/22	None	18	118	104	186	150	232	200	146	99	46	89	93	NA ¹	123	111	63	18
10/12/22	None	218	464	968	807	750	543	429	368	457	207	232	193	NA ¹	470	443	256	74
10/13/22	None	789	3,200	1,661	596	179	600	846	2,700	1,161	936	714	532	NA ¹	1,160	818	917	265
10/14/22	None	1,046	1,829	2,307	3,750	2,775	1,514	643	343	146	129	64	39	NA ¹	1,215	845	1,231	355
10/15/22	Low/Medium	118	86	39	43	25	43	25	Rain	Rain	7	NA ¹	NA ¹	NA ¹	48	41	36	13
10/16/22	Medium	361	1,661	1,714	Rain	Rain	132	540	432	918	450	229	100	NA ¹	654	441	592	187
10/18/22	None	225	457	714	86	125	314	93	75	14	18	18	NA ¹	NA ¹	194	93	221	67
10/20/22	None	150	1,164	1,032	571	489	414	400	250	161	182	46	214	NA ¹	423	325	352	102
10/23/22	Low/Medium	404	307	389	404	557	618	475	336	346	NA ¹	NA ¹	NA ¹	NA ¹	426	404	105	35
10/25/22	None	50	100	61	71	29	7	14	21	7	11	18	NA ¹	NA ¹	35	21	31	9
10/27/22	Medium	1,168	893	554	539	493	418	354	400	368	186	57	82	NA ¹	459	409	318	92
10/28/22	None	329	371	246	250	175	96	75	64	64	39	46	NA ¹	NA ¹	160	96	121	36
Entire Season		516	1,124	995	805	704	558	440	430	365	302	185	157	NA¹	591	404	641	36

0 indicates no targets counted for that hour; NA indicates no or only partial data for that hour; NA¹ indicates equipment failure during that hour

Appendix A Table 7 Mean Nightly Flight Direction During Fall 2022 Nocturnal Radar Surveys

Night of	Mean Flight Direction (°)	Circular Stdev (°)
08/20/22	107	80
08/22/22	353	45
08/23/22	37	46
08/25/22	253	65
08/26/22	19	24
08/28/22	32	61
08/29/22	28	52
08/30/22	16	36
09/06/22	246	50
09/10/22	183	64
09/11/22	204	81
09/14/22	106	87
09/16/22	169	80
09/21/22	210	74
10/03/22	307	49
10/04/22	342	46
10/05/22	209	26
10/07/22	26	32
10/11/22	74	90
10/12/22	283	96
10/13/22	301	35
10/14/22	291	31
10/15/22	352	20
10/16/22	231	76
10/18/22	305	36
10/20/22	247	119
10/23/22	218	93
10/25/22	53	43
10/27/22	190	38
10/28/22	210	50
Entire Season	318	113

Appendix A Table 8 Summary of Mean Flight Heights by Hour, Night, and For Entire Season During Fall 2022 Nocturnal Radar Surveys

Night of	Mean Flight Height (m) by Hour After Sunset													Entire Night				# of Targets Below 180 Meters	% of Targets Below 180 Meters	# of Targets Below 200 Meters	% of Targets Below 200 Meters
	1	2	3	4	5	6	7	8	9	10	11	12	13	Mean	Median	STDV	SE				
08/20/22	277	278	274	286	222	212	220	194	189	227	NA	NA	NA	244	184	231	6	698	49%	751	53%
08/22/22	203	207	247	285	240	213	262	Rain	Rain	Rain	NA	NA	NA	233	180	195	6	460	50%	494	54%
08/23/22	185	260	252	284	Rain	348	226	262	188	177	NA	NA	NA	244	185	211	6	530	50%	574	54%
08/25/22	366	341	297	275	270	237	260	305	257	206	NA	NA	NA	294	246	219	4	871	36%	972	40%
08/26/22	254	273	297	229	202	225	197	217	241	160	NA	NA	NA	242	193	187	5	721	47%	779	51%
08/28/22	226	183	187	178	229	219	176	190	178	159	262	NA	NA	194	146	157	5	588	58%	623	62%
08/29/22	184	204	196	198	236	285	258	169	221	187	--	NA	NA	206	156	165	7	304	56%	323	59%
08/30/22	205	195	239	224	240	236	156	191	140	140	130	NA	NA	192	142	168	5	714	61%	764	65%
09/06/22	275	333	299	263	337	277	272	273	272	269	284	NA	NA	296	250	221	4	980	35%	1,101	39%
09/10/22	261	302	312	338	284	280	316	360	344	303	311	NA	NA	310	269	225	5	774	35%	848	38%
09/11/22	286	278	286	267	256	222	247	259	266	319	247	NA	NA	269	213	219	5	830	44%	887	47%
09/14/22	208	287	289	216	224	224	297	273	274	258	226	NA	NA	254	199	210	5	831	48%	874	50%
09/16/22	384	376	270	349	318	415	259	323	274	323	207	403	NA	329	293	241	9	238	35%	258	38%
09/21/22	370	352	423	315	294	297	NA ¹	NA ¹	NA ¹	NA ¹	NA ¹	NA ¹	NA ¹	326	294	203	8	179	27%	204	31%
10/03/22	330	301	440	528	503	424	522	591	NA ¹	NA ¹	NA ¹	NA ¹	NA	483	321	397	9	607	31%	669	35%
10/04/22	188	281	354	229	213	295	375	352	NA ¹	NA ¹	NA ¹	NA ¹	NA	278	147	323	12	446	59%	471	63%
10/05/22	Rain	Rain	Rain	290	376	285	384	400	469	537	392	NA ¹	NA ¹	370	367	202	12	66	25%	68	26%
10/07/22	123	313	470	579	586	497	434	373	260	164	214	NA ¹	NA ¹	348	231	314	19	125	45%	132	47%
10/11/22	95	153	256	176	278	294	211	129	408	342	132	158	NA ¹	232	125	246	19	106	60%	108	61%
10/12/22	229	354	339	287	363	309	413	454	484	462	402	465	NA ¹	383	269	332	10	436	42%	463	44%
10/13/22	213	339	442	389	485	326	264	166	143	125	97	180	NA ¹	316	236	257	6	830	40%	908	43%
10/14/22	270	326	361	205	149	109	79	78	70	51	59	107	NA ¹	231	133	239	7	846	64%	879	67%
10/15/22	224	169	252	427	394	151	178	Rain	178	240	NA ¹	NA ¹	NA ¹	241	194	173	20	36	47%	42	55%
10/16/22	170	241	247	Rain	Rain	499	328	322	357	392	322	294	NA ¹	308	246	236	6	552	36%	624	40%
10/18/22	179	286	208	263	155	209	160	240	Rain	291	411	NA ¹	NA ¹	226	156	195	10	208	55%	214	56%
10/20/22	182	224	215	186	180	101	122	165	438	799	226	69	NA ¹	396	258	359	12	374	39%	399	42%
10/23/22	565	791	729	750	725	705	650	635	551	NA ¹	NA ¹	NA ¹	NA ¹	694	723	378	9	211	12%	239	14%
10/25/22	198	323	575	604	496	281	561	672	893	444	432	NA ¹	NA ¹	461	456	306	28	29	25%	32	27%
10/27/22	342	337	360	358	358	348	331	339	314	290	310	333	NA ¹	346	315	220	5	586	26%	661	29%
10/28/22	540	682	666	617	613	615	506	564	559	324	287	598	NA ¹	598	623	380	15	128	21%	140	22%
Entire Season	281	319	341	323	331	319	325	339	323	337	269	189	NA¹	322	240	280	1	14,304	40%	15,501	44%

-- indicates no targets counted for that hour; NA indicates no or only partial data for that hour; NA¹ indicates equipment failure during that hour

Appendix A Table 9 Summary of Publicly Available Avian Spring and Fall Radar Survey Results Conducted at Proposed (Pre-Construction) Wind Power Facilities in Nova Scotia, Canada; Maine, U.S.; Using X-band Mobile Radar Systems (2005-2022 Sorted by Season and Mean Passage Rate Low to High).

Project Site	Year	Number of Survey Nights	Number of Survey Hours	Landscape	Mean Passage Rate (t/km/hr)	Range in Nightly Passage Rates	Mean Flight Direction	Mean Flight Height (m)	Reference
Spring									
Stetson, Washington Cty, ME	2007	21	138	Forested ridge	147	3–434	55	210	Woodlot Alternatives, Inc. 2007. A Spring 2007 Survey of Bird and Bat Migration at the Stetson Wind Project, Washington County, Maine. Prepared for Evergreen Wind V, LLC.
Proposed Wind Site near Nuttby, Nova Scotia	2022	20	171	Forested ridge	230	5–989	78	371	<i>This Report</i>
Rollins, Penobscot Cty, ME	2008	20	189	Forested ridge	247	40–766	75	316	Stantec Consulting Services Inc. 2008. Spring 2008 Bird and Bat Migration Survey Report: Visual, Radar and Acoustic Bat Surveys for the Rollins Wind Project. Prepared for First Wind, LLC.
Bowers, Penobscot Cty, ME	2010	20	188	Forested ridge	289	20–589	56	243	Stantec Consulting Services Inc. 2010. 2010 Spring Avian and Spring/Summer Bat Surveys for the Bowers Wind Project. Prepared for Champlain Wind Energy LLC.
Mars Hill, Aroostook Cty, ME	2006	15	85	Forested ridge	338	76–674	58	384	Woodlot Alternatives, Inc. 2006. A Spring 2006 Radar, Visual, and Acoustic Survey of Bird Migration at the Mars Hill Wind Farm in Mars Hill, Maine. Prepared for Evergreen Windpower, LLC.
Bull Hill, Hancock Cty, ME	2010	20	184	Forested ridge within Coastal plain	387	43–879	48	217	Stantec Consulting Services Inc. 2010. Spring 2010 Avian and Bat Survey Report for the Bull Hill Wind Project. Prepared for Blue Sky East Wind LLC.
Number Nine, Aroostook Cty, ME	2014	20	170	Forested ridge	402	26-1,056	43	357	Stantec Consulting Services Inc. 2014. Fall 2014 Nocturnal Radar Survey Report. Prepared for Number Nine Wind Farm, LLC.
Downeast, Washington Cty, ME	2016	20	189	Agricultural plateau within Coastal plain	469	86–1,969	68	384	Stantec Consulting Services Inc. 2017. Nocturnal Migration Radar Report Downeast Wind Project - September 2015 to October 2016.
Passadumkeag, Penobscot, ME	2011	20	179	Forested ridge	476	3–1,950	67	321	Stantec Consulting Services Inc. 2011. Spring and Summer 2011 Avian and Bat Survey Report for the Passadumkeag Wind Project in Grand Falls Township, Maine. Prepared for Passadumkeag Windpark LLC.
Oakfield, Penobscot Cty, ME	2008	20	194	Forested ridge	498	132–899	33	276	Stantec Consulting Services Inc. 2008. A Spring 2008 Survey of Bird and Bat Migration at the Oakfield Wind Project, Washington County, Maine. Prepared for Evergreen Wind, LLC.
Bull Hill, Hancock Cty, ME	2011	10	94	Forested ridge within Coastal plain	519	88–1,108	98	371	Stantec Consulting Services Inc. 2011. Spring 2011 Radar Survey Results and Comparison to Spring 2010 Results: Memo for the Bull Hill Wind Project. Prepared for First Wind.
Weaver, Hancock Cty, ME	2014	20	188	Forested ridge within Coastal plain	806	49–2,586	72	365	Stantec Consulting Services Inc. 2014. 2014 Pre-Construction Avian and Bat Surveys – Weaver Wind Project. Prepared for First Wind, LLC.
Fall									
Number Nine, Aroostook Cty, ME	2014	20	227	Forested ridge	247	47–806	218	354	Stantec Consulting Services Inc. 2014. Fall 2014 Nocturnal Radar Survey Report. Prepared for Number Nine Wind Farm, LLC.
Bowers, Washington Cty, ME	2009	22	249	Forested ridge	344	95–844	231	315	Stantec Consulting Services Inc. 2010. Fall 2009 Avian and Bat Surveys for the Bowers Wind Project. Prepared for Champlain Wind Energy, LLC.
Rollins, Lincoln, Penobscot Cty, ME	2007	22	231	Forested ridge	368	82–953	284	343	Woodlot Alternatives, Inc. 2008. A Fall 2007 Survey of Bird and Bat Migration at the Rollins Wind Project, Washington County, Maine. Prepared for Evergreen Wind, LLC.
Passadumkeag, Penobscot Cty, ME	2011	20	222	Forested ridge	394	65–1,281	251	325	Stantec Consulting Services. 2011. Summer and Fall 2011 Avian and Bat Survey Report for the Passadumkeag Wind Project in Grand Falls Township, Maine. Prepared for Passadumkeag Windpark LLC.

Appendix A Table 9 Summary of Publicly Available Avian Spring and Fall Radar Survey Results Conducted at Proposed (Pre-Construction) Wind Power Facilities in Nova Scotia, Canada; Maine, U.S.; Using X-band Mobile Radar Systems (2005-2022 Sorted by Season and Mean Passage Rate Low to High).

Project Site	Year	Number of Survey Nights	Number of Survey Hours	Landscape	Mean Passage Rate (t/km/hr)	Range in Nightly Passage Rates	Mean Flight Direction	Mean Flight Height (m)	Reference
Bull Hill, Hancock Cty, ME	2011	10	112	Forested ridge within Coastal plain	431	111–747	282	279	Stantec Consulting Services Inc. 2011. Fall 2011 Radar Survey Results and Comparison to Fall 2009 Radar Results: Memo for the Bull Hill Wind Project. Prepared for Blue Sky East Wind, LLC.
Stetson, Washington Cty, ME	2006	12	77	Forested ridge	476	131–1,192	227	378	Woodlot Alternatives, Inc. 2007. A Fall 2006 Survey of Bird and Bat Migration at the Stetson Wind Project, Washington County, Maine. Prepared for Evergreen Wind V, LLC.
Downeast, Washington Cty, ME	2016	20	227	Agricultural plateau within Coastal plain	486	113–1,768	252	465	Stantec Consulting Services Inc. 2017. Nocturnal Migration Radar Report Downeast Wind Project - September 2015 to October 2016.
Oakfield, Penobscot Cty, ME	2008	20	NA	Forested ridge	501	116–945	200	309	Woodlot Alternatives, Inc. 2008. A Fall 2008 Survey of Bird and Bat Migration at the Oakfield Wind Project, Washington County, Maine. Prepared for Evergreen Wind, LLC.
Mars Hill, Aroostook Cty, ME	2005	18	117	Forested ridge	512	60–1,092	228	424	Woodlot Alternatives, Inc. 2006. A Fall 2005 Radar, Visual, and Acoustic Survey of Bird Migration at the Mars Hill Wind Farm in Mars Hill, Maine. Prepared for Evergreen Windpower, LLC.
Weaver, Hancock Cty, ME	2016	20	225	Forested ridge	543	61–1,126	207	479	Stantec Consulting Services Inc. 2018. Weaver Wind Project Pre-Construction Nocturnal Radar Migration Surveys, Fall 2016. Prepared for Weaver Wind LLC.
Proposed Wind Site near Nuttby, Nova Scotia	2022	30	309	Forested ridge	591	35–1,508	281	322	<i>This Report</i>
Bull Hill, Hancock Cty, ME	2009	20	232	Forested ridge	614	188–1,500	260	357	Stantec Consulting Services Inc. 2010. Summer and Fall 2009 Avian and Bat Survey Report for the Bull Hill Project. Prepared for Blue Sky East Wind, LLC.
Weaver, Hancock Cty, ME	2014	20	211	Forested ridge	657	239–1,122	259	412	Stantec Consulting Services Inc. 2014. 2014 Pre-Construction Avian and Bat Surveys – Weaver Wind Project. Prepared for First Wind, LLC.
Downeast, Washington Cty, ME	2015	20	227	Agricultural plateau	920	66–2,173	255	428	Stantec Consulting Services Inc. 2017. Nocturnal Migration Radar Report Downeast Wind Project - September 2015 to October 2016.

Table A.1 Migratory Bird Survey Data

Survey Date	Transect ID	Common Name	Scientific Name	Bird Group	Number Observed	Distance (m)	Behaviour	Height	Direction of Travel
5/30/2022	NBT-3	ovenbird	<i>Seiurus aurocapilla</i>	Landbirds	1	50	Singing	Low	n/a
5/30/2022	NBT-3	alder flycatcher	<i>Empidonax alnorum</i>	Landbirds	1	20	Singing	Low	n/a
5/30/2022	NBT-3	mourning warbler	<i>Geothlypis philadelphia</i>	Landbirds	1	50	Singing	Low	n/a
5/30/2022	NBT-3	white-throated sparrow	<i>Zonotrichia albicollis</i>	Landbirds	1	80	Singing	Low	n/a
5/30/2022	NBT-3	American robin	<i>Turdus migratorius</i>	Landbirds	1	15	Calling	Low	n/a
5/30/2022	NBT-3	hermit thrush	<i>Catharus guttatus</i>	Landbirds	1	30	Calling	Low	n/a
5/30/2022	NBT-3	white-throated sparrow	<i>Zonotrichia albicollis</i>	Landbirds	1	5	Flyover	Low	local
5/30/2022	NBT-3	mourning warbler	<i>Geothlypis philadelphia</i>	Landbirds	1	30	Singing	Low	n/a
5/30/2022	NBT-3	black-throated blue warbler	<i>Setophaga caerulescens</i>	Landbirds	1	30	Singing	Low	n/a
5/30/2022	NBT-3	alder flycatcher	<i>Empidonax alnorum</i>	Landbirds	1	20	Singing	Low	n/a
5/30/2022	NBT-3	common yellowthroat	<i>Geothlypis trichas</i>	Landbirds	1	10	Singing	Low	n/a
5/30/2022	NBT-3	red-eyed vireo	<i>Vireo olivaceus</i>	Landbirds	1	30	Singing	Low	n/a
5/30/2022	NBT-3	hairy woodpecker	<i>Dryobates villosus</i>	Landbirds	1	15	Calling	Low	n/a

APPENDIX B

**Acoustic Tables and Acoustic Results by Species:
Vocalizations by Time of Day and Date**

Appendix B Table 1 Species Identified, by Detector, During Spring 2022 Avian Acoustic Surveys

Species	Scientific Name	Seasonal Presence	N1	N2	N3	N4	N5	Total
Alder Flycatcher	<i>Empidonax alnorum</i>	Migrant/Breeder	380					380
American Crow	<i>Corvus brachyrhynchos</i>	Resident/Breeder	2	3	2			7
American Goldfinch	<i>Spinus tristis</i>	Resident/Breeder	95	36	34	20	1	186
American Redstart	<i>Setophaga ruticilla</i>	Migrant/Breeder	47	5	3			55
American Robin	<i>Turdus migratorius</i>	Migrant/Breeder	334	425	308	7	1	1,075
American Three-toed Woodpecker	<i>Picoides dorsalis</i>	Resident/Unknown				1		1
American Tree Sparrow	<i>Spizella arborea</i>	Migrant/Non-breeder	1	13	2	2		18
American Woodcock	<i>Scolopax minor</i>	Migrant/Breeder	13,227	36,263		2,474		51,964
Barred Owl	<i>Strix varia</i>	Resident/Breeder	16	201	245	83		545
Bay-breasted Warbler	<i>Setophaga castanea</i>	Migrant/Breeder	4	84	8	10		106
Belted Kingfisher	<i>Megaceryle alcyon</i>	Migrant/Breeder		7				7
Black-and-white Warbler	<i>Mniotilta varia</i>	Migrant/Breeder	1,001	75	244	643	58	2,021
Black-backed Woodpecker	<i>Picoides arcticus</i>	Resident/Breeder		2		132	12	146
Black-bellied Plover	<i>Pluvialis squatarola</i>	Migrant/Non-breeder				1		1
Black-capped Chickadee	<i>Poecile atricapillus</i>	Resident/Breeder	467	2,042	1,380	89	1	3,979
Black-throated Blue Warbler	<i>Setophaga caeruleascens</i>	Migrant/Breeder	1	1	1	5	67	75
Black-throated Green Warbler	<i>Setophaga virens</i>	Migrant/Breeder	432	1,145	318	171	96	2,162
Blue Jay	<i>Cyanocitta cristata</i>	Resident/Breeder	28	41		34		103
Blue-headed Vireo	<i>Vireo solitarius</i>	Migrant/Breeder	74	52	158	23		307
Bohemian Waxwing	<i>Bombycilla garrulus</i>	Migrant/Non-breeder		2	1			3
Boreal Chickadee	<i>Poecile hudsonicus</i>	Resident/Breeder	1	153		14		168
Boreal Owl	<i>Aegolius funereus</i>	Resident/Unknown			1	2		3
Brown Creeper	<i>Certhia americana</i>	Migrant/Breeder	35	6	252	46	2	341
Canada Goose	<i>Branta canadensis</i>	Migrant/Breeder	4	71	126	2		203
Canada Jay	<i>Perisoreus canadensis</i>	Resident/Breeder		1		4		5
Canada Warbler	<i>Cardellina canadensis</i>	Migrant/Breeder	13			1,433		1,446
Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	Migrant/Breeder	105			40		145
Chimney Swift	<i>Chaetura pelagica</i>	Migrant/Breeder	1					1
Common Grackle	<i>Quiscalus quiscula</i>	Migrant/Breeder	1	37		5	1	44
Common Loon	<i>Gavia immer</i>	Migrant/Breeder				2		2
Common Nighthawk	<i>Chordeiles minor</i>	Migrant/Breeder	1	1				2
Common Raven	<i>Corvus corax</i>	Resident/Breeder	12			3		15
Common Redpoll	<i>Acanthis flammea</i>	Migrant/Non-breeder	1		1			2
Common Yellowthroat	<i>Geothlypis trichas</i>	Migrant/Breeder	122			10		132
Dark-eyed Junco	<i>Junco hyemalis</i>	Resident/Breeder	38	465	196	132	72	903
Downy Woodpecker	<i>Picoides pubescens</i>	Resident/Breeder	3		3			6
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Migrant/Breeder	3	22		10		35
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Resident/Breeder	37	65	80	1,255	208	1,645
Great Horned Owl	<i>Bubo virginianus</i>	Resident/Breeder		20	14	87	6	127
Hairy Woodpecker	<i>Picoides villosus</i>	Resident/Breeder		5		1		6

Appendix B Table 1 Species Identified, by Detector, During Spring 2022 Avian Acoustic Surveys

Hermit Thrush	<i>Catharus guttatus</i>	Migrant/Breeder	360	2,319	3,618	1,211	174	7,682
Least Flycatcher	<i>Empidonax minimus</i>	Migrant/Breeder	3		89	3		95
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	Migrant/Breeder		1				1
Long-tailed Duck	<i>Clangula hyemalis</i>	Migrant/Non-breeder		4	2	4		10
Magnolia Warbler	<i>Setophaga magnolia</i>	Migrant/Breeder	80	339	14	270	6	709
Mourning Warbler	<i>Geothlypis philadelphia</i>	Migrant/Breeder	2				6	8
Nashville Warbler	<i>Oreothlypis ruficapilla</i>	Migrant/Breeder	27	122	9	543		701
Northern Flicker	<i>Colaptes auratus</i>	Migrant/Breeder	310	525		226		1,061
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	Migrant/Non-breeder	4					4
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	Resident/Breeder		16	203	1,326		1,545
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Migrant/Breeder	1			1		2
Ovenbird	<i>Seiurus aurocapilla</i>	Migrant/Breeder	1,048	86	626	4	11	1,775
Palm Warbler	<i>Setophaga palmarum</i>	Migrant/Breeder	87	14	7	542		650
Pileated Woodpecker	<i>Dryocopus pileatus</i>	Resident/Breeder	34	15	3	24		76
Pine Siskin	<i>Spinus pinus</i>	Resident/Breeder	11	49	8	15		83
Purple Finch	<i>Haemorhous purpureus</i>	Migrant/Breeder	22	143	4			169
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Resident/Breeder	1	197	31	114	7	350
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Resident/Breeder	2					2
Ring-billed Gull	<i>Larus delawarensis</i>	Migrant/Unknown				1		1
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	Migrant/Breeder	131	1		1		133
Ruby-crowned Kinglet	<i>Regulus calendula</i>	Migrant/Breeder	1	1	1	84		87
Ruddy Turnstone	<i>Arenaria interpres</i>	Migrant/Non-breeder	10					10
Ruffed Grouse	<i>Bonasa umbellus</i>	Resident/Breeder	24	24		1		49
Rusty Blackbird	<i>Euphagus carolinus</i>	Migrant/Breeder	5					5
Sanderling	<i>Calidris alba</i>	Migrant/Non-breeder	4					4
Savannah Sparrow	<i>Passerculus sandwichensis</i>	Migrant/Breeder	14	1	2	3		20
Song Sparrow	<i>Melospiza melodia</i>	Migrant/Breeder	244			4		248
Spotted Sandpiper	<i>Actitis macularius</i>	Migrant/Breeder					1	1
Swainson's Thrush	<i>Catharus ustulatus</i>	Migrant/Breeder	17	2			6	25
Unidentified Bird	<i>Not applicable</i>	Not applicable	32	8	4	13	3	60
Veery	<i>Catharus fuscescens</i>	Migrant/Breeder				3		3
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Migrant/Breeder	1,328	289	52	1,427	24	3,120
White-winged Crossbill	<i>Loxia leucoptera</i>	Resident/Breeder	3	27	28	36		94
Winter Wren	<i>Troglodytes hiemalis</i>	Migrant/Breeder	657	1		5,993	640	7,291
Wood Duck	<i>Aix sponsa</i>	Migrant/Breeder	2					2
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	Migrant/Breeder				206	11	217
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	Migrant/Breeder	10	4	7			21
Yellow-rumped Warbler	<i>Setophaga coronata</i>	Migrant/Breeder	50	296	161	1,662	2	2,171
Note: Bold and highlighted grey indicates Species at Risk Bold indicates Species of Conservation Concern								

Appendix B Table 2 Species Identified, by Detector, During Fall 2022 Avian Acoustic Surveys

Species	Scientific Name	Seasonal Presence	N1	N2	N3	N4	N5	Total
American Crow	<i>Corvus brachyrhynchos</i>	Resident/Breeder		9	5	5		19
American Goldfinch	<i>Spinus tristis</i>	Resident/Breeder	6	9		15	5	35
American Redstart	<i>Setophaga ruticilla</i>	Migrant/Breeder		1	2			3
American Robin	<i>Turdus migratorius</i>	Migrant/Breeder	5	4		41		50
American Tree Sparrow	<i>Spizella arborea</i>	Migrant/Non-breeder				21	7	28
American Woodcock	<i>Scolopax minor</i>	Migrant/Breeder	4	15		11		30
Barred Owl	<i>Strix varia</i>	Resident/Breeder	20	34	195	237	196	682
Bay-breasted Warbler	<i>Setophaga castanea</i>	Migrant/Breeder	3	21			2	26
Black-and-white Warbler	<i>Mniotilta varia</i>	Migrant/Breeder	65	2	3			70
Black-backed Woodpecker	<i>Picoides arcticus</i>	Resident/Breeder			2	43	6	51
Black-capped Chickadee	<i>Poecile atricapillus</i>	Resident/Breeder	37	31	13	57	17	155
Blackpoll Warbler	<i>Setophaga striata</i>	Migrant/Breeder		1				1
Black-throated Green Warbler	<i>Setophaga virens</i>	Migrant/Breeder	1	7	2		1	11
Blue Jay	<i>Cyanocitta cristata</i>	Resident/Breeder	10	1	6	16	17	50
Bohemian Waxwing	<i>Bombycilla garrulus</i>	Migrant/Non-breeder		2		2		4
Boreal Chickadee	<i>Poecile hudsonicus</i>	Resident/Breeder		16		1	1	18
Boreal Owl	<i>Aegolius funereus</i>	Resident/Unknown		2		1	2	5
Brown Creeper	<i>Certhia americana</i>	Migrant/Breeder	3	4	30	25	57	119
Canada Goose	<i>Branta canadensis</i>	Migrant/Breeder			1	4	1	6
Canada Jay	<i>Perisoreus canadensis</i>	Resident/Breeder				5	12	17
Canada Warbler	<i>Cardellina canadensis</i>	Migrant/Breeder		1		180	1	182
Cedar Waxwing	<i>Bombycilla cedrorum</i>	Migrant/Breeder	83	3		57	3	146
Common Grackle	<i>Quiscalus quiscula</i>	Migrant/Breeder	1	51	8	8		68
Common Loon	<i>Gavia immer</i>	Migrant/Breeder			2	5	4	11
Common Raven	<i>Perisoreus canadensis</i>	Resident/Breeder			4		4	8
Common Redpoll	<i>Acanthis flammea</i>	Migrant/Non-breeder	1					1
Common Yellowthroat	<i>Geothlypis trichas</i>	Migrant/Breeder	36	5				41
Dark-eyed Junco	<i>Junco hyemalis</i>	Resident/Breeder		1	1	221	77	300
Downy Woodpecker	<i>Picoides pubescens</i>	Resident/Breeder					7	7
Eastern Wood-Pewee	<i>Contopus virens</i>	Migrant/Breeder			2			2
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Migrant/Breeder	1	11		12	3	27
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Resident/Breeder	246	28	22	843	642	1,781
Great Horned Owl	<i>Bubo virginianus</i>	Resident/Breeder		21	1	787	20	829
Greater Yellowlegs	<i>Tringa melanoleuca</i>	Migrant/Breeder		1	1		1	3
Hairy Woodpecker	<i>Picoides villosus</i>	Resident/Breeder	15	33	40	215	299	602
Hermit Thrush	<i>Catharus guttatus</i>	Migrant/Breeder		24	3	363	31	421
Least Sandpiper	<i>Calidris minutilla</i>	Migrant/Breeder					2	2
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	Migrant/Breeder				1	1	2
Magnolia Warbler	<i>Setophaga magnolia</i>	Migrant/Breeder		7		2	1	10

Appendix B Table 2 Species Identified, by Detector, During Fall 2022 Avian Acoustic Surveys

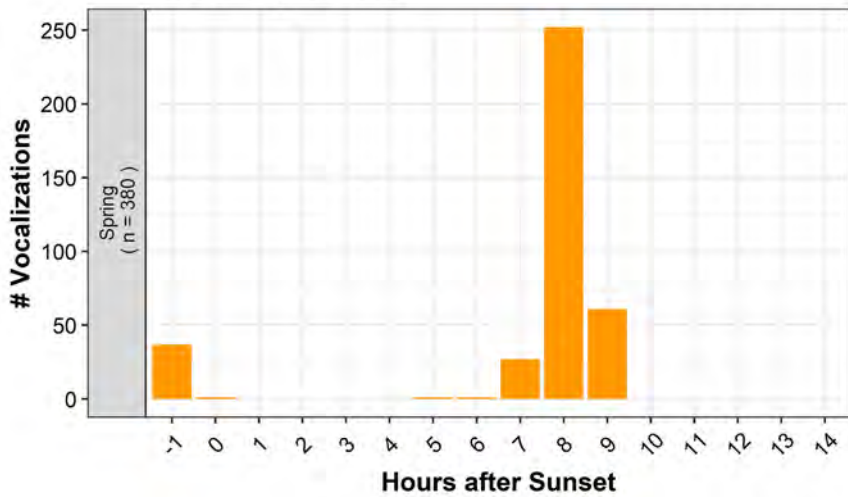
Mourning Warbler	<i>Geothlypis philadelphia</i>	Migrant/Breeder	1					1
Nashville Warbler	<i>Oreothlypis ruficapilla</i>	Migrant/Breeder		30	2	11	7	50
Northern Flicker	<i>Colaptes auratus</i>	Migrant/Breeder	19	9		79	18	125
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	Resident/Breeder				1		1
Ovenbird	<i>Seiurus aurocapilla</i>	Migrant/Breeder	5		1		2	8
Palm Warbler	<i>Setophaga palmarum</i>	Migrant/Breeder	7	3		11	11	32
Pileated Woodpecker	<i>Dryocopus pileatus</i>	Resident/Breeder	6		12	1	2	21
Pine Siskin	<i>Spinus pinus</i>	Resident/Breeder			2			2
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Resident/Breeder	5	2	18	31	49	105
Red-necked Phalarope	<i>Phalaropus lobatus</i>	Migrant/Non-breeder				3		3
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	Migrant/Breeder			1			1
Ruffed Grouse	<i>Bonasa umbellus</i>	Resident/Breeder	20				1	21
Sandhill Crane	<i>Grus canadensis</i>	Migrant/Unknown		1			4	5
Savannah Sparrow	<i>Passerculus sandwichensis</i>	Migrant/Breeder	2			10	12	24
Unidentified Bird	<i>Not applicable</i>	Not applicable	6	20		86	150	262
Upland Sandpiper	<i>Bartramia longicauda</i>	Migrant/Non-breeder				3		3
Veery	<i>Catharus fuscescens</i>	Migrant/Breeder	1				2	3
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Migrant/Breeder	10	9		151	36	206
White-winged Crossbill	<i>Loxia leucoptera</i>	Resident/Breeder	1				10	11
Winter Wren	<i>Troglodytes hiemalis</i>	Migrant/Breeder				42	124	166
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	Migrant/Breeder	1					1
Yellow-rumped Warbler	<i>Setophaga coronata</i>	Migrant/Breeder		16		43	18	77

Note:

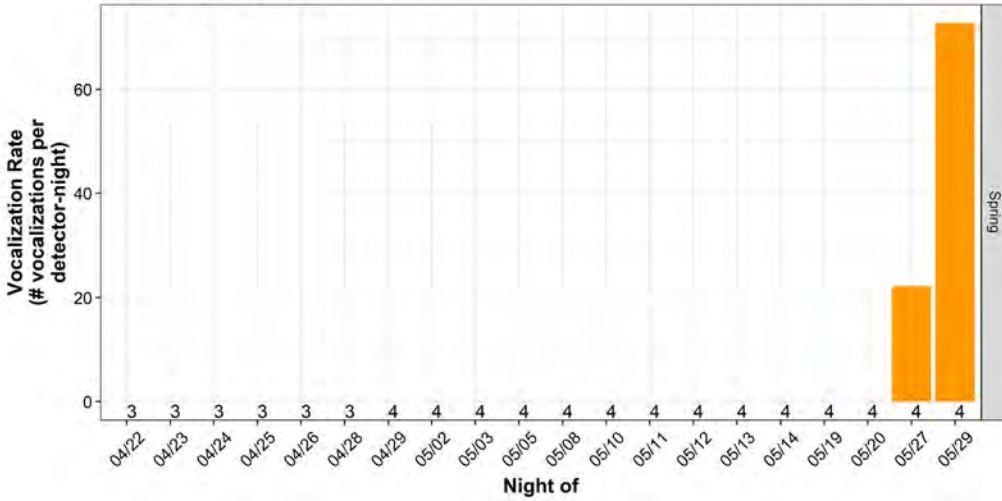
Bold and highlighted grey indicates Species at Risk

Bold indicates Species of Conservation Concern

Alder Flycatcher

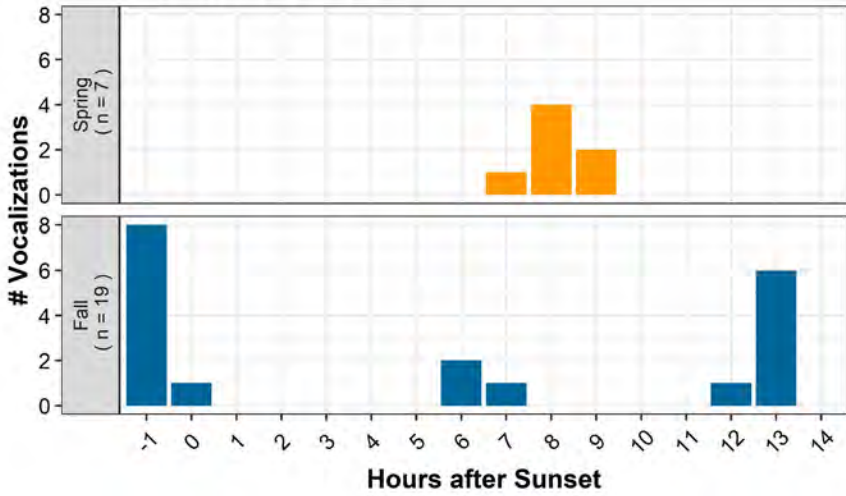


Alder Flycatcher

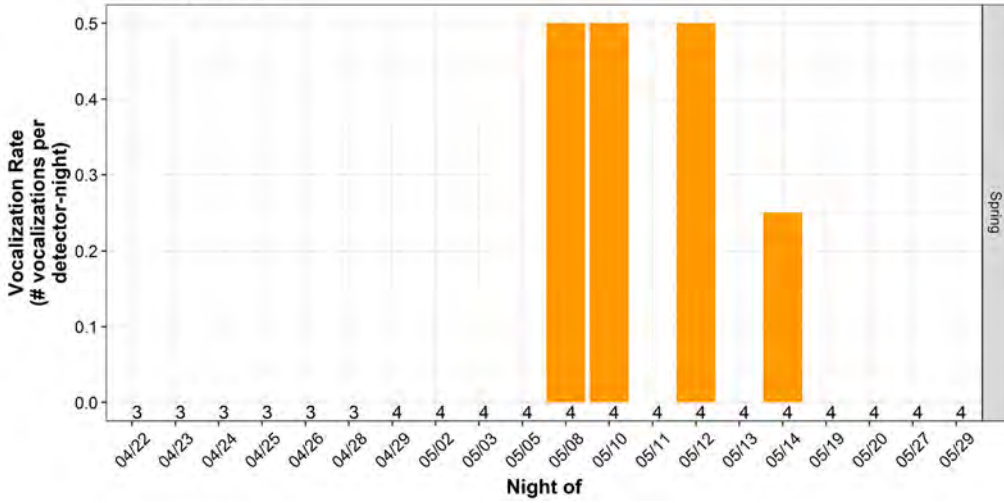


Appendix B Figure 1. Alder Flycatcher – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

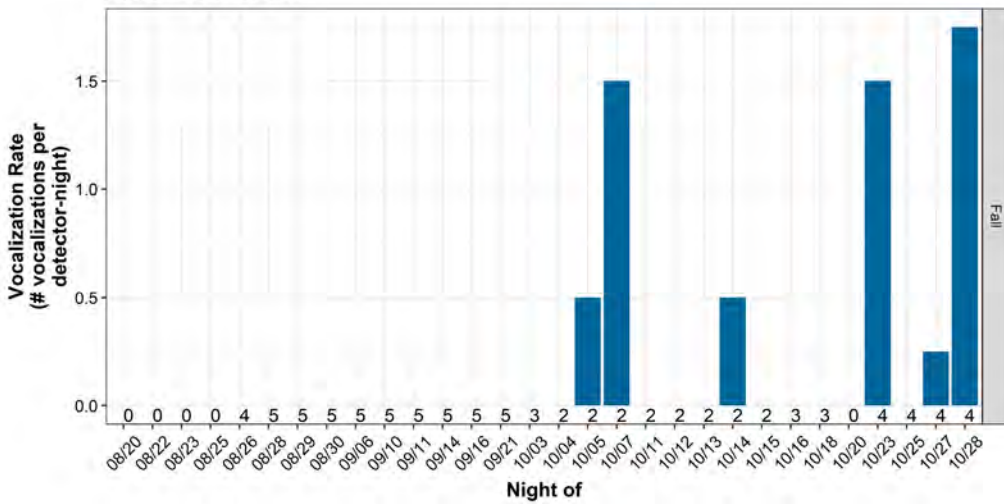
American Crow



American Crow

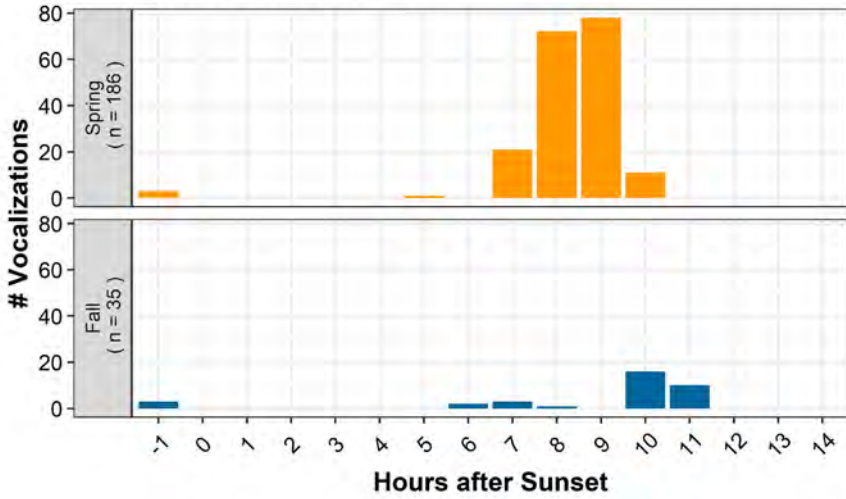


American Crow

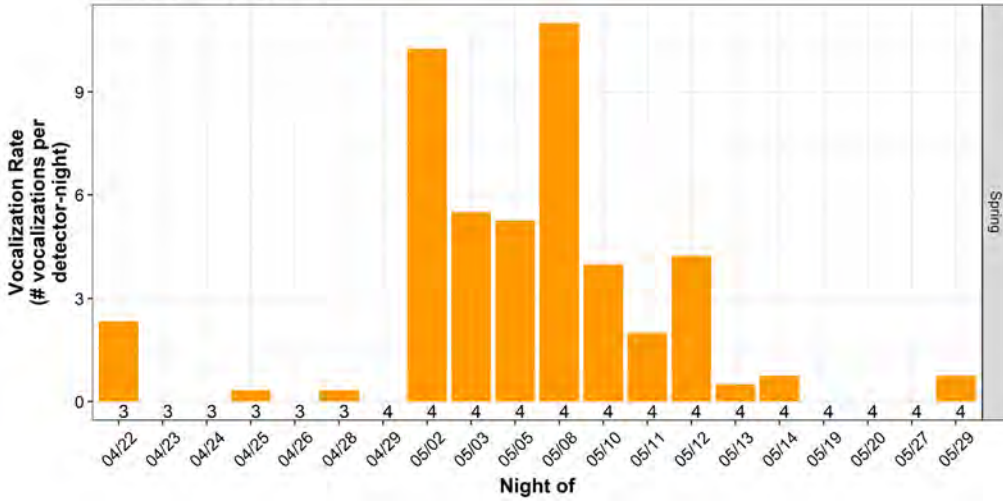


Appendix B Figure 2. American Crow – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

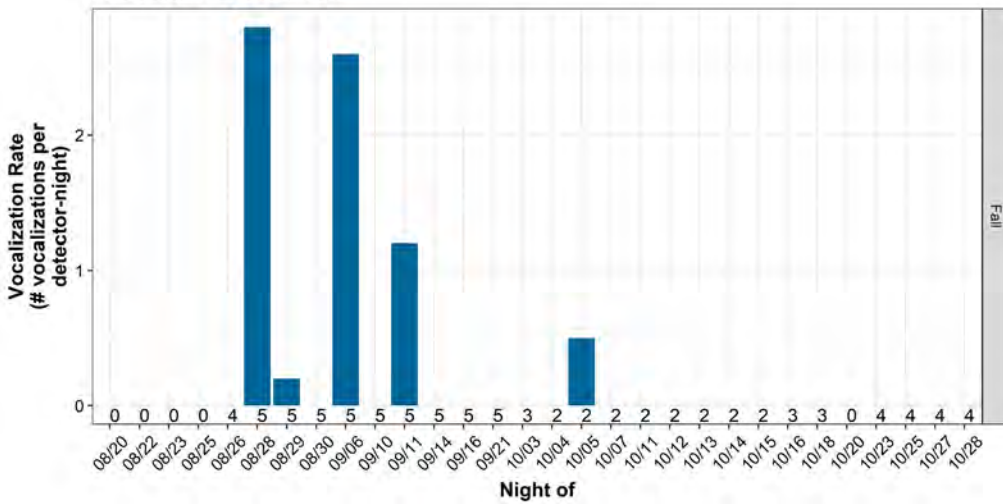
American Goldfinch



American Goldfinch

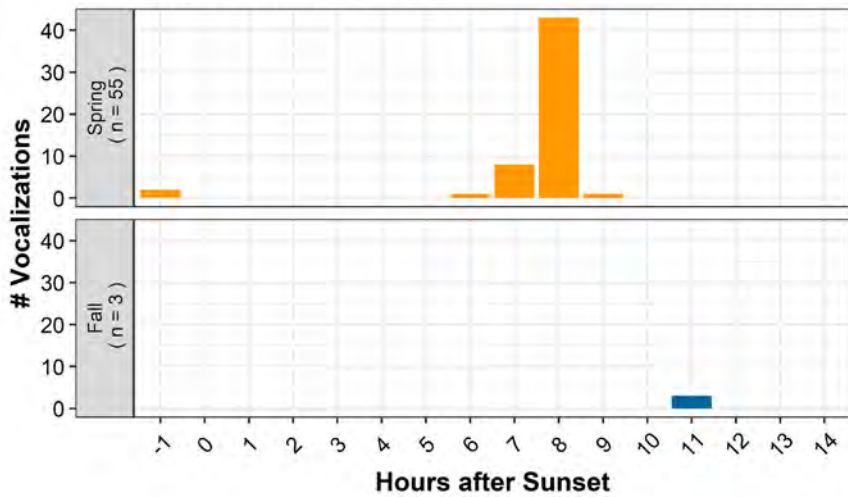


American Goldfinch

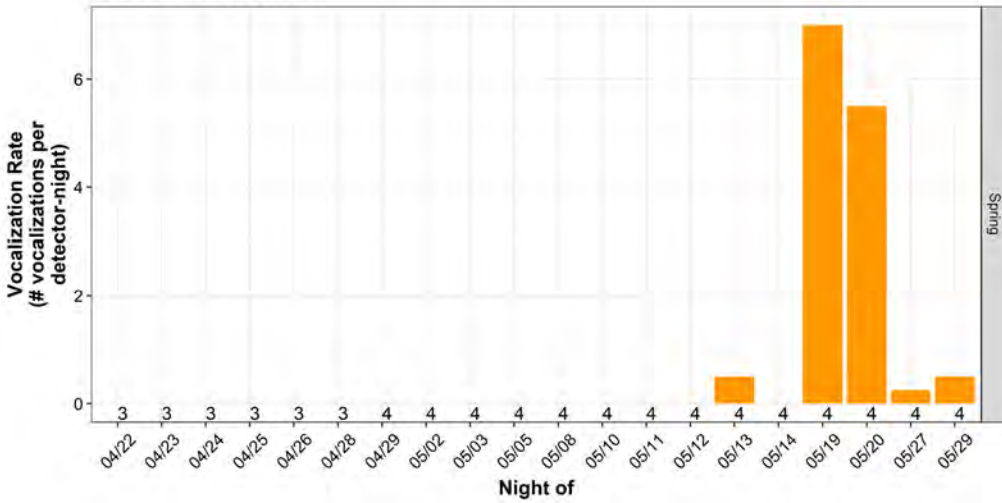


Appendix B Figure 3. American Goldfinch – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

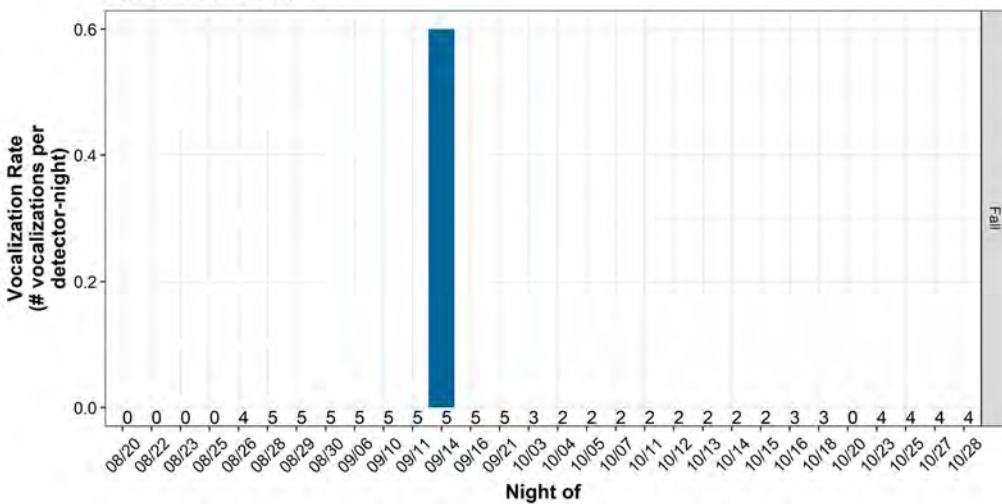
American Redstart



American Redstart

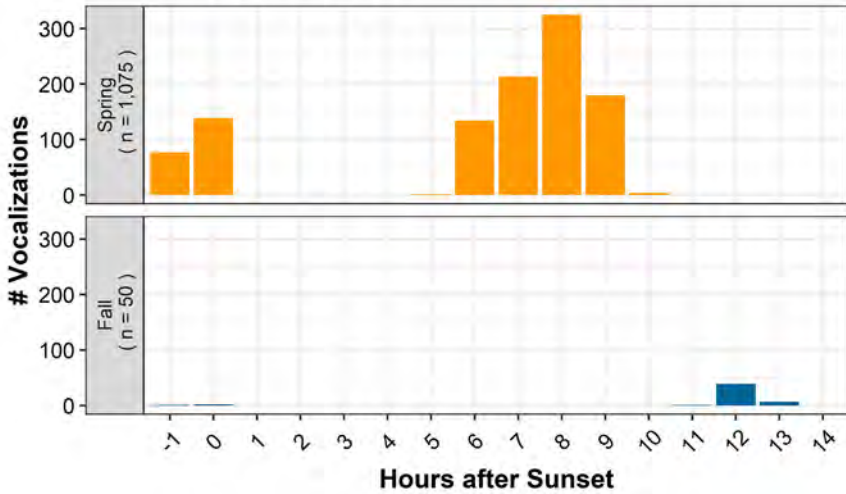


American Redstart

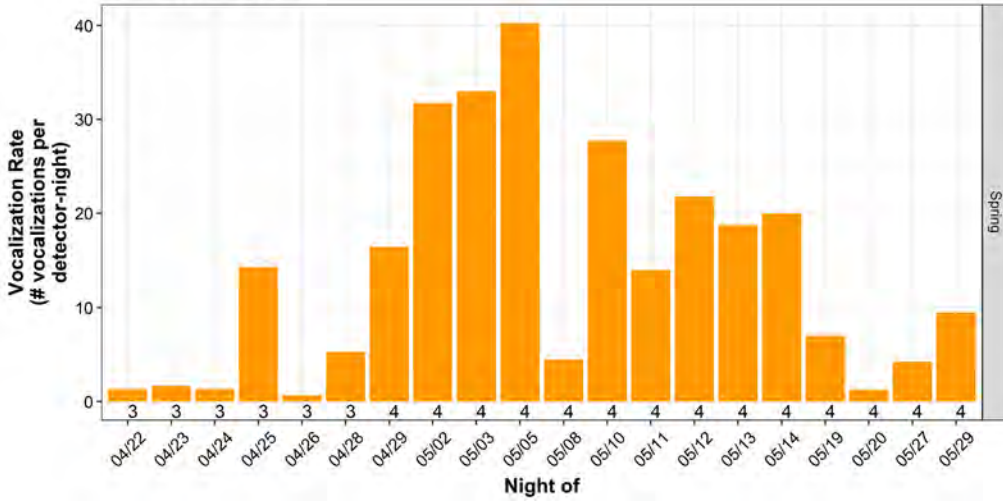


Appendix B Figure 4. American Redstart – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

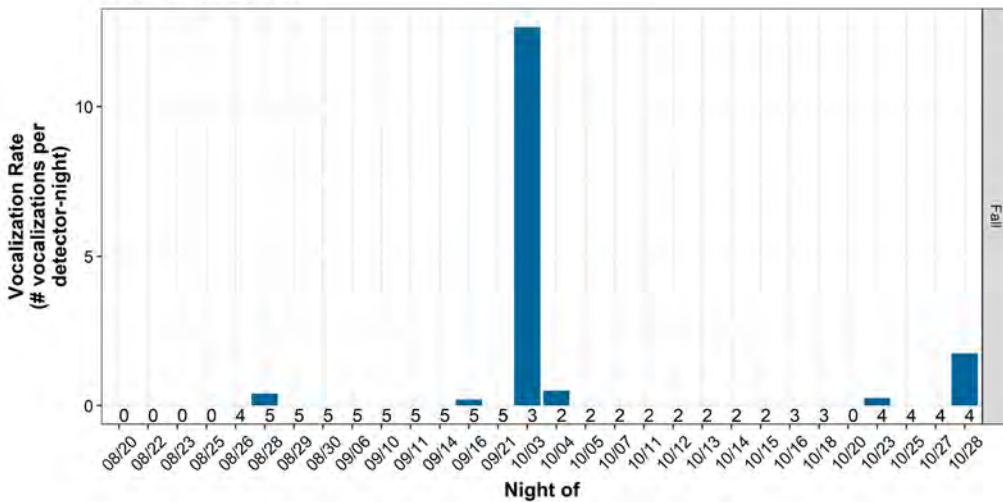
American Robin



American Robin

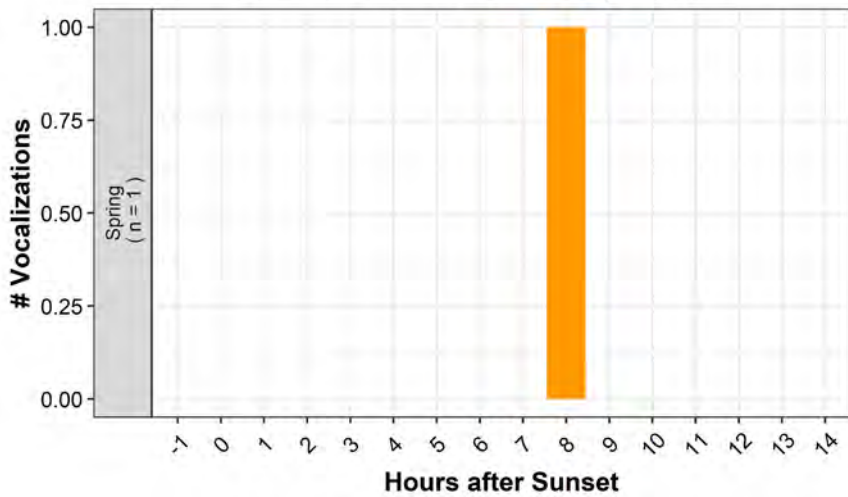


American Robin

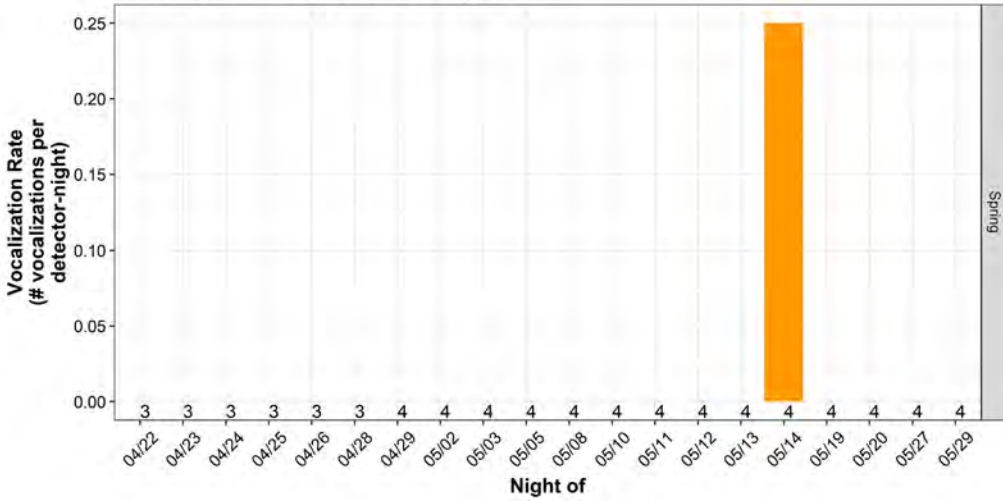


Appendix B Figure 5. American Robin – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

American Three-toed Woodpecker

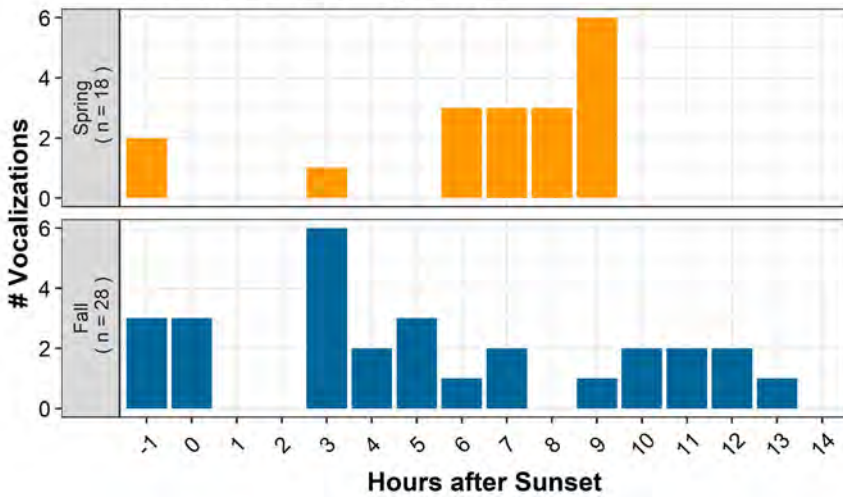


American Three-toed Woodpecker

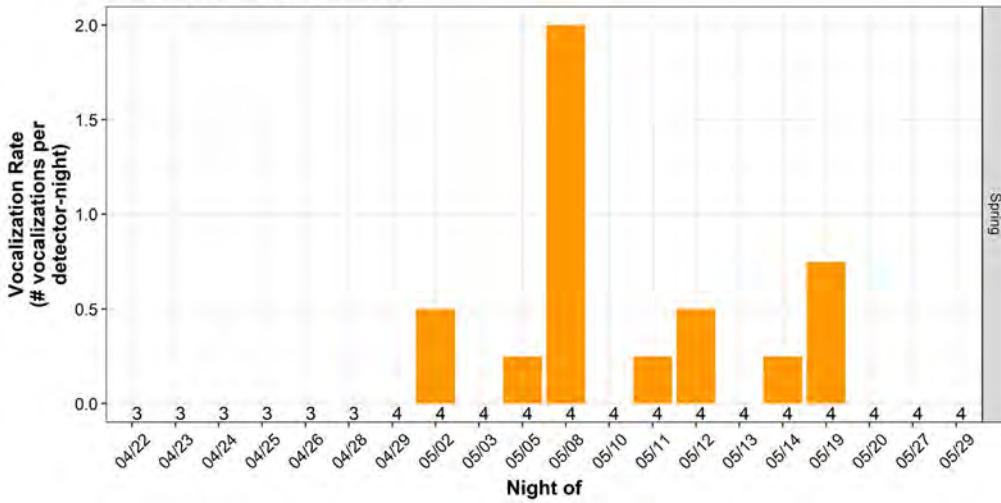


Appendix B Figure 6. American Three-toed Woodpecker – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

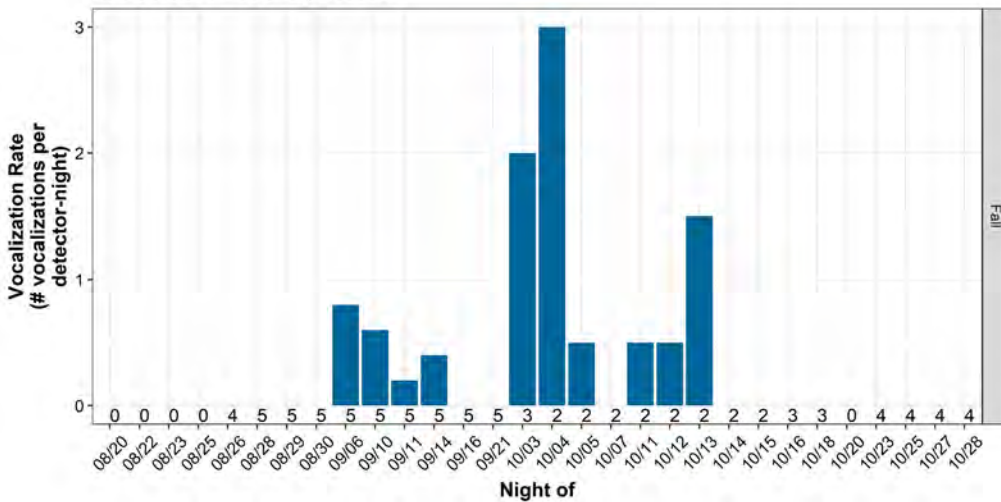
American Tree Sparrow



American Tree Sparrow

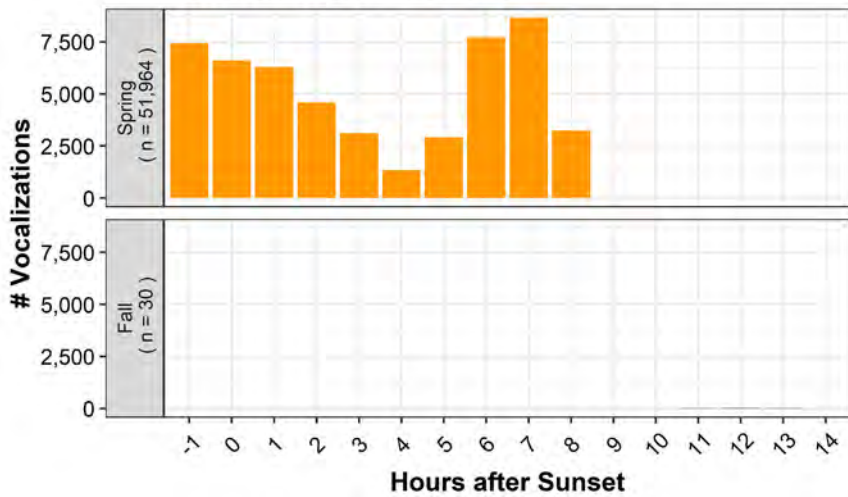


American Tree Sparrow

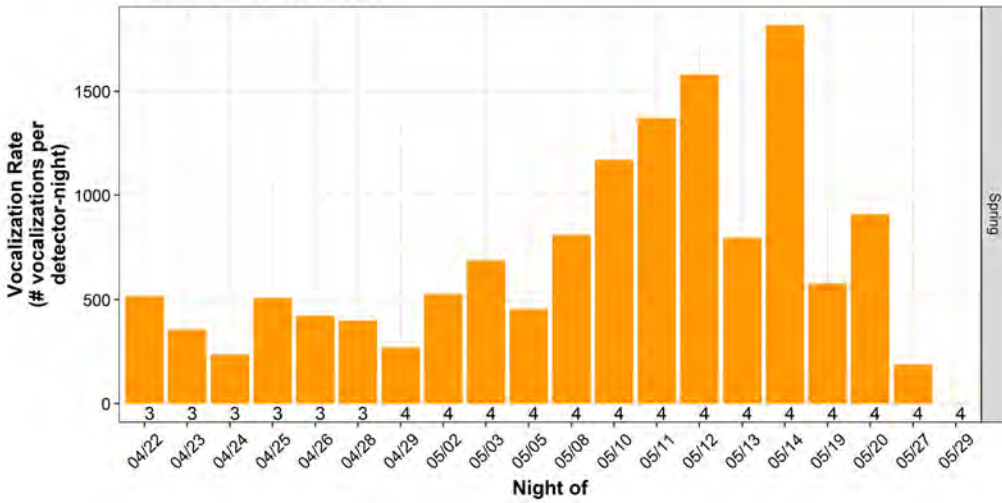


Appendix B Figure 7. American Tree Sparrow – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

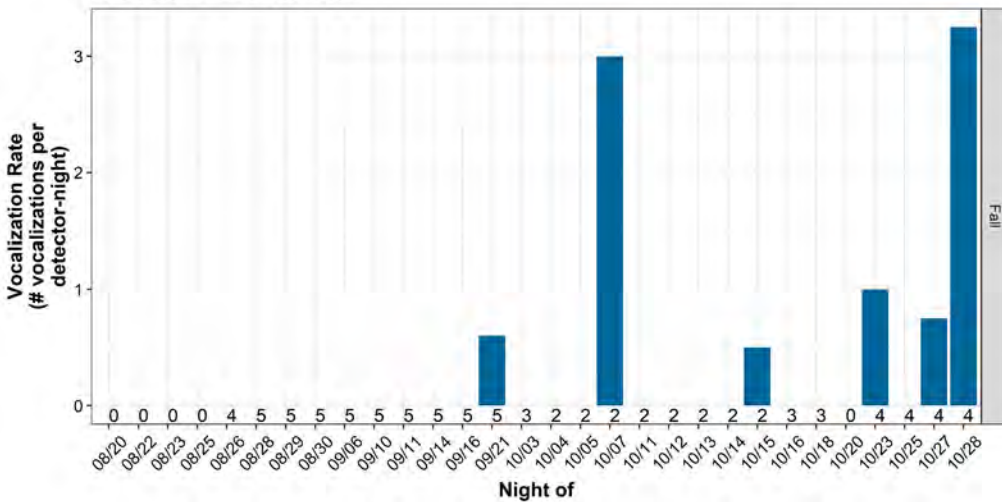
American Woodcock



American Woodcock

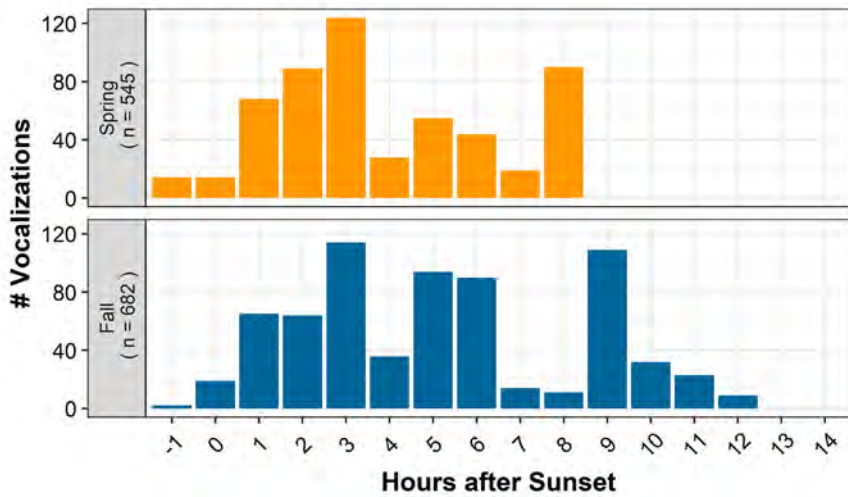


American Woodcock

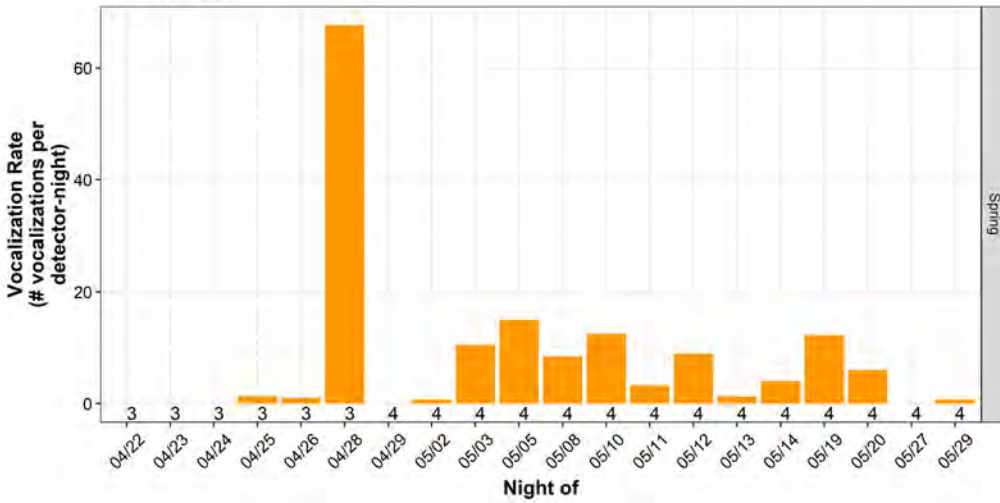


Appendix B Figure 8. American Woodcock – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

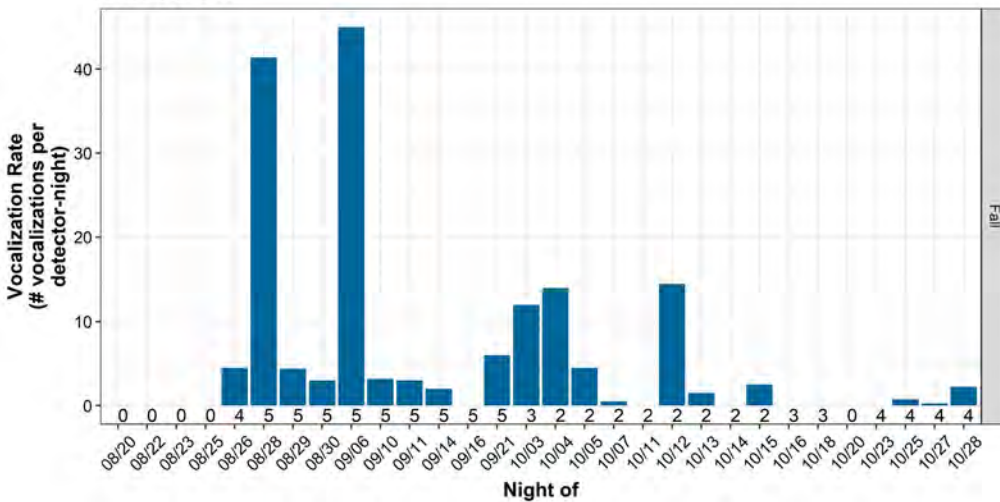
Barred Owl



Barred Owl

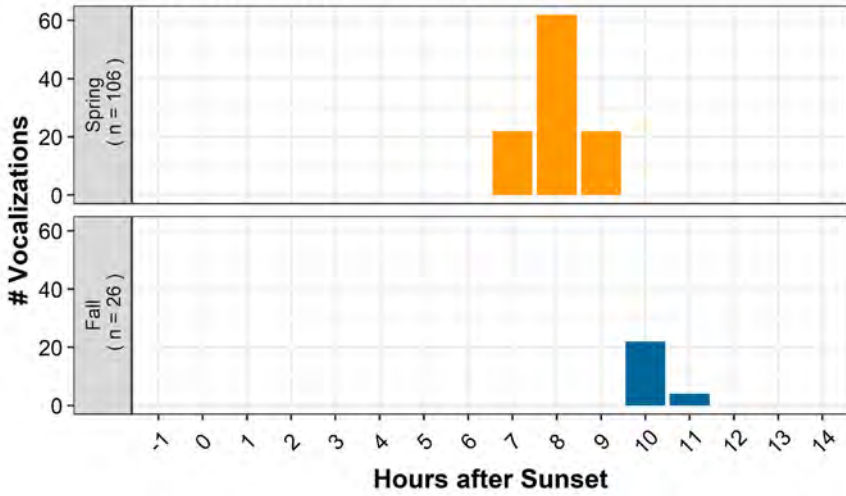


Barred Owl

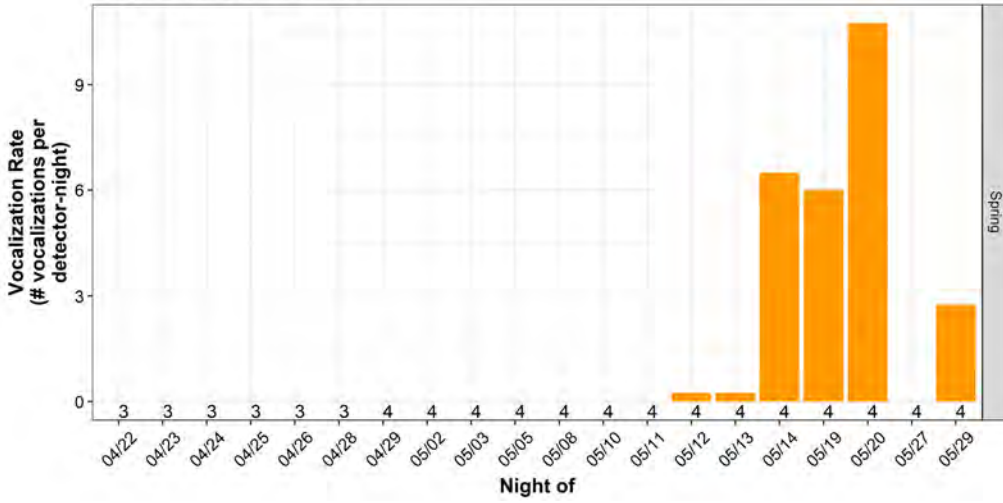


Appendix B Figure 9. Barred Owl – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

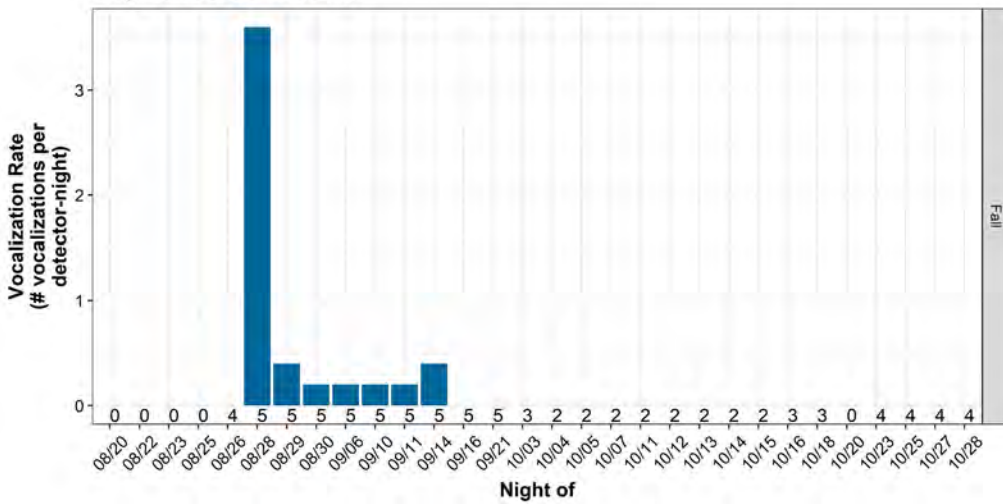
Bay-breasted Warbler



Bay-breasted Warbler

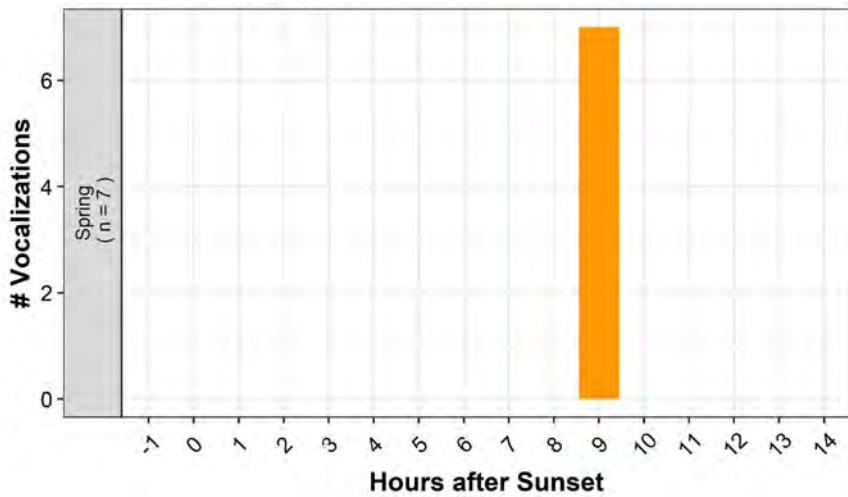


Bay-breasted Warbler

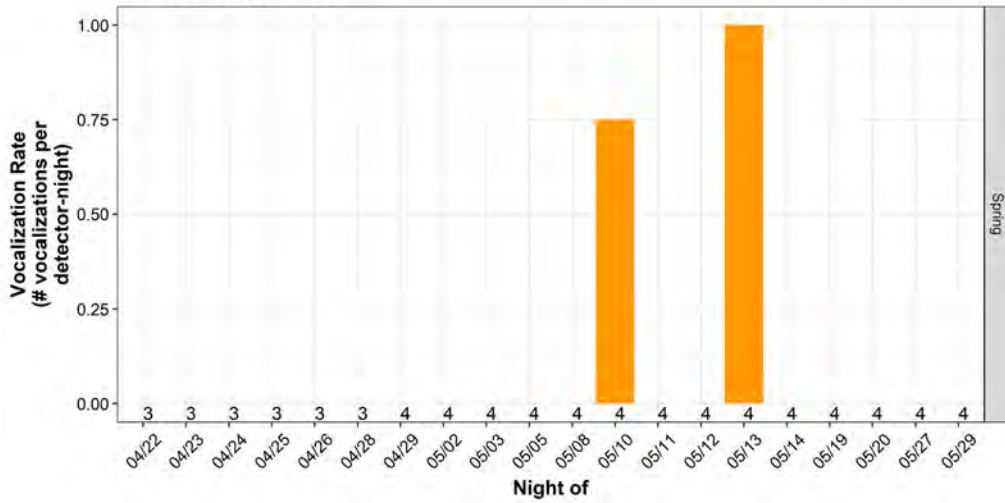


Appendix B Figure 10. Bay-breasted Warbler – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Belted Kingfisher

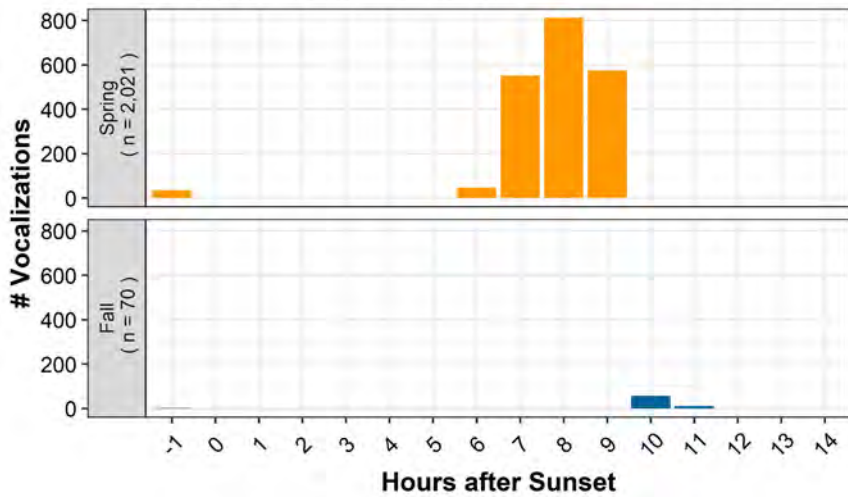


Belted Kingfisher

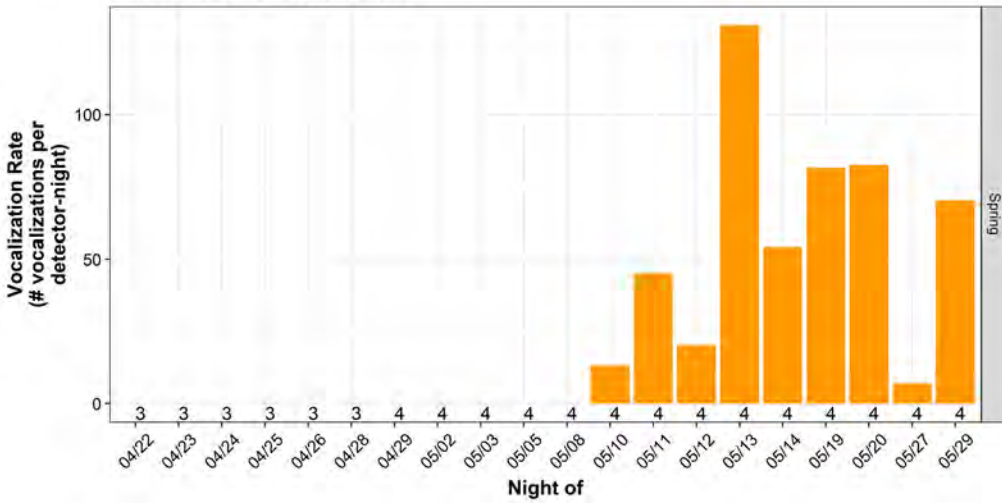


Appendix B Figure 11. Belted Kingfisher – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

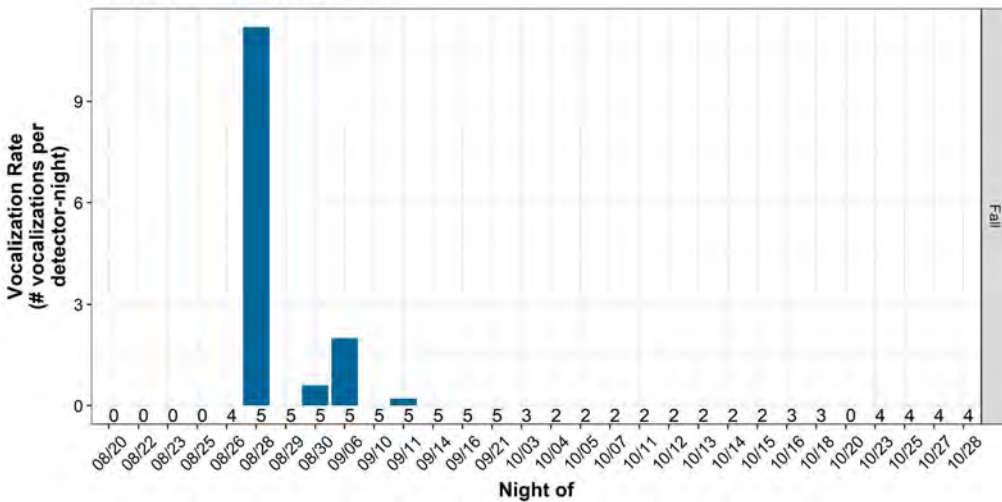
Black-and-white Warbler



Black-and-white Warbler

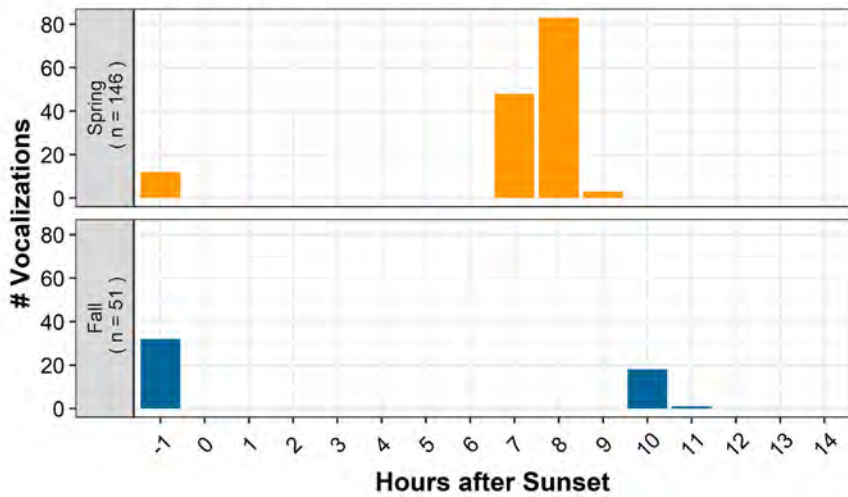


Black-and-white Warbler

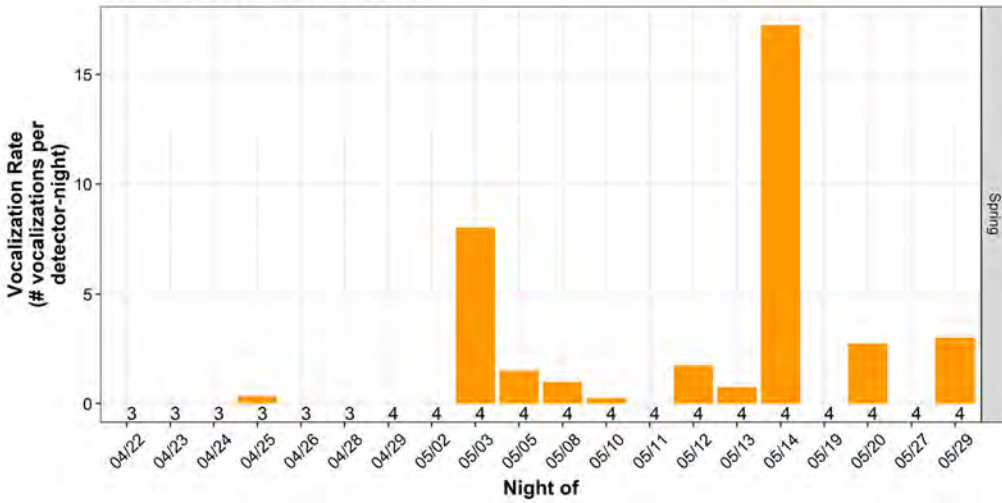


Appendix B Figure 12. Black-and-white Warbler – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

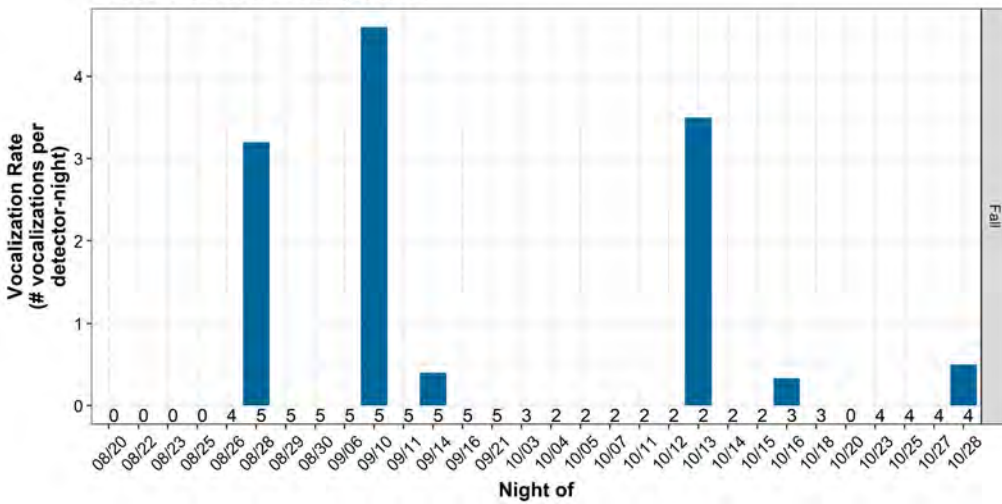
Black-backed Woodpecker



Black-backed Woodpecker

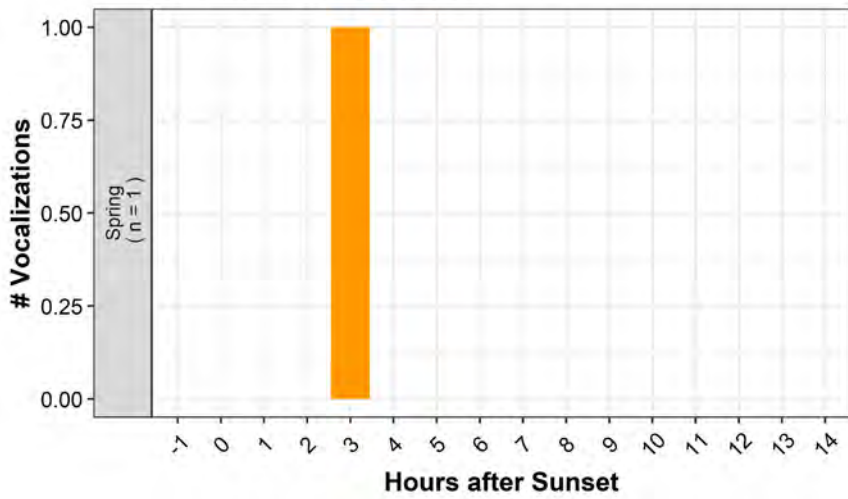


Black-backed Woodpecker

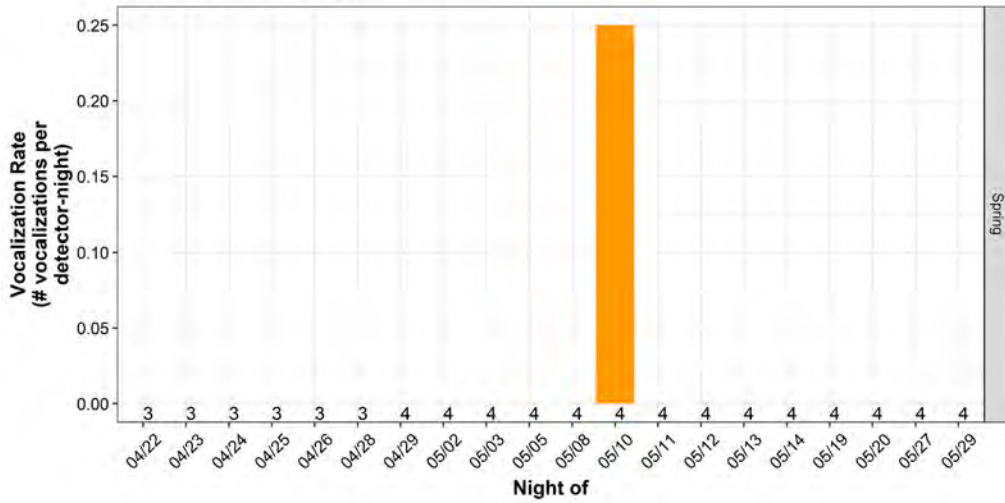


Appendix B Figure 13. Black-backed Woodpecker – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Black-bellied Plover

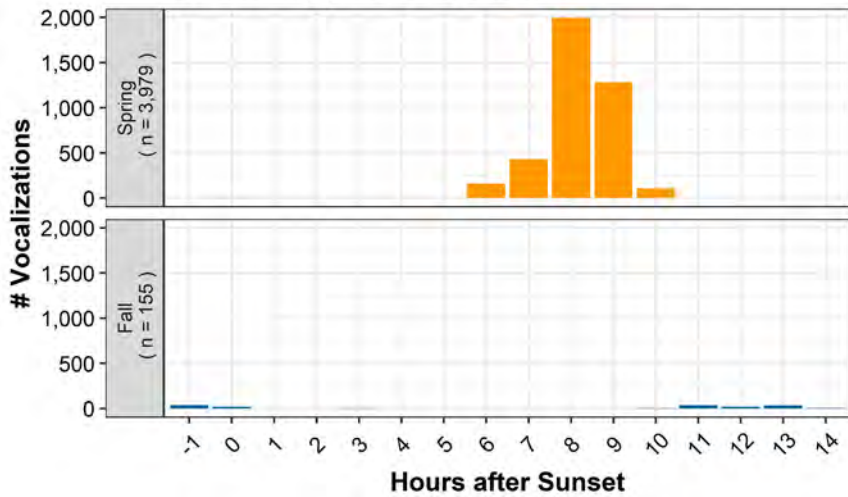


Black-bellied Plover

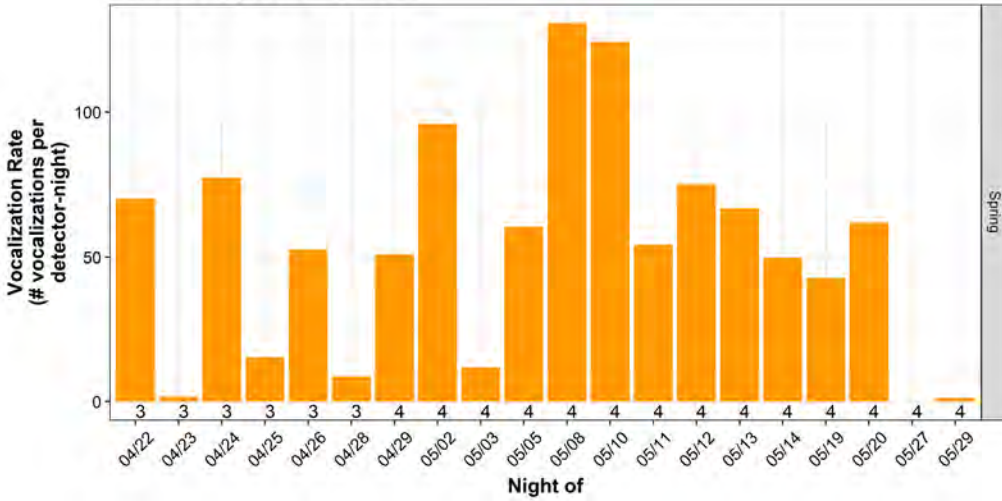


Appendix B Figure 14. Black-bellied Plover – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

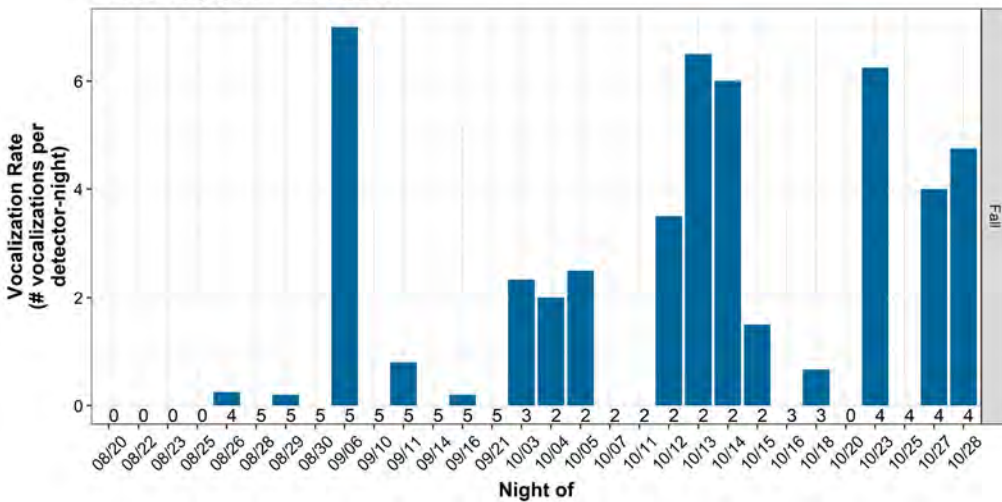
Black-capped Chickadee



Black-capped Chickadee

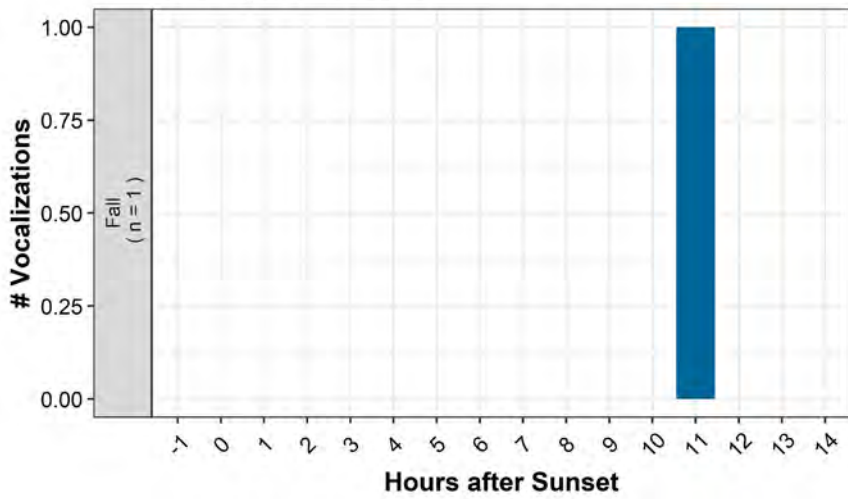


Black-capped Chickadee

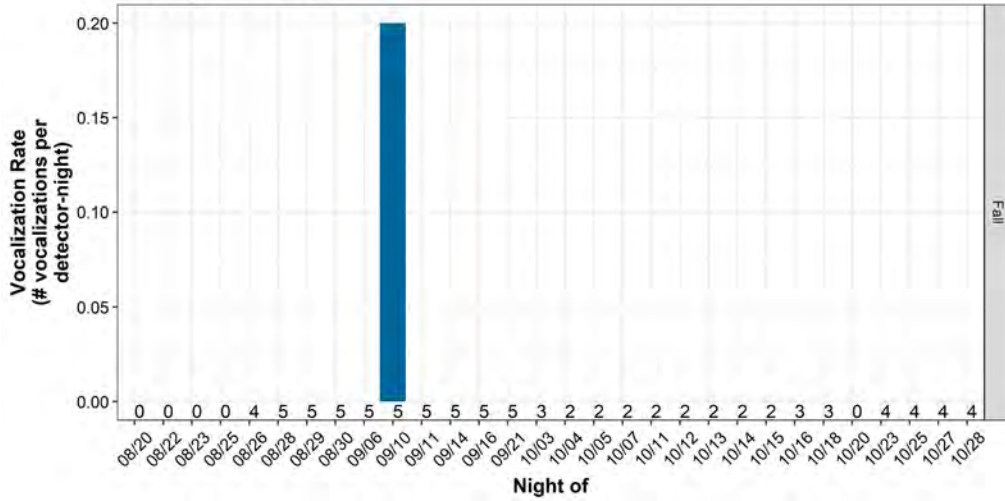


Appendix B Figure 15. Black-capped Chickadee – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Blackpoll Warbler

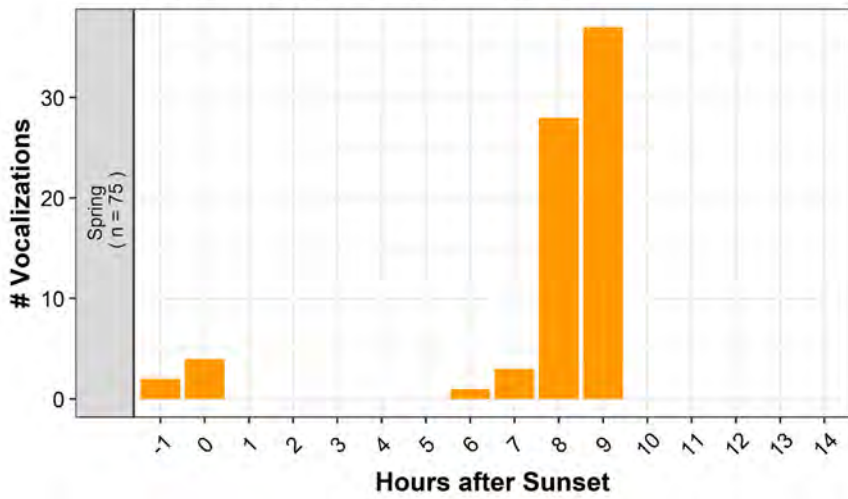


Blackpoll Warbler

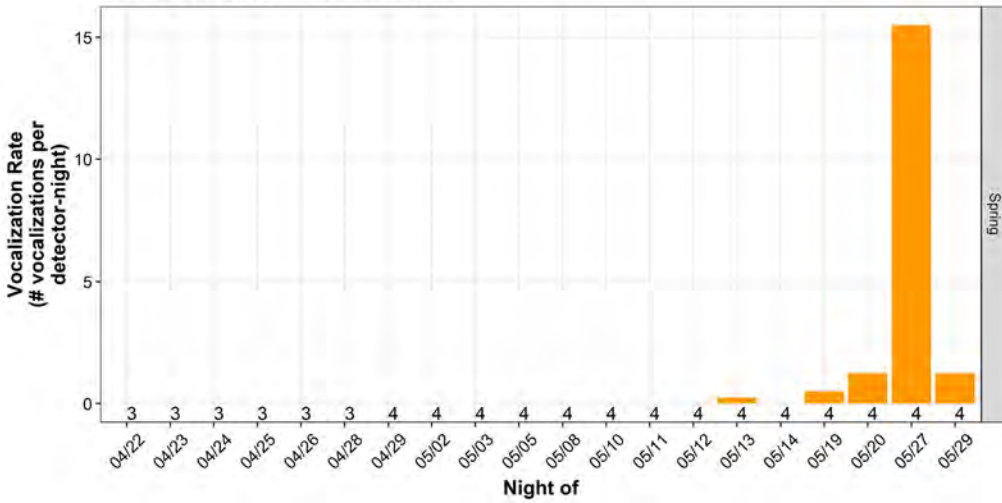


Appendix B Figure 16. Blackpoll Warbler – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in fall)

Black-throated Blue Warbler

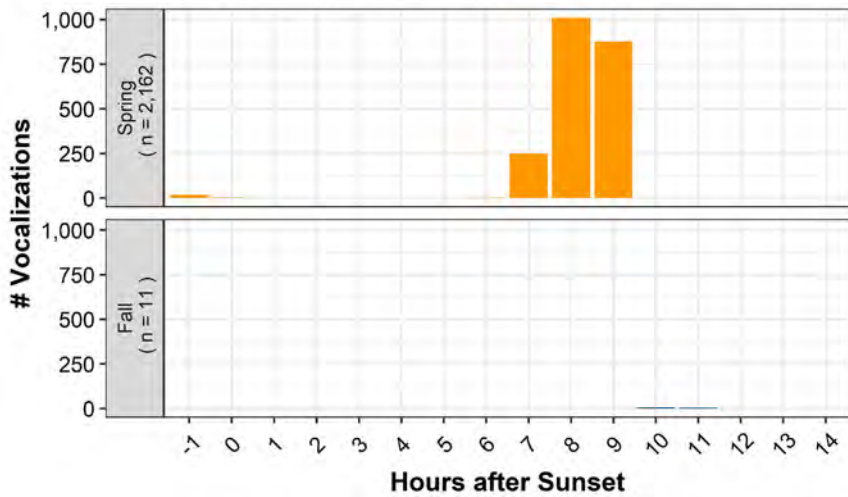


Black-throated Blue Warbler

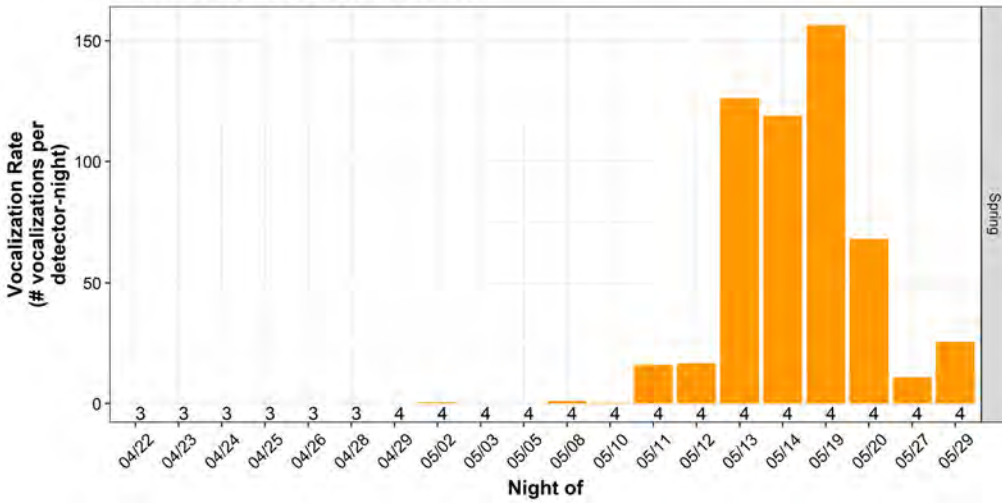


Appendix B Figure 17. Black-throated Blue Warbler – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

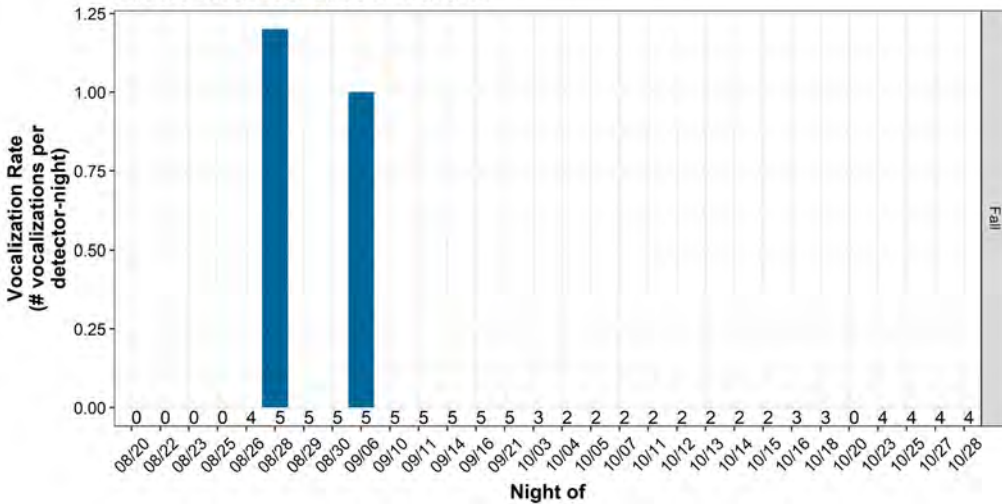
Black-throated Green Warbler



Black-throated Green Warbler

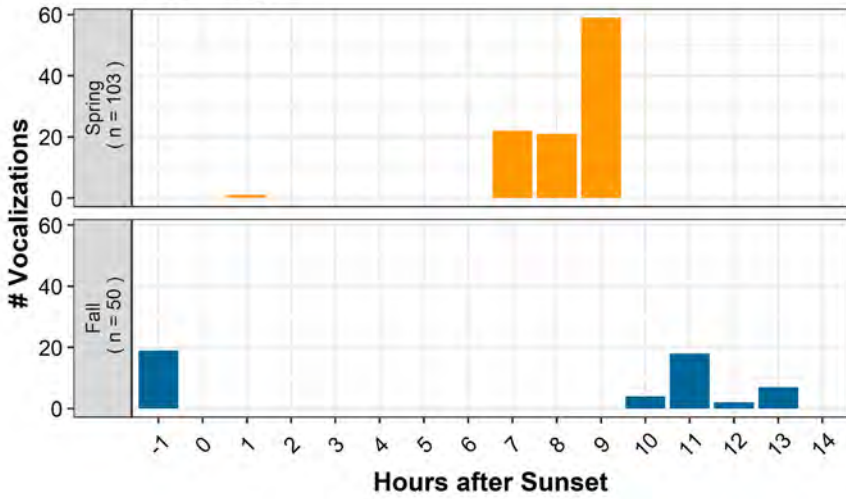


Black-throated Green Warbler

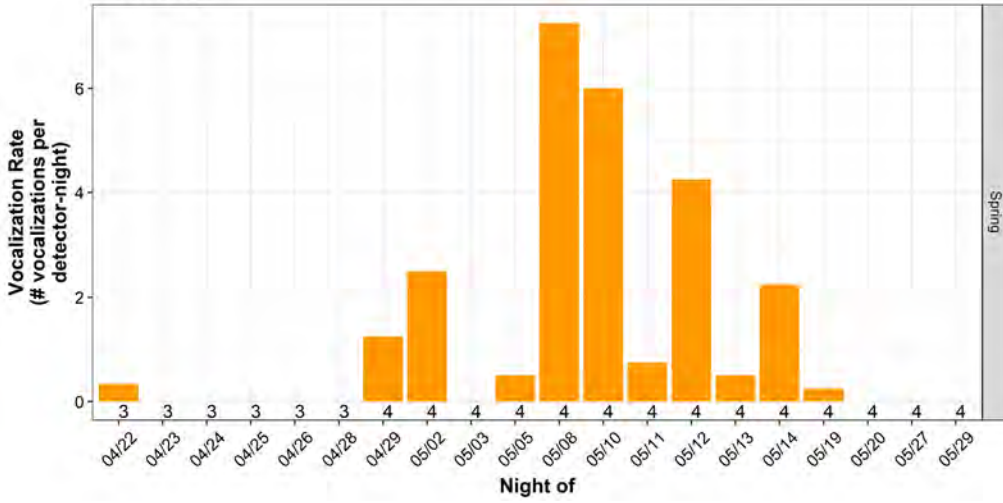


Appendix B Figure 18. Black-throated Green Warbler – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

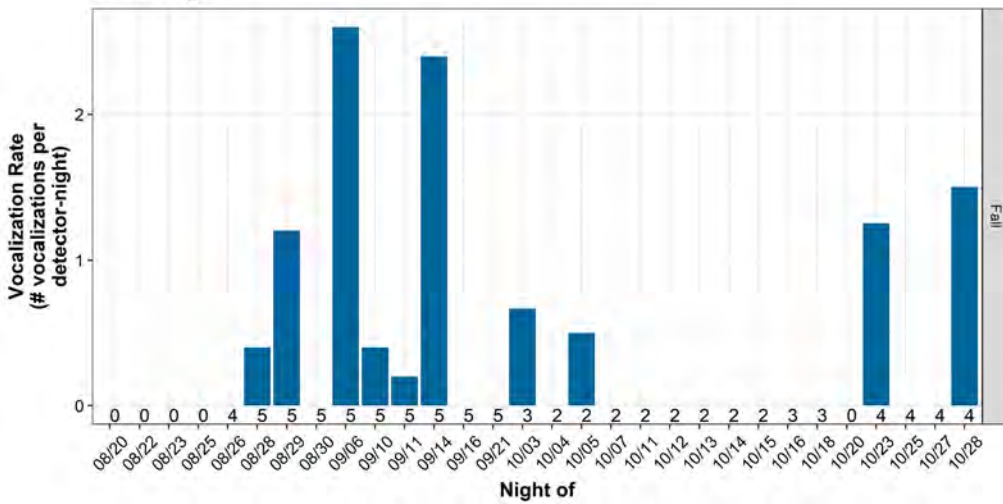
Blue Jay



Blue Jay

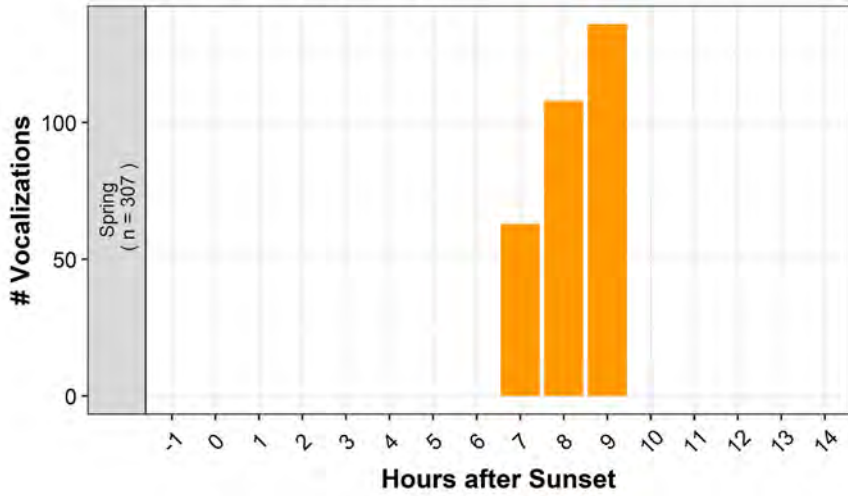


Blue Jay

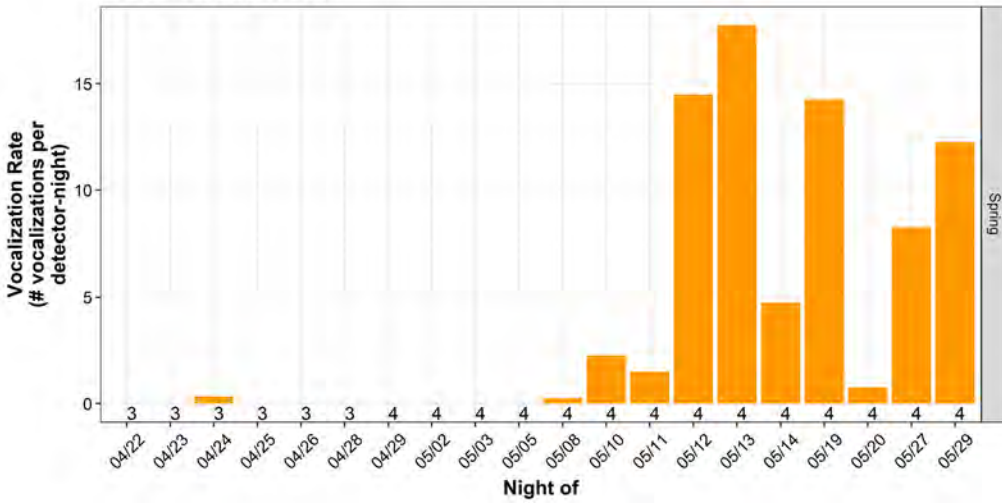


Appendix B Figure 19. Blue Jay – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Blue-headed Vireo

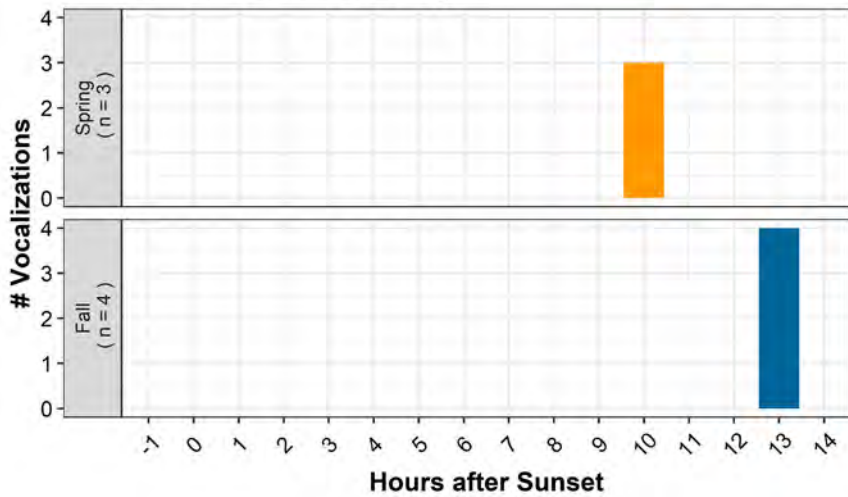


Blue-headed Vireo

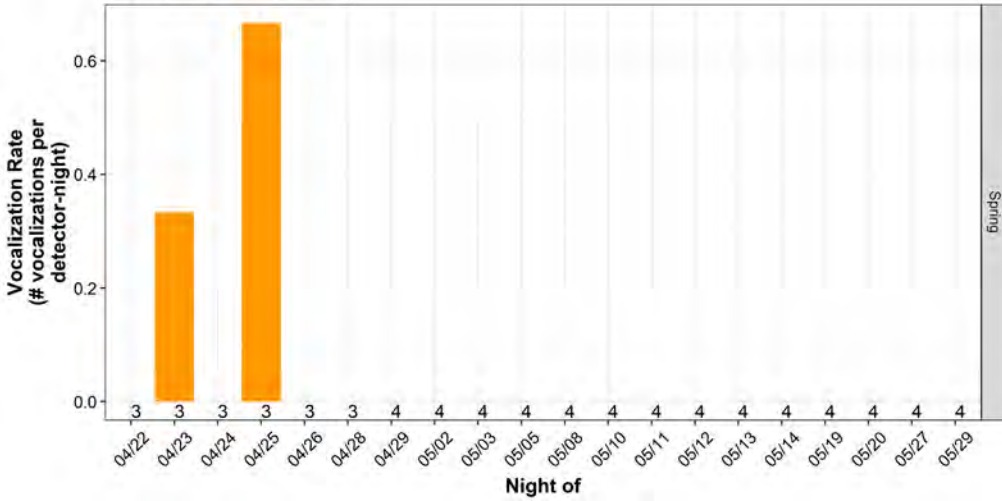


Appendix B Figure 20. Blue-headed Vireo – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

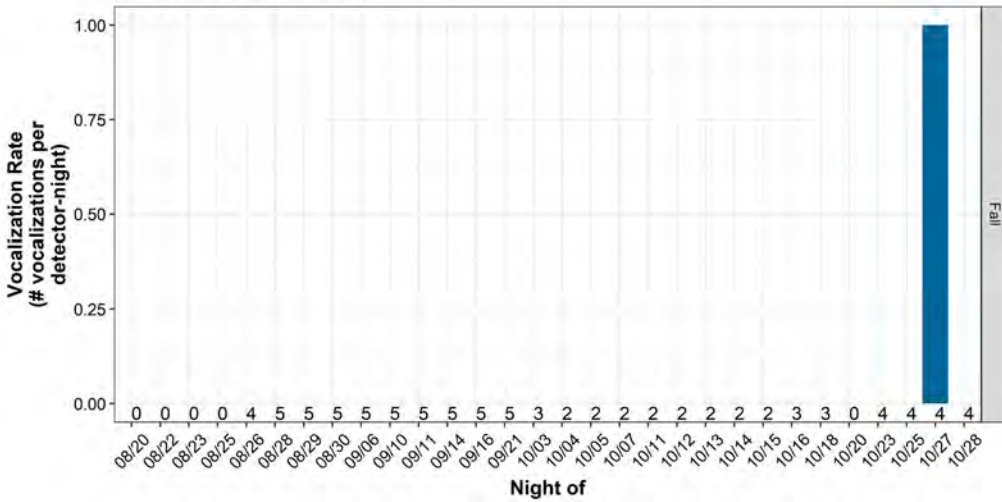
Bohemian Waxwing



Bohemian Waxwing

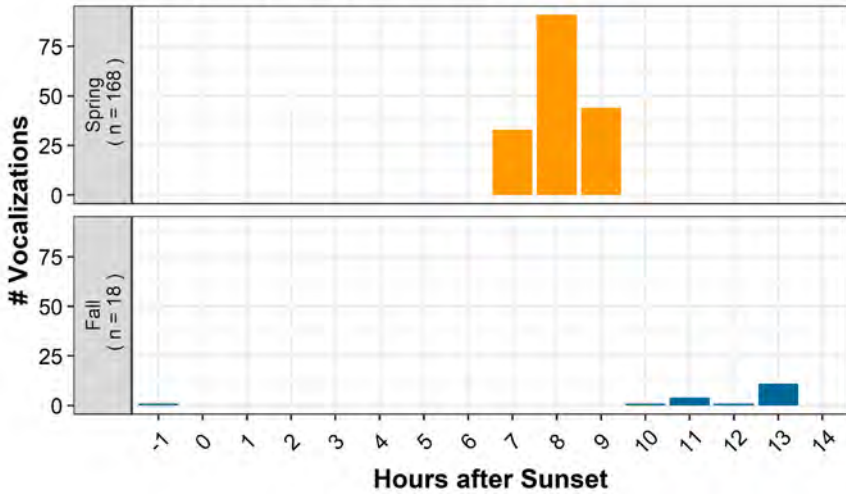


Bohemian Waxwing

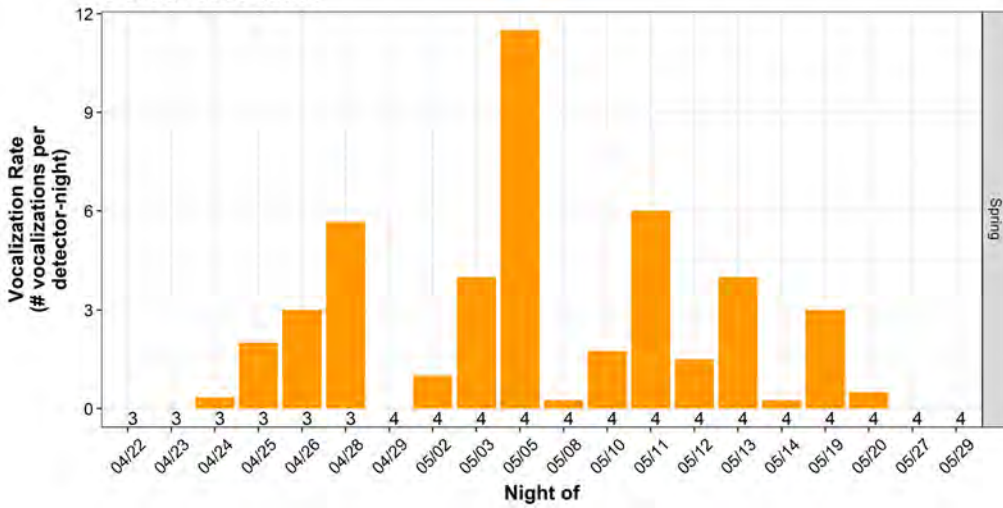


Appendix B Figure 21. Bohemian Waxwing – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

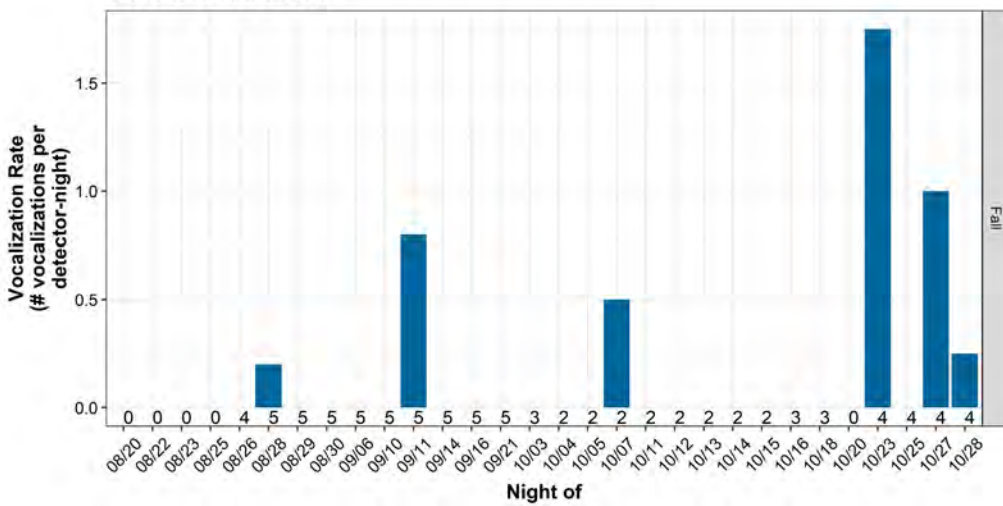
Boreal Chickadee



Boreal Chickadee

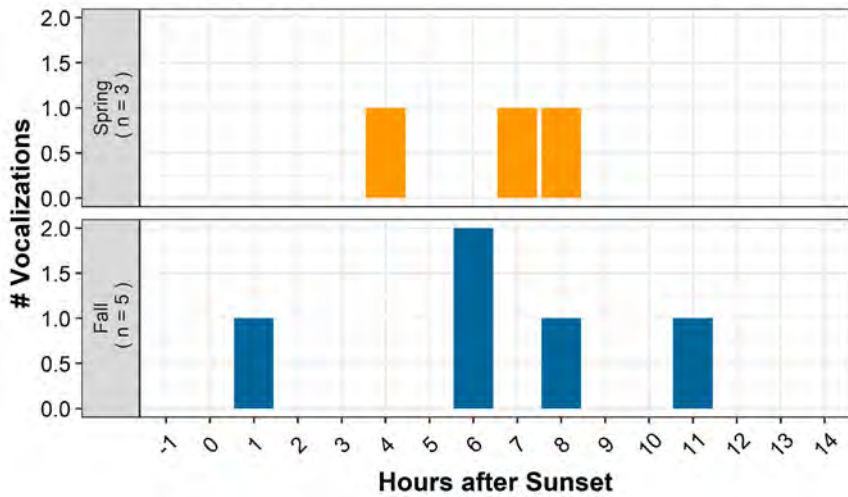


Boreal Chickadee

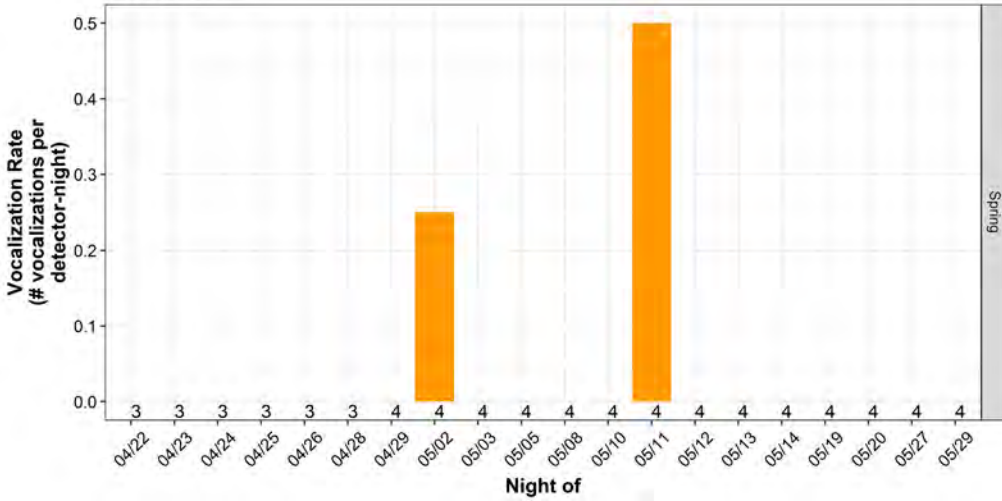


Appendix B Figure 22. Boreal Chickadee – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

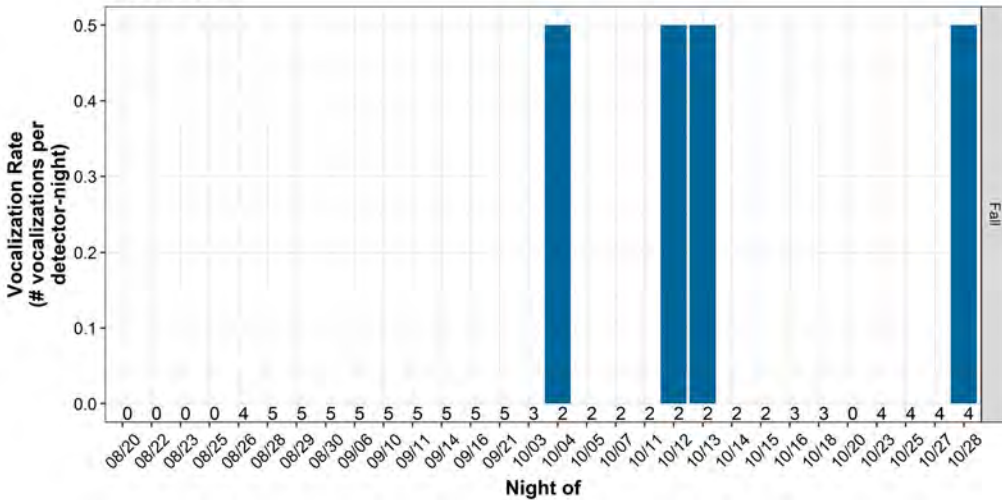
Boreal Owl



Boreal Owl

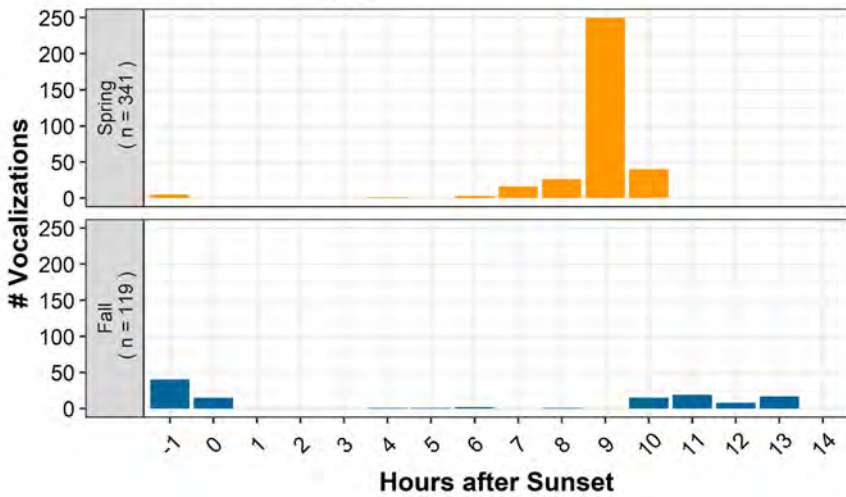


Boreal Owl

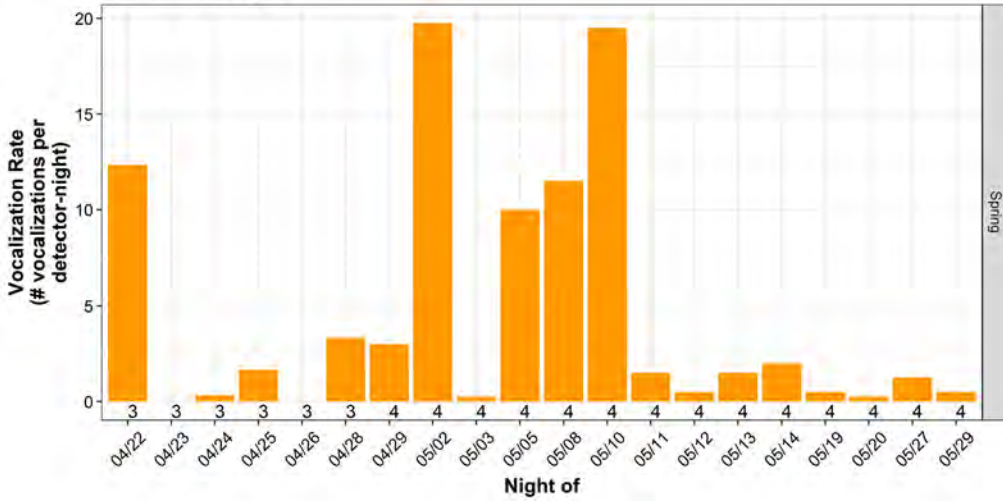


Appendix B Figure 23. Boreal Owl – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

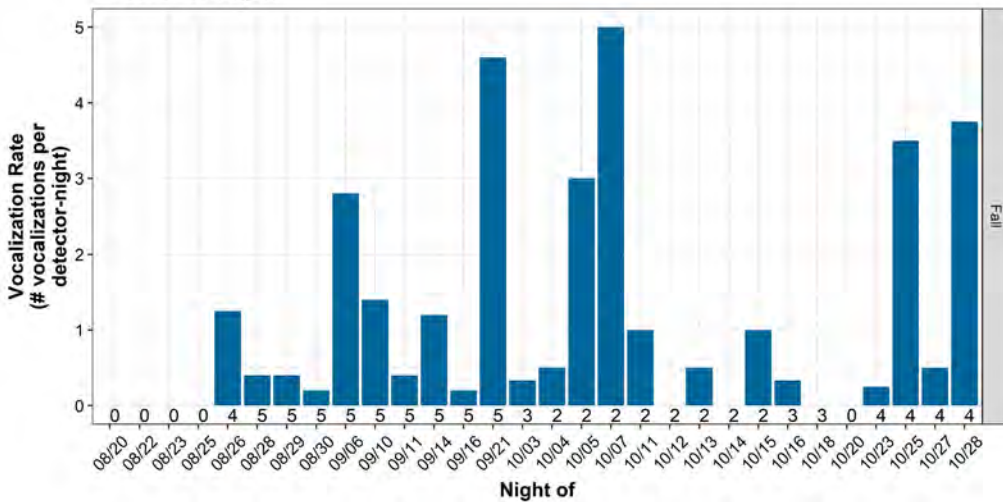
Brown Creeper



Brown Creeper

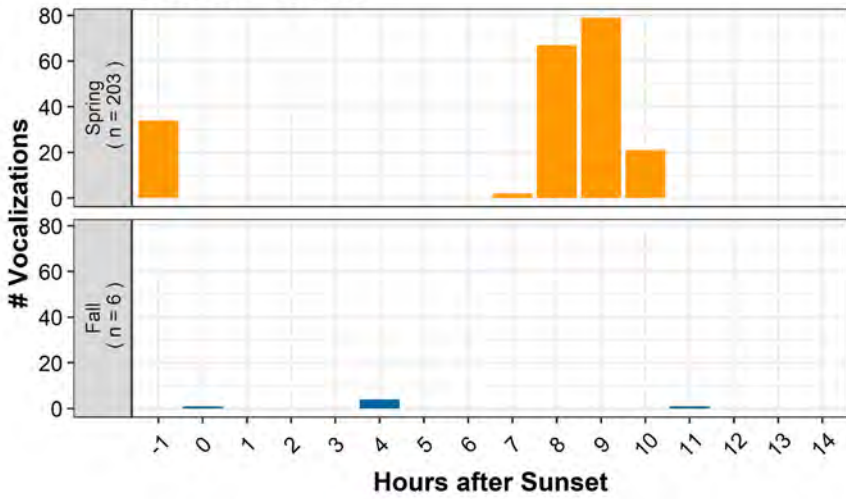


Brown Creeper

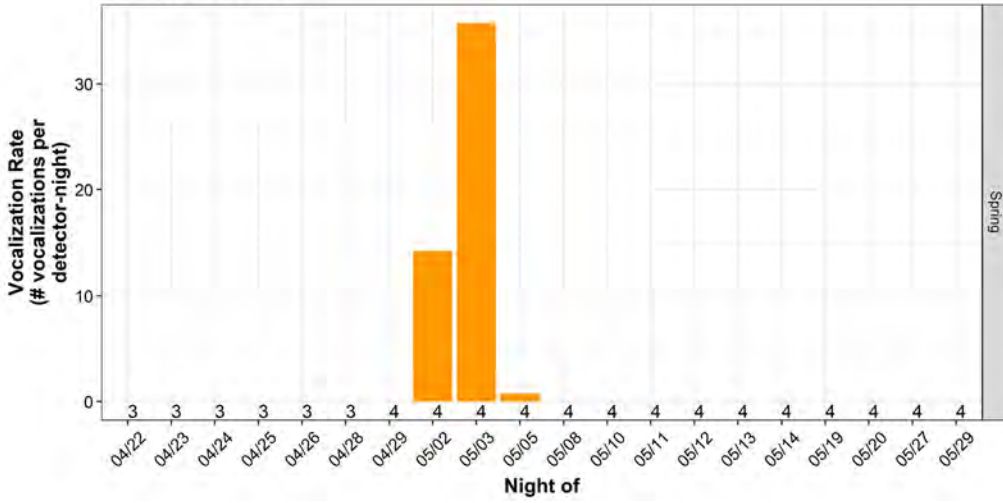


Appendix B Figure 24. Brown Creeper – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

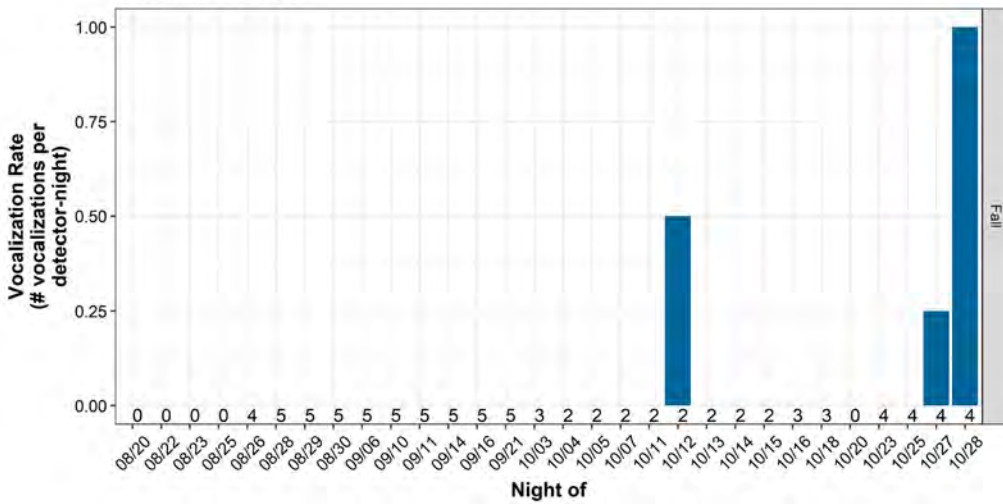
Canada Goose



Canada Goose

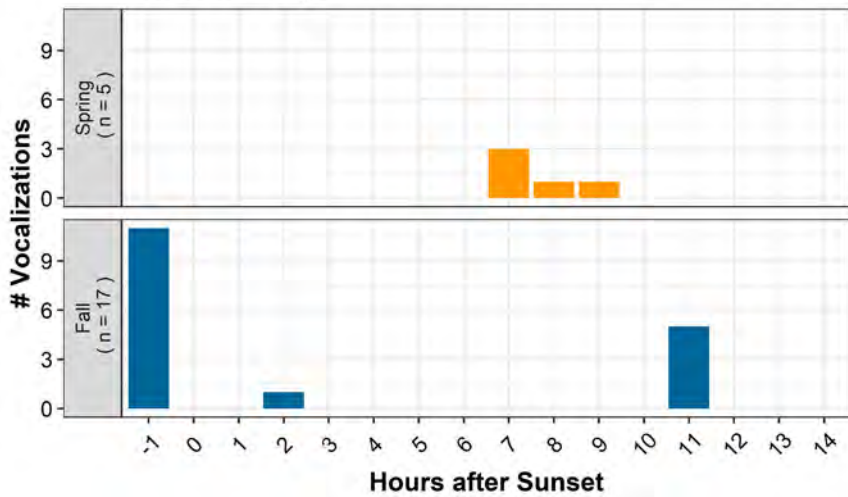


Canada Goose

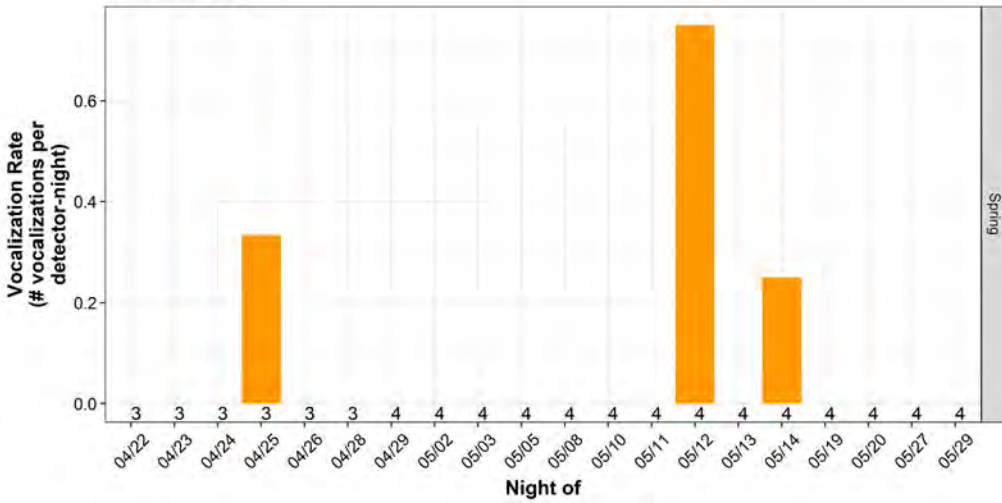


Appendix B Figure 25. Canada Goose – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

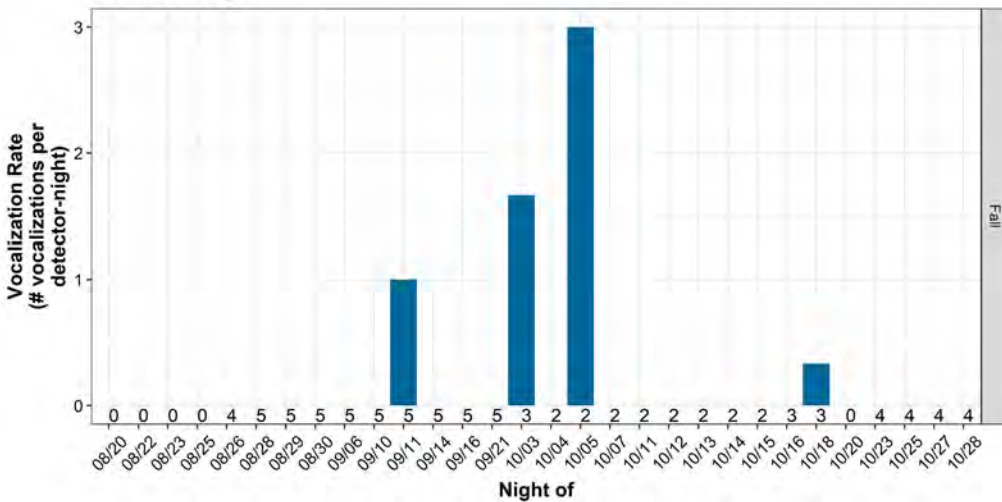
Canada Jay



Canada Jay

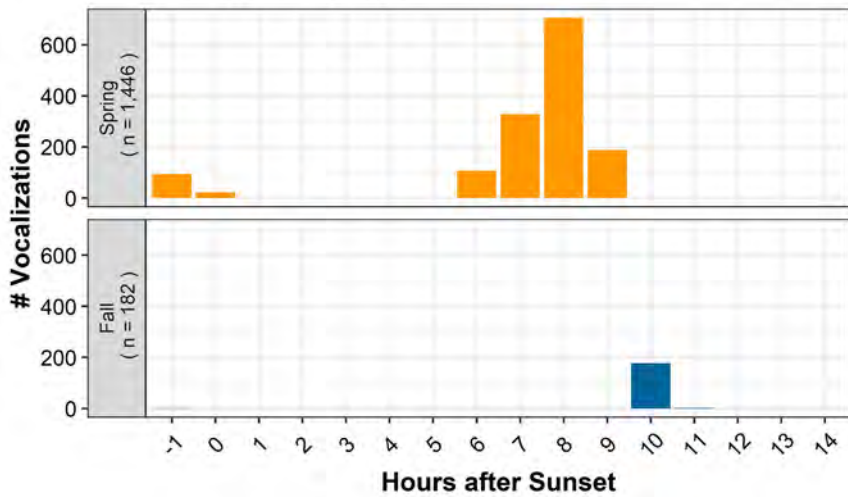


Canada Jay

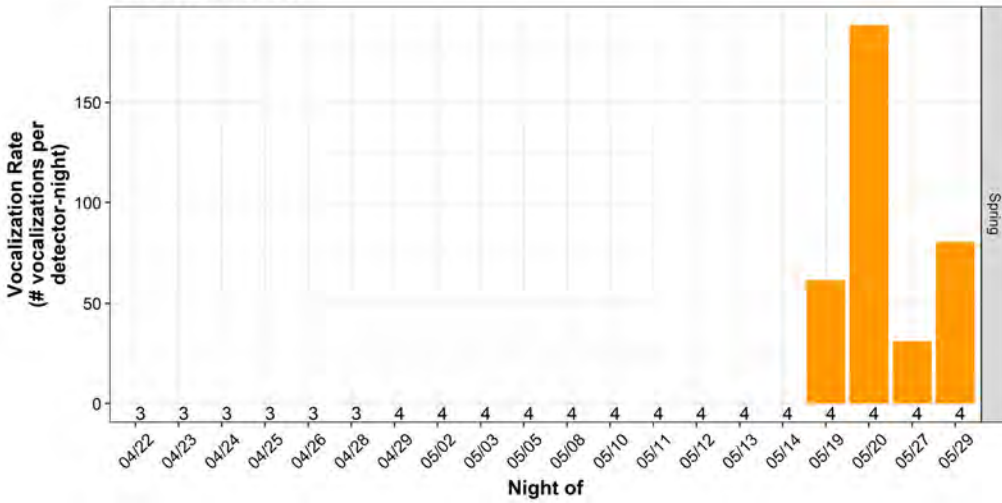


Appendix B Figure 26. Canada Jay – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

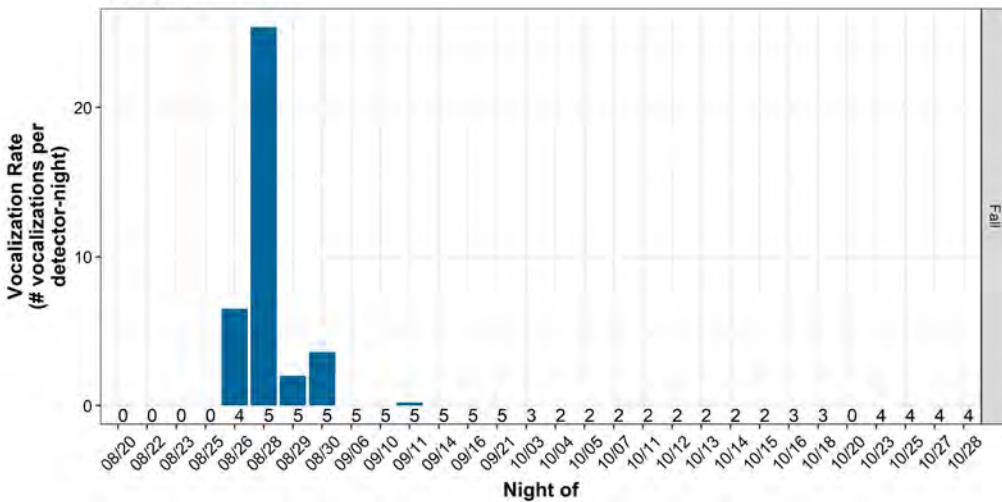
Canada Warbler



Canada Warbler

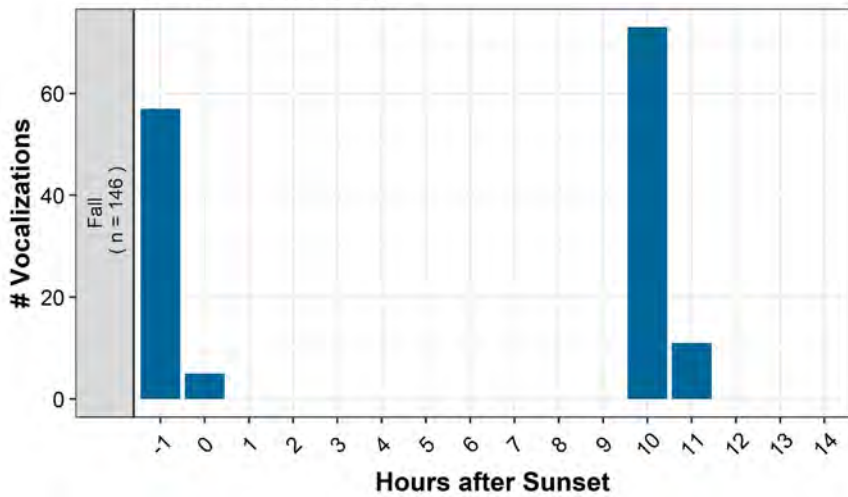


Canada Warbler

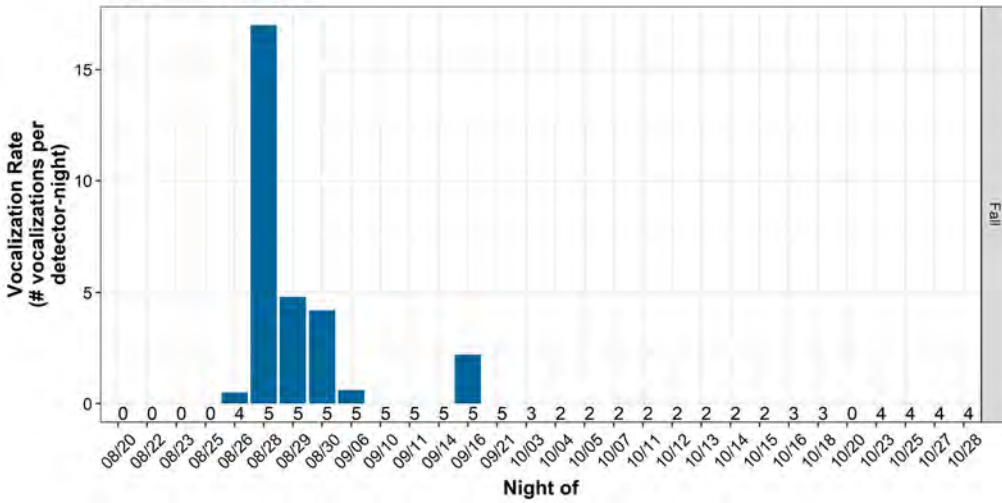


Appendix B Figure 27. Canada Warbler – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Cedar Waxwing

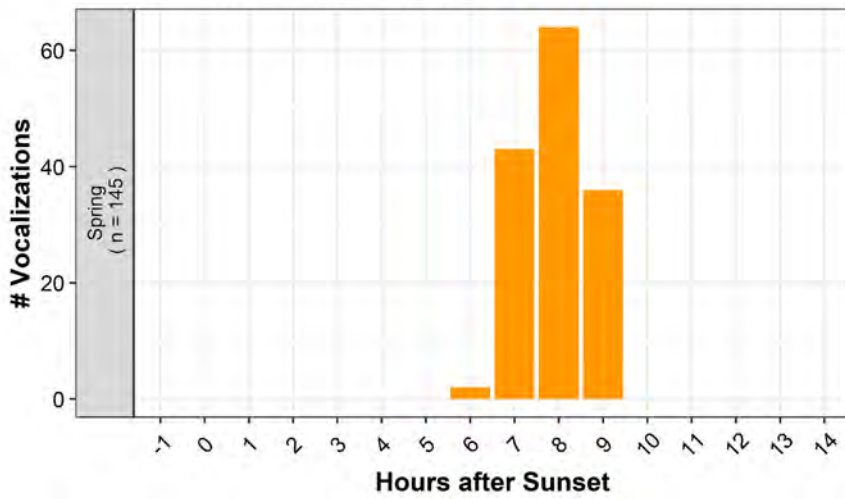


Cedar Waxwing

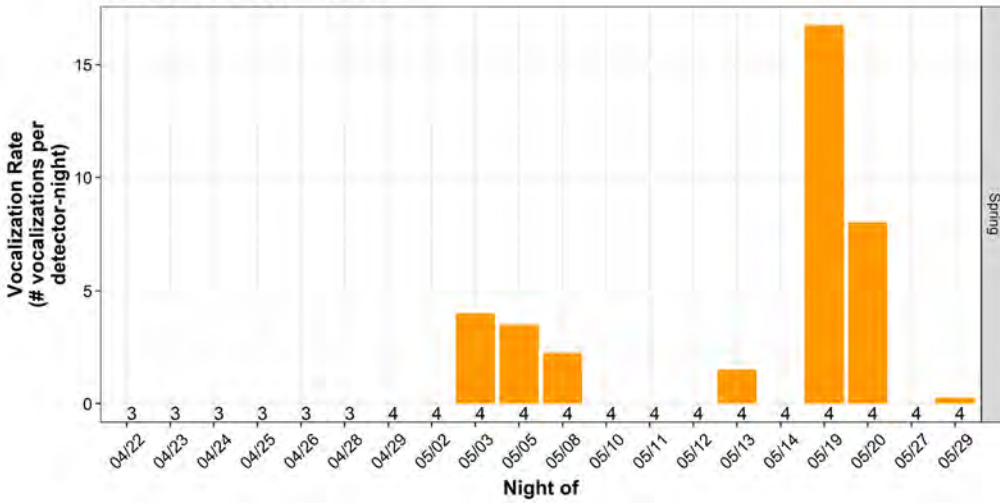


Appendix B Figure 28. Cedar Waxwing – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in fall)

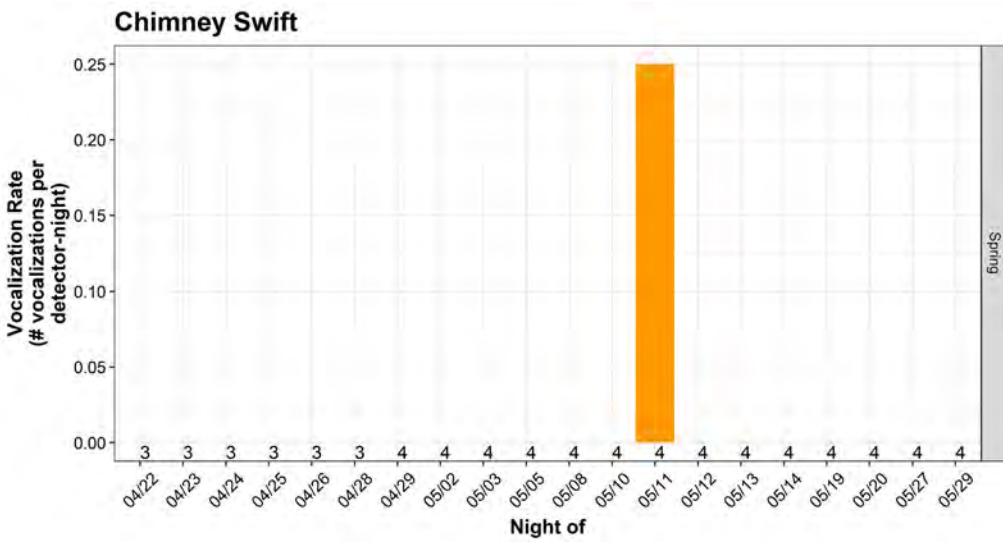
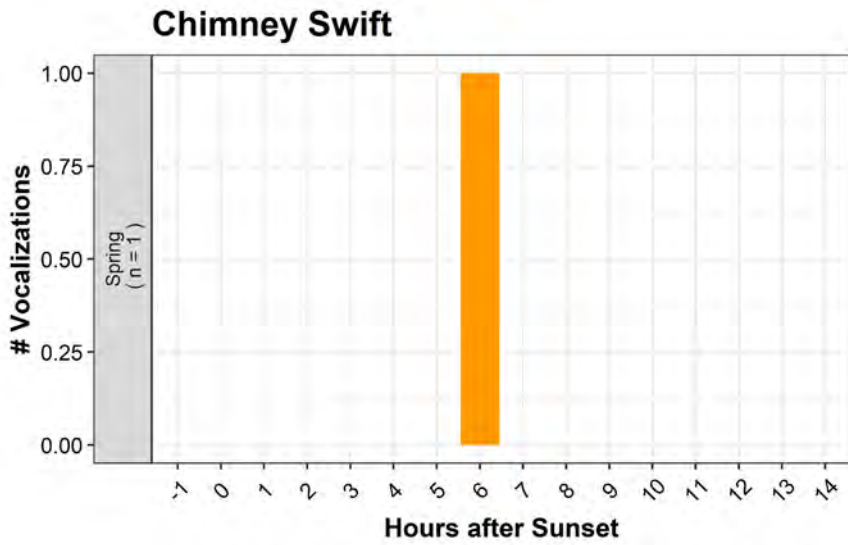
Chestnut-sided Warbler



Chestnut-sided Warbler

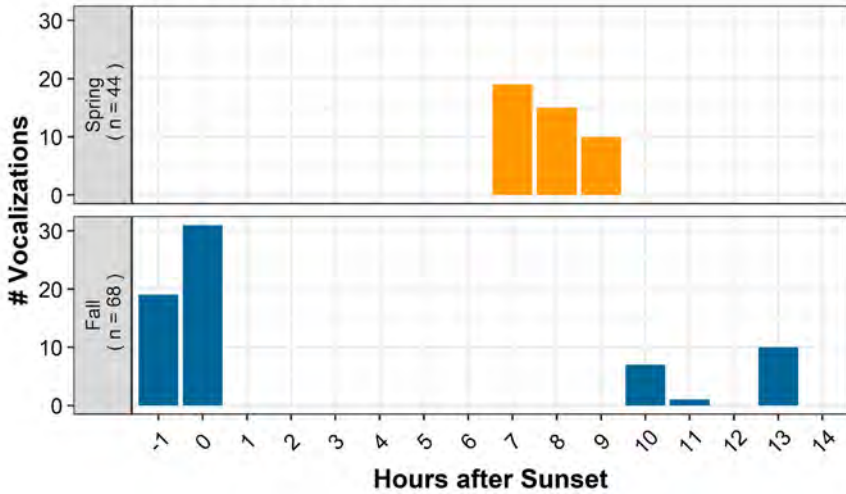


Appendix B Figure 29. Chestnut-sided Warbler – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

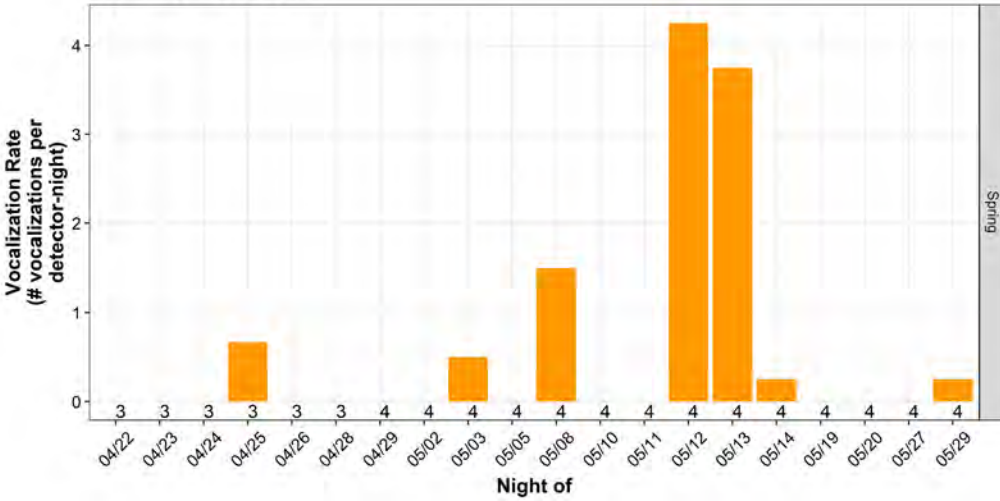


Appendix B Figure 30. Chimney Swift – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

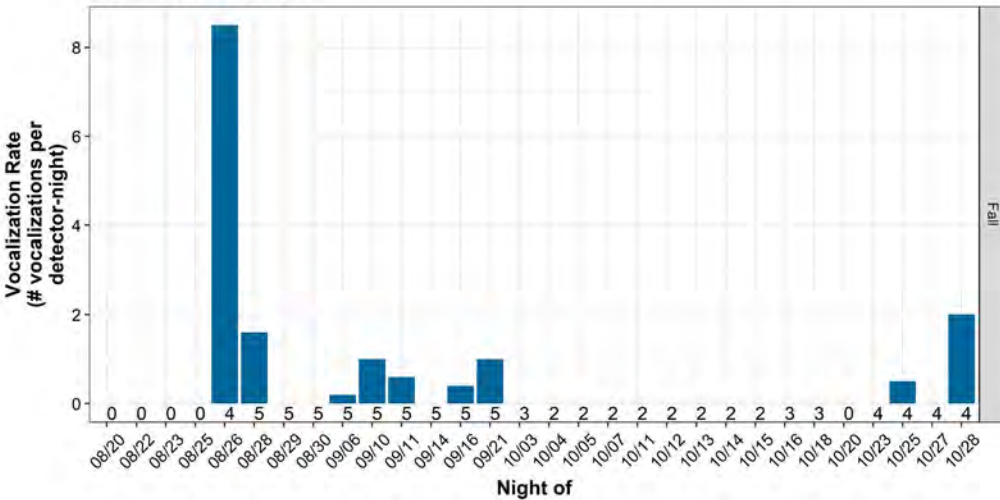
Common Grackle



Common Grackle

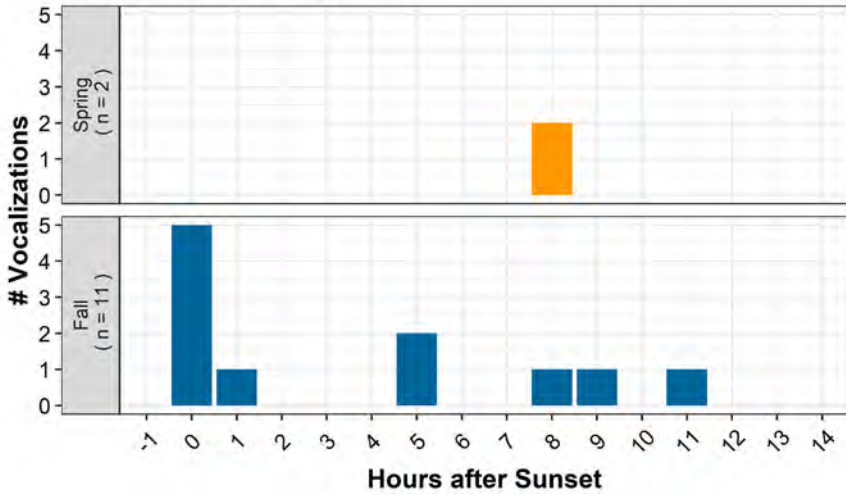


Common Grackle

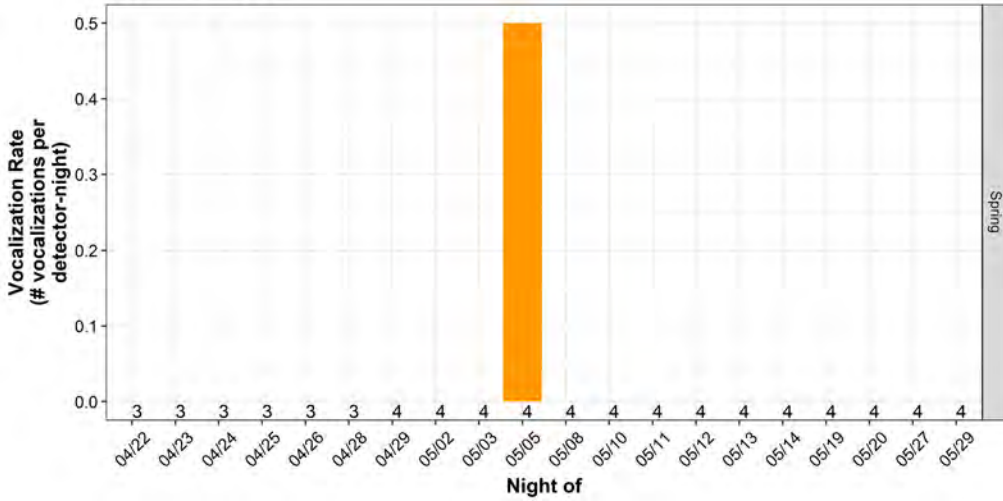


Appendix B Figure 31. Common Grackle – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

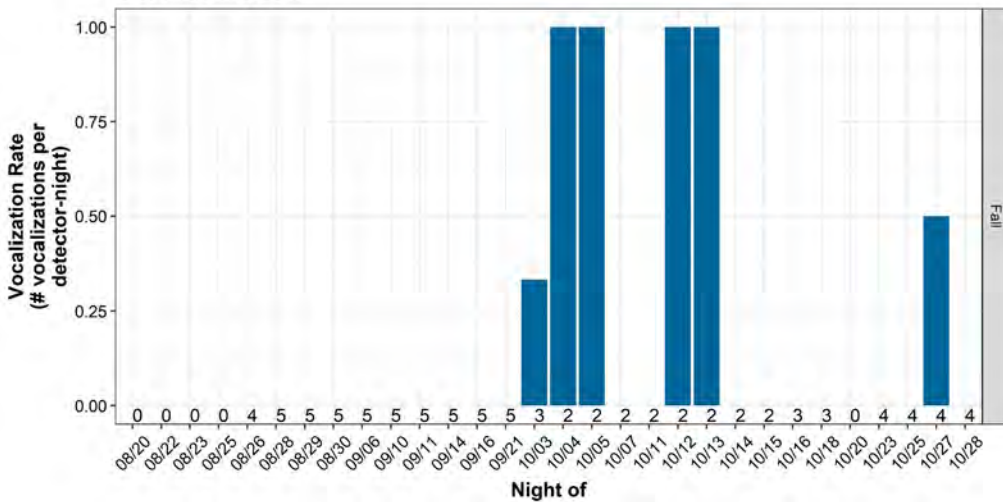
Common Loon



Common Loon

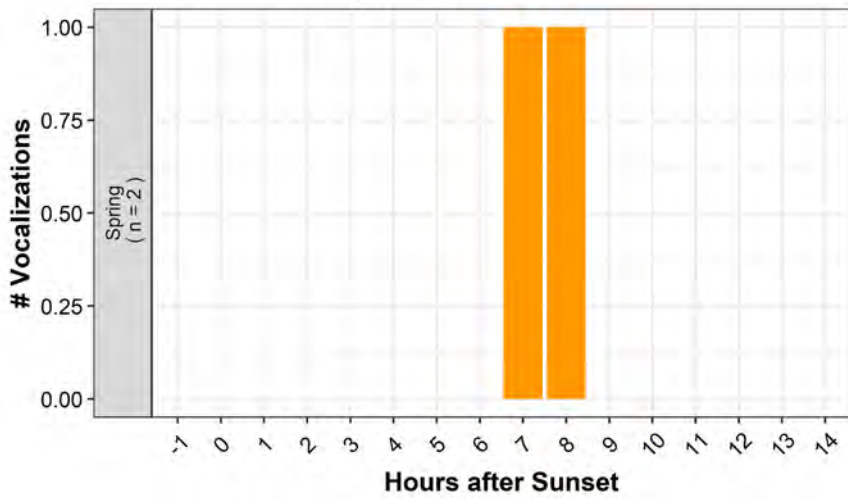


Common Loon

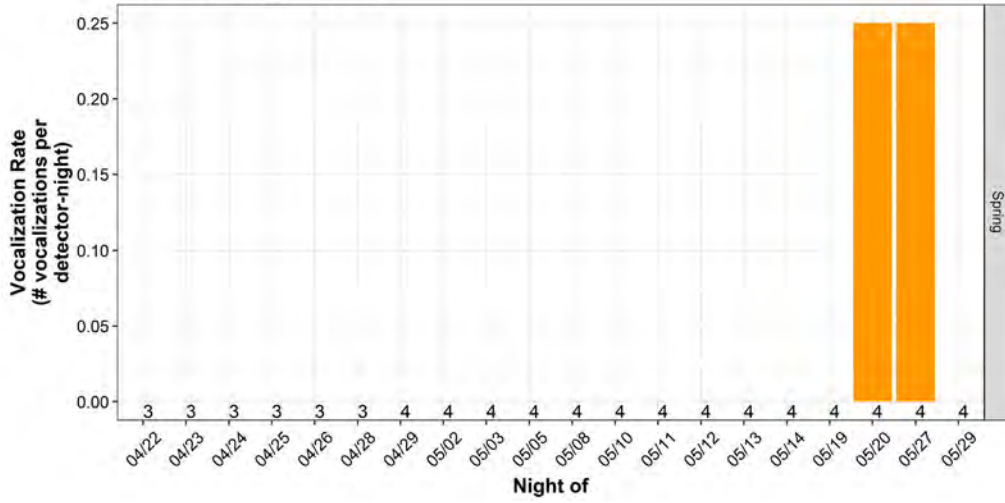


Appendix B Figure 32. Common Loon– Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Common Nighthawk

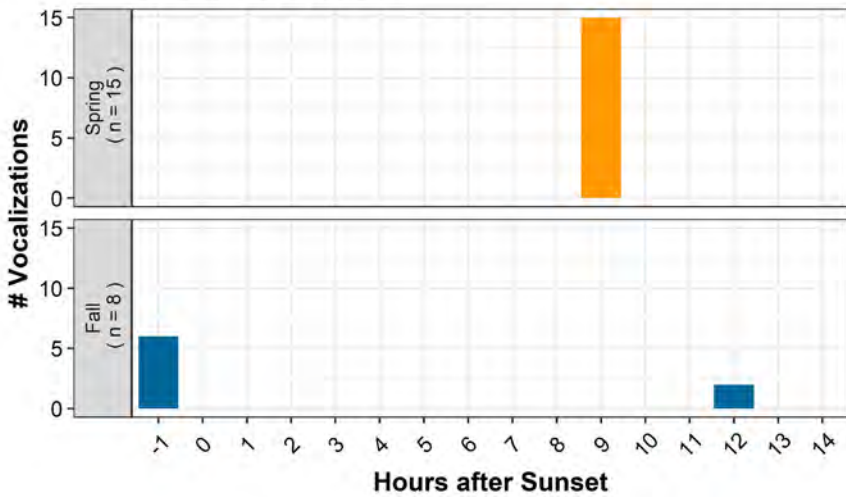


Common Nighthawk

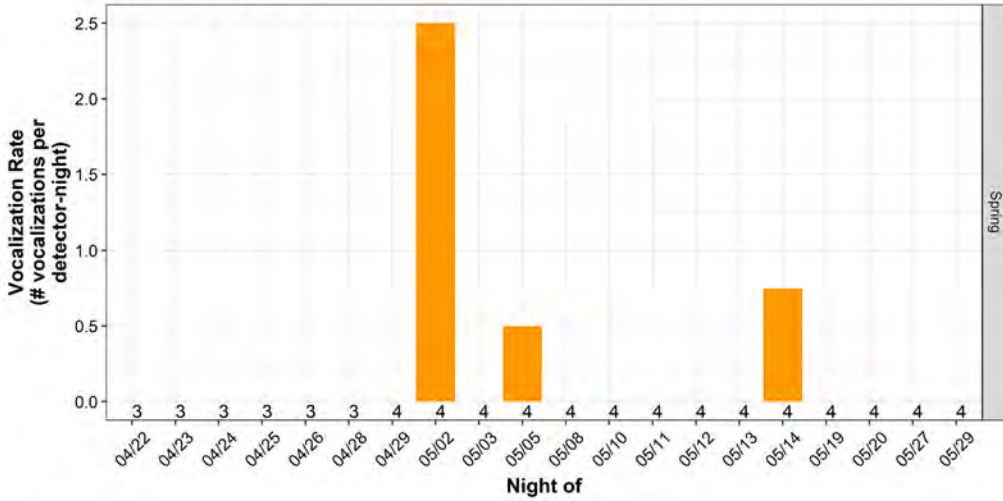


Appendix B Figure 33. Common Nighthawk – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

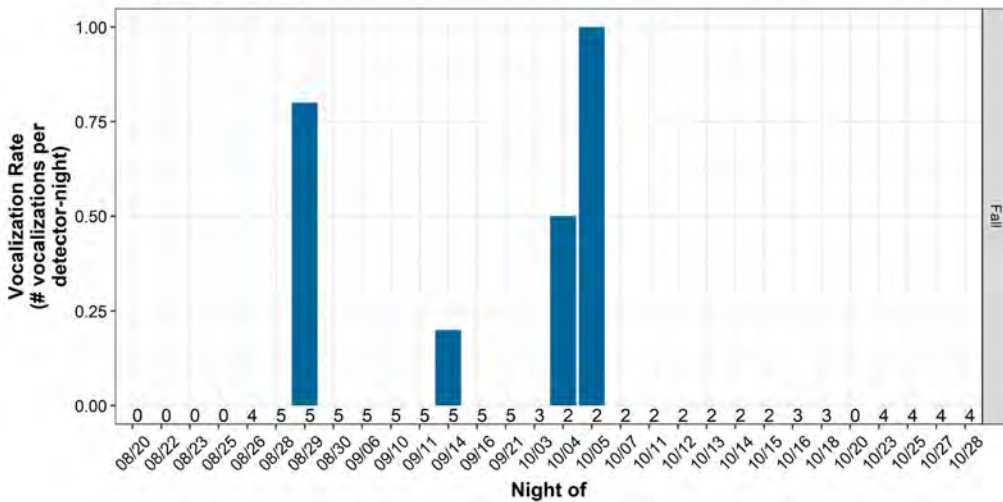
Common Raven



Common Raven

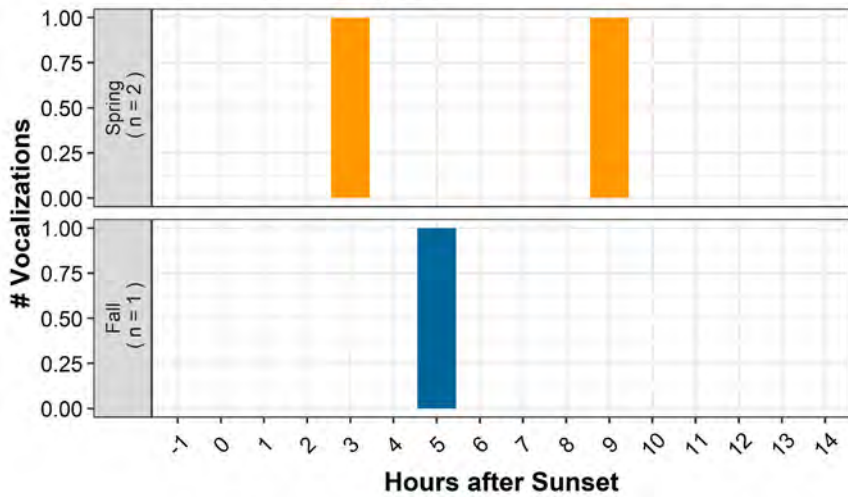


Common Raven

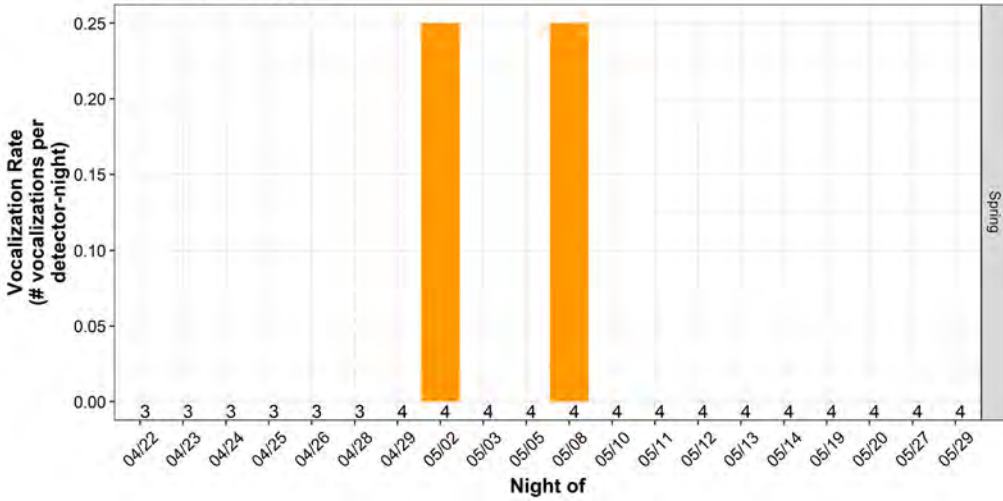


Appendix B Figure 34. Common Raven – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

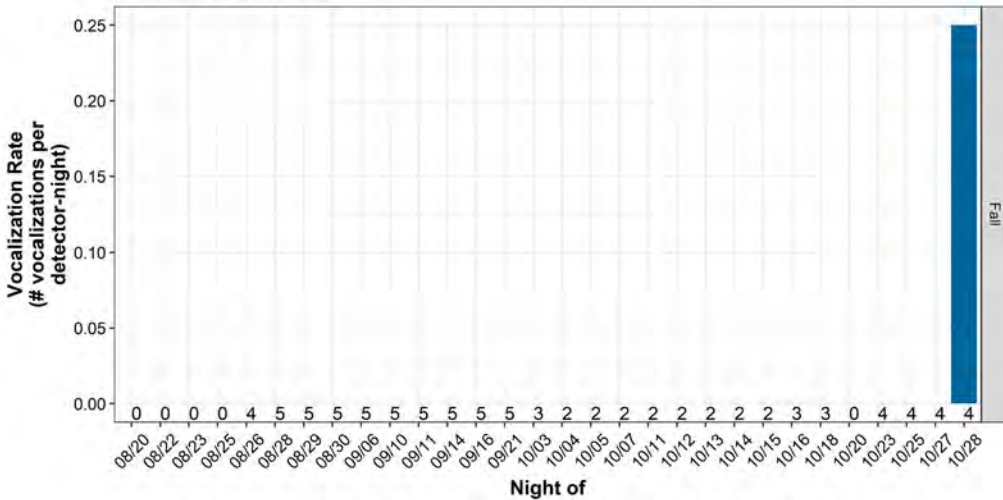
Common Redpoll



Common Redpoll

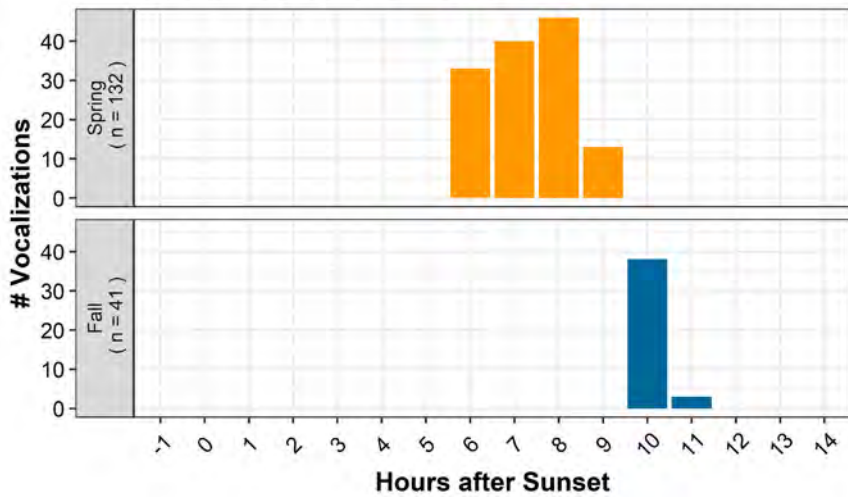


Common Redpoll

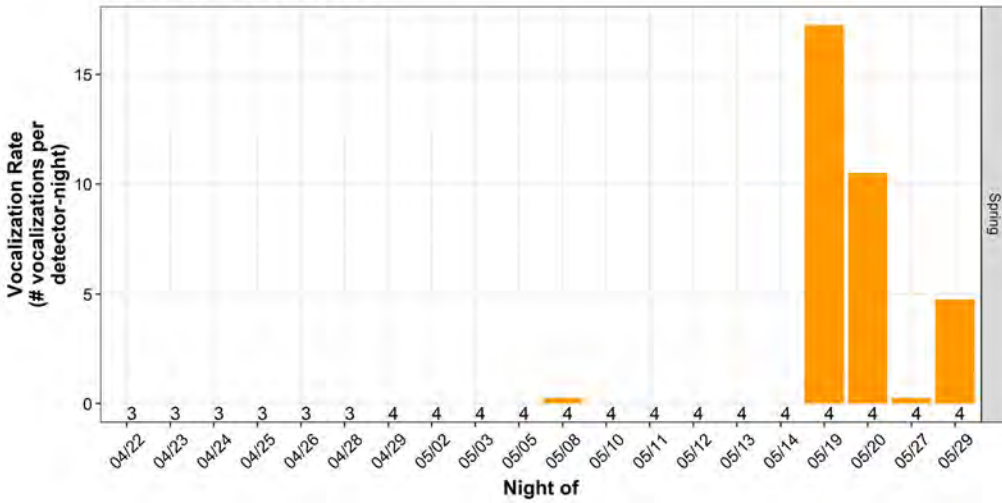


Appendix B Figure 35. Common Redpoll – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

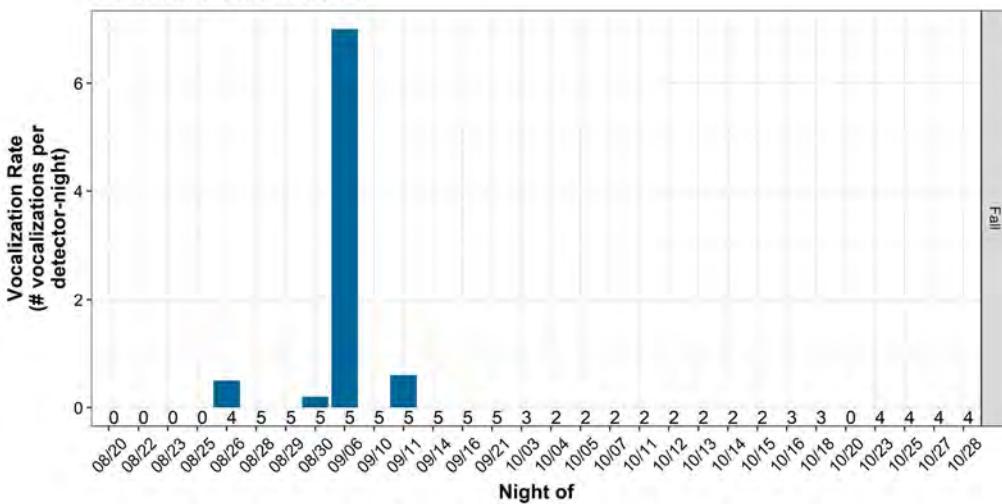
Common Yellowthroat



Common Yellowthroat

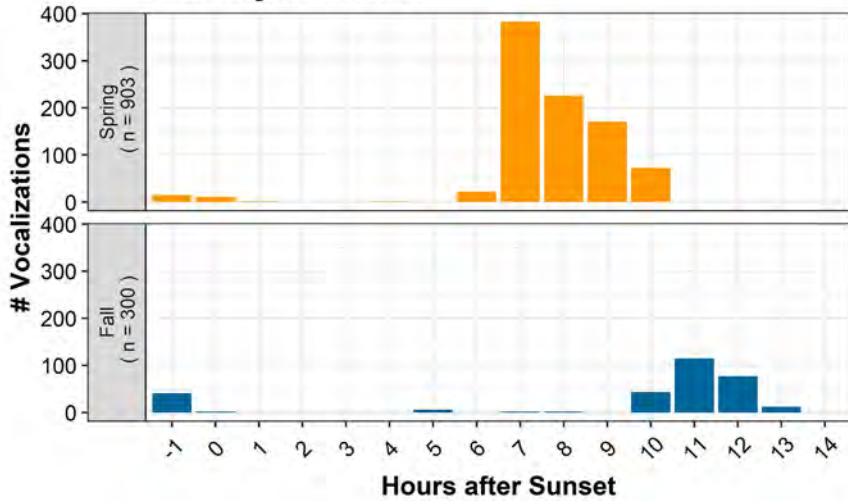


Common Yellowthroat

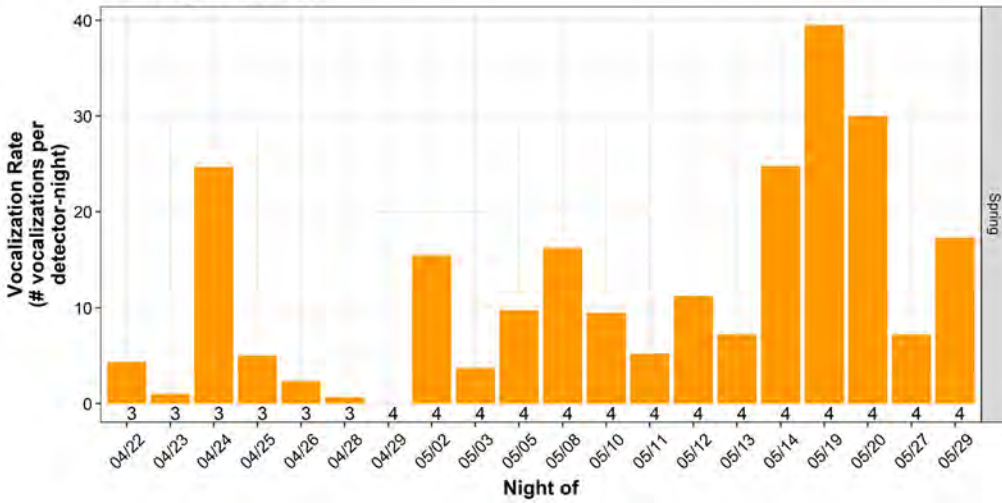


Appendix B Figure 36. Common Yellowthroat – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

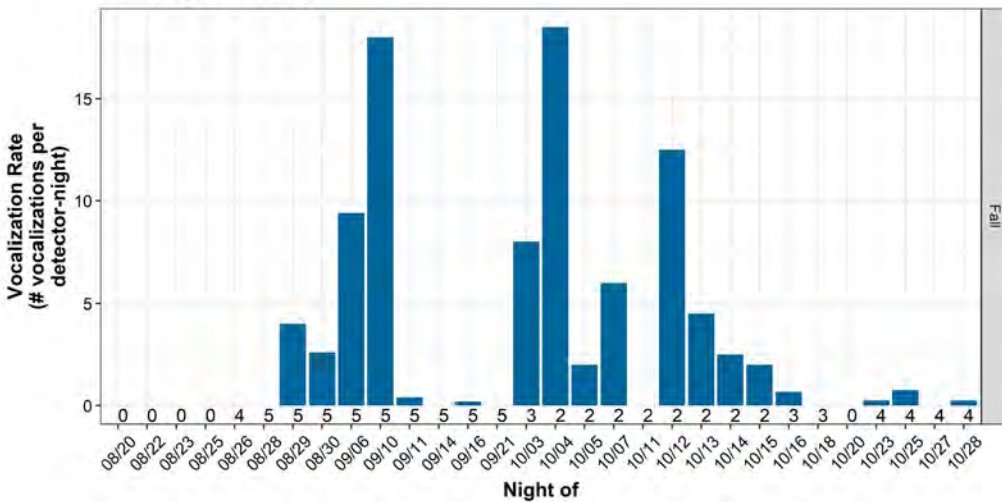
Dark-eyed Junco



Dark-eyed Junco

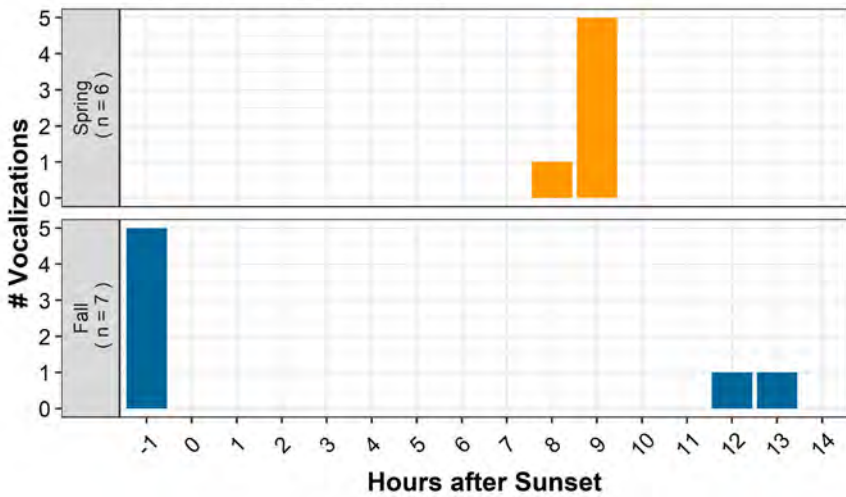


Dark-eyed Junco

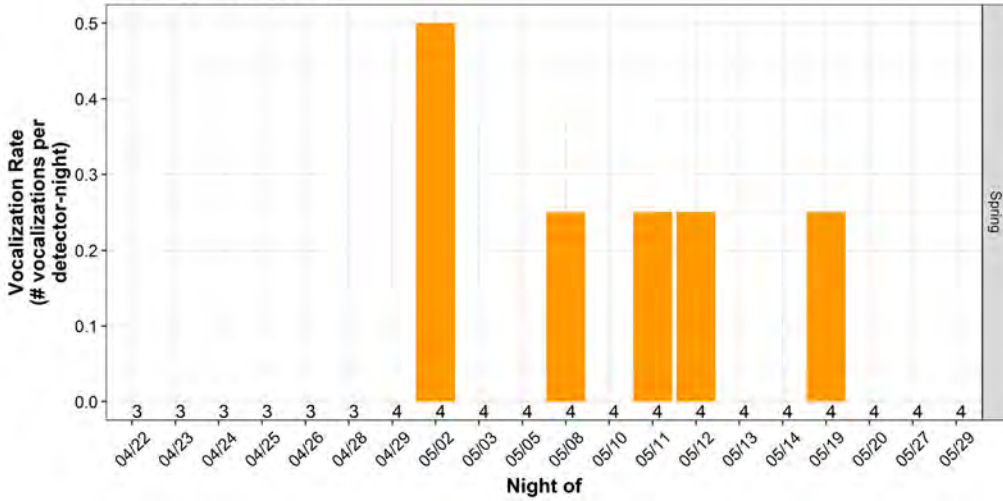


Appendix B Figure 37. Dark-eyed Junco– Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

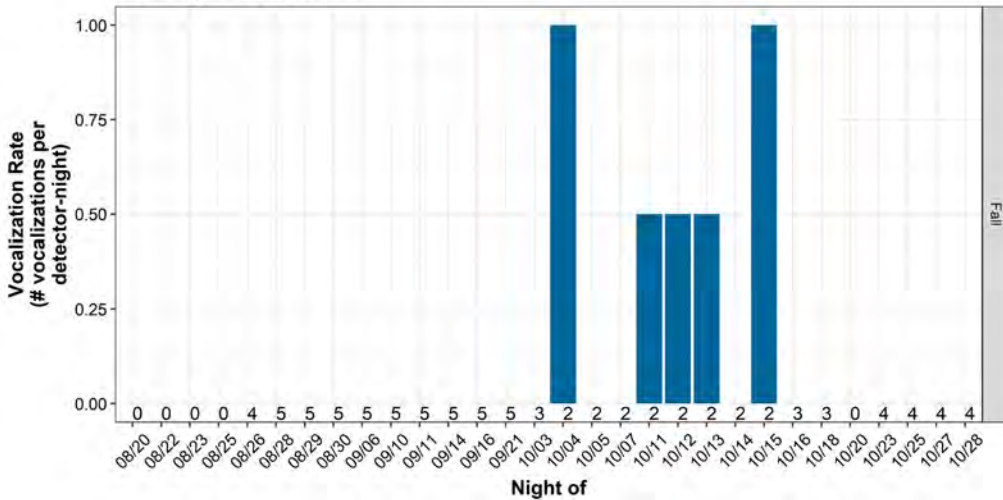
Downy Woodpecker



Downy Woodpecker

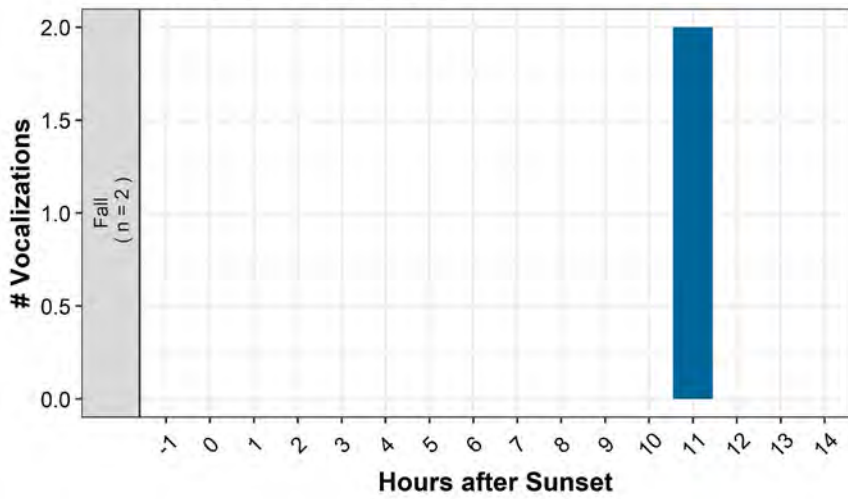


Downy Woodpecker

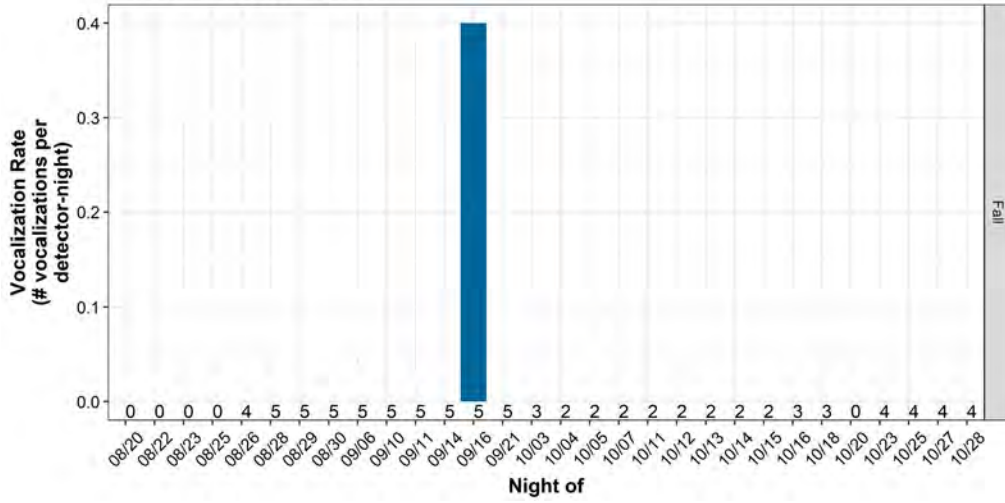


Appendix B Figure 38. Downy Woodpecker – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Eastern Wood-Pewee

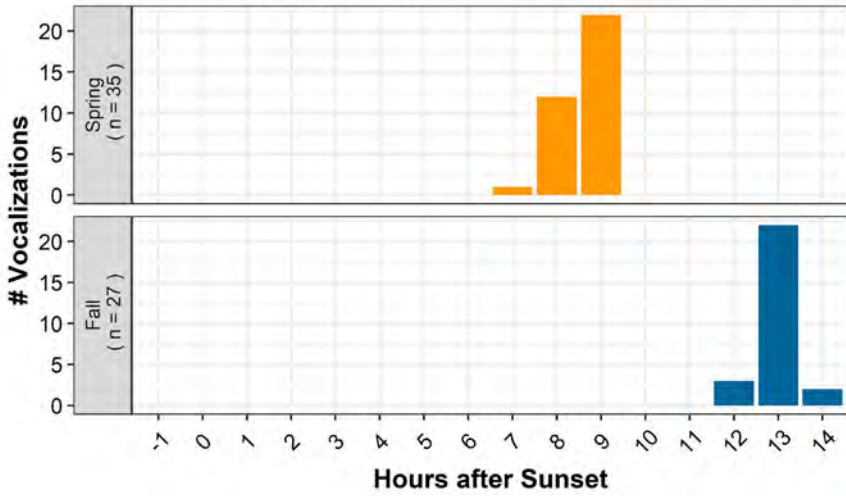


Eastern Wood-Pewee

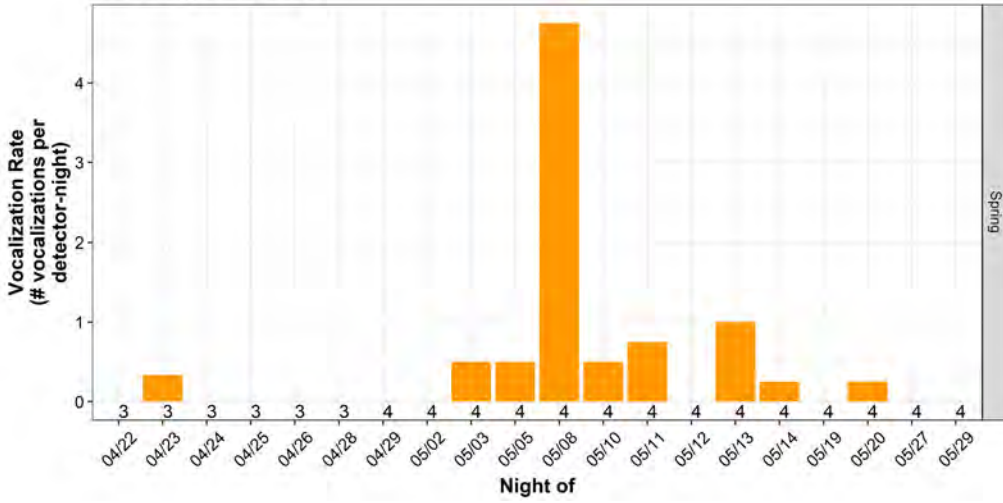


Appendix B Figure 39. Eastern Wood-Pewee – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in fall)

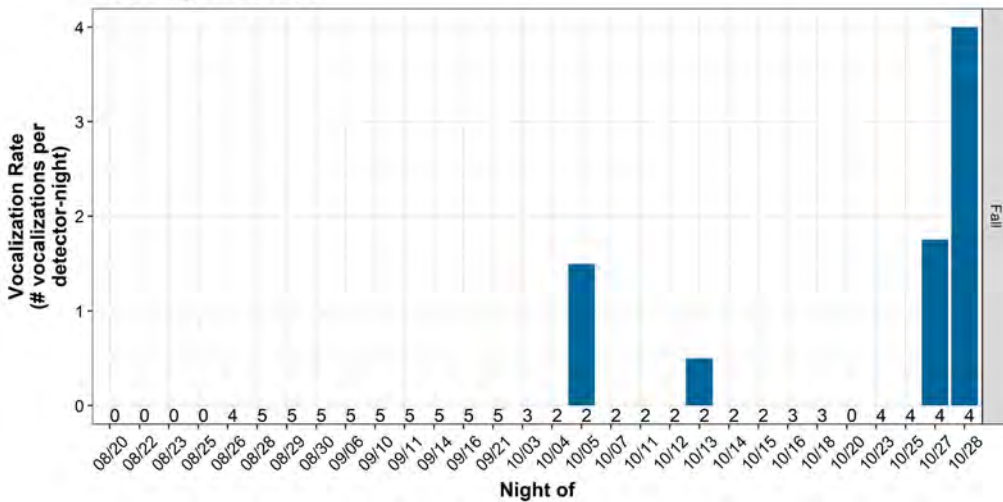
Evening Grosbeak



Evening Grosbeak

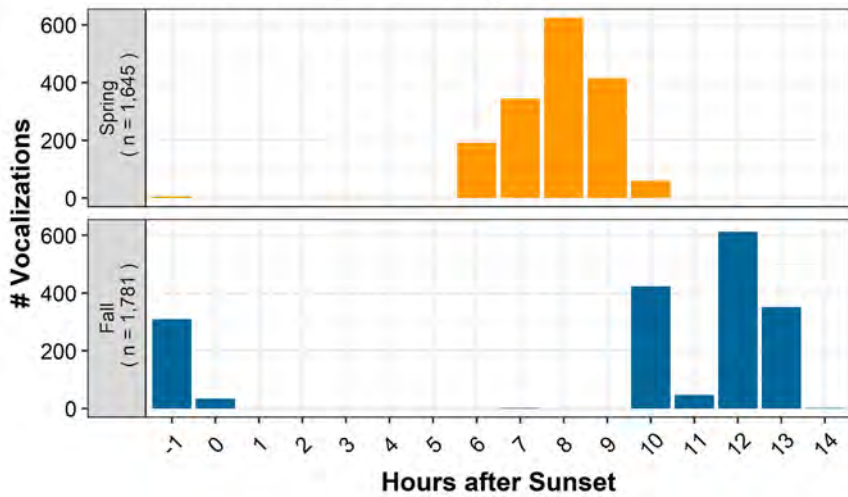


Evening Grosbeak

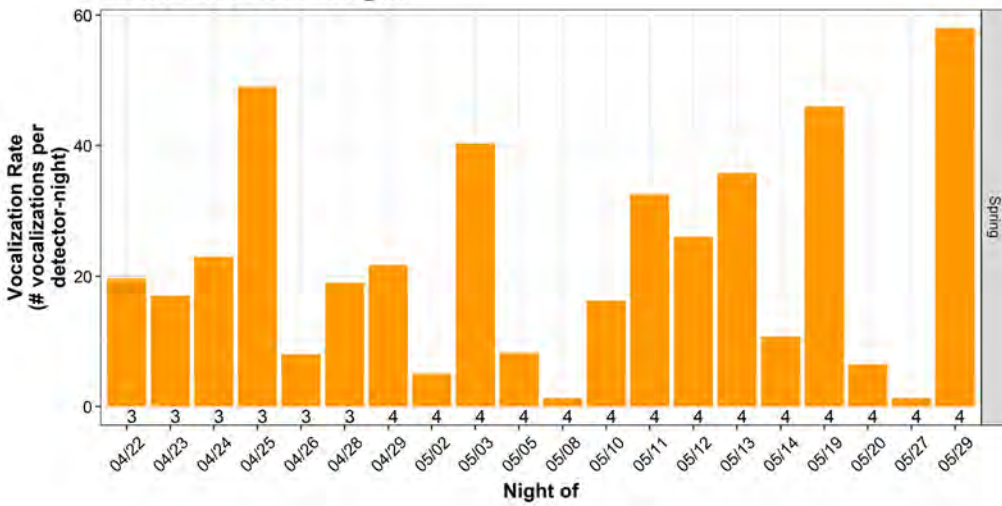


Appendix B Figure 40. Evening Grosbeak – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

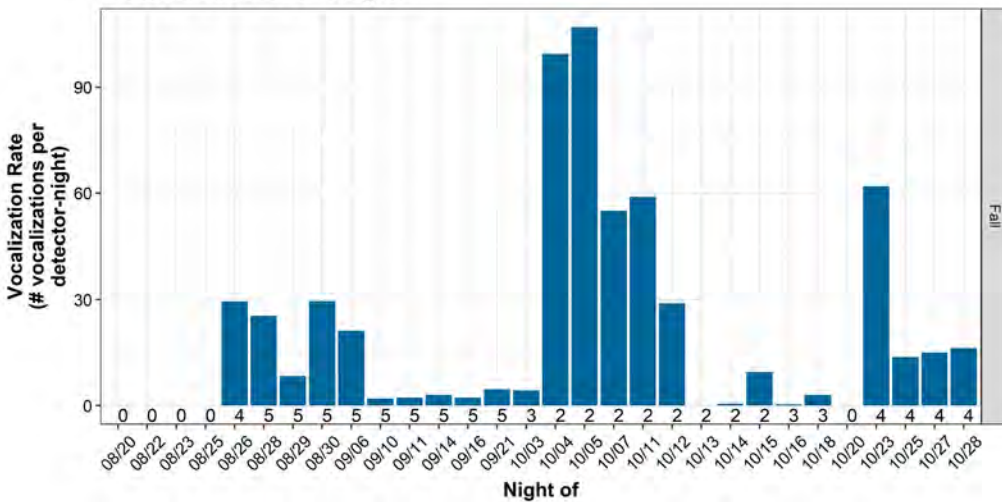
Golden-crowned Kinglet



Golden-crowned Kinglet

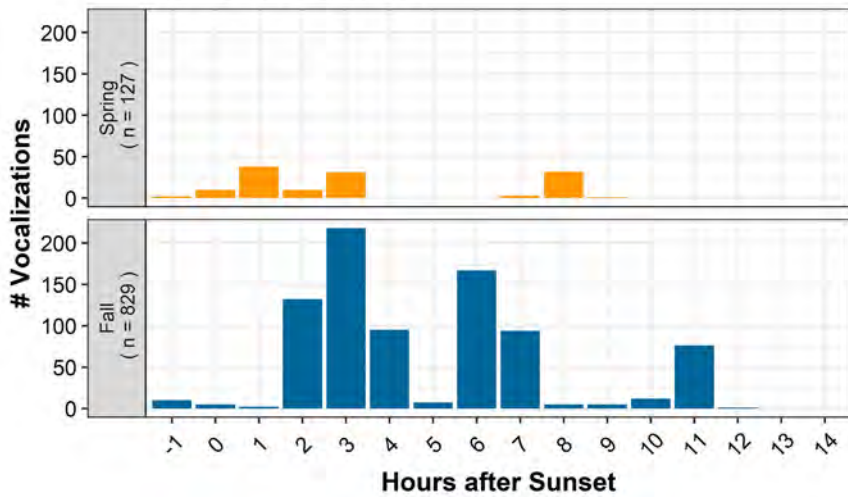


Golden-crowned Kinglet

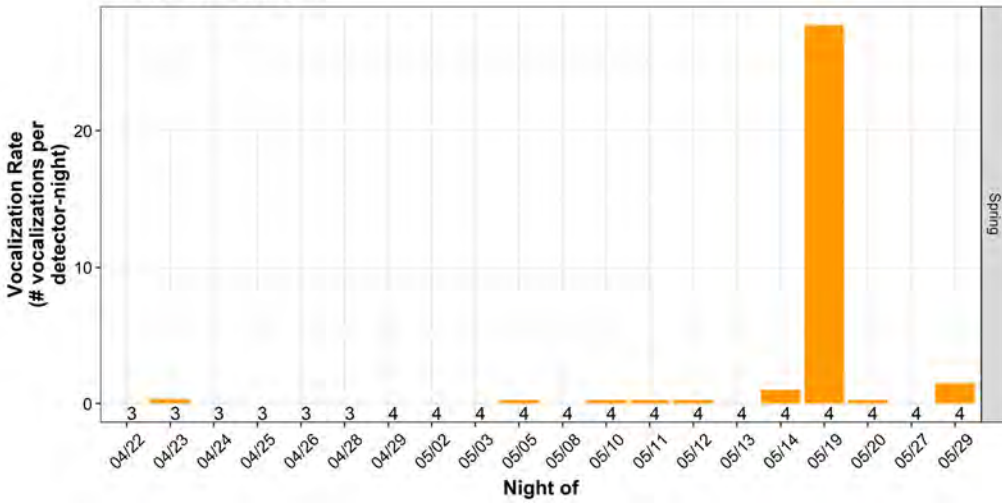


Appendix B Figure 41. Golden-crowned Kinglet – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

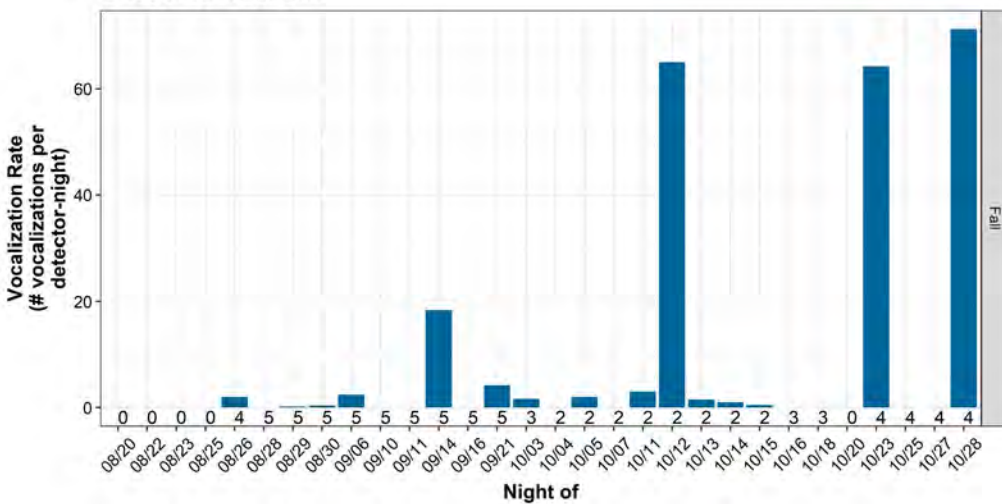
Great Horned Owl



Great Horned Owl

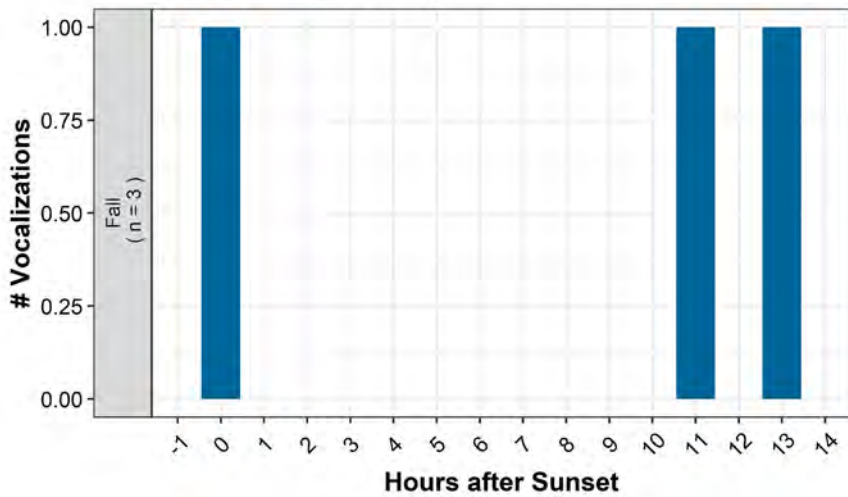


Great Horned Owl

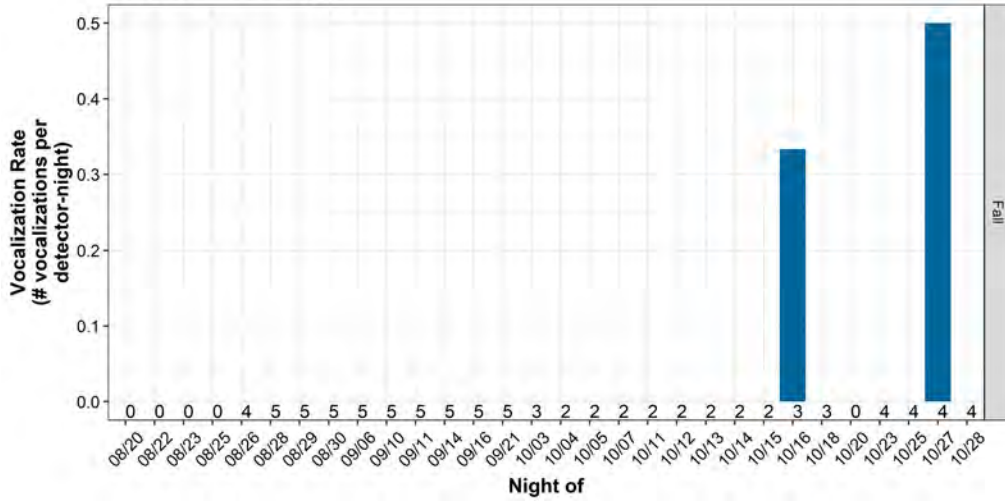


Appendix B Figure 42. Great Horned Owl – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Greater Yellowlegs

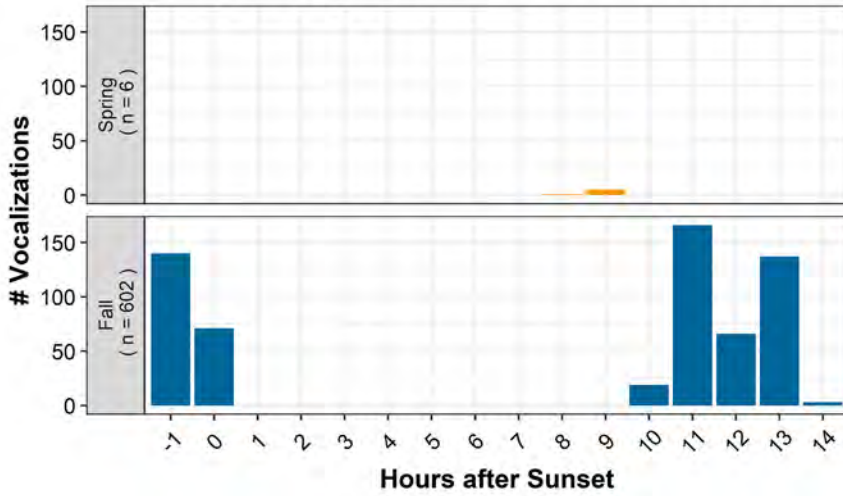


Greater Yellowlegs

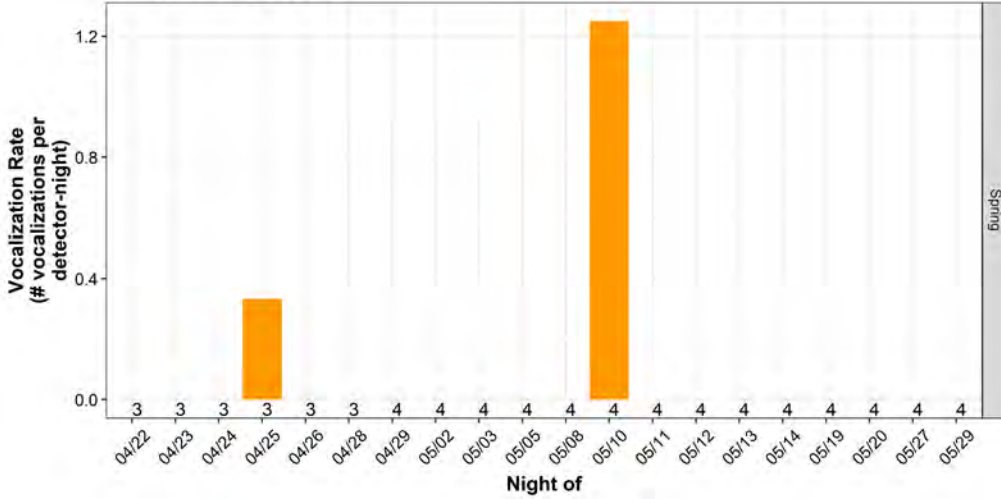


Appendix B Figure 43. Greater Yellowlegs – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in fall)

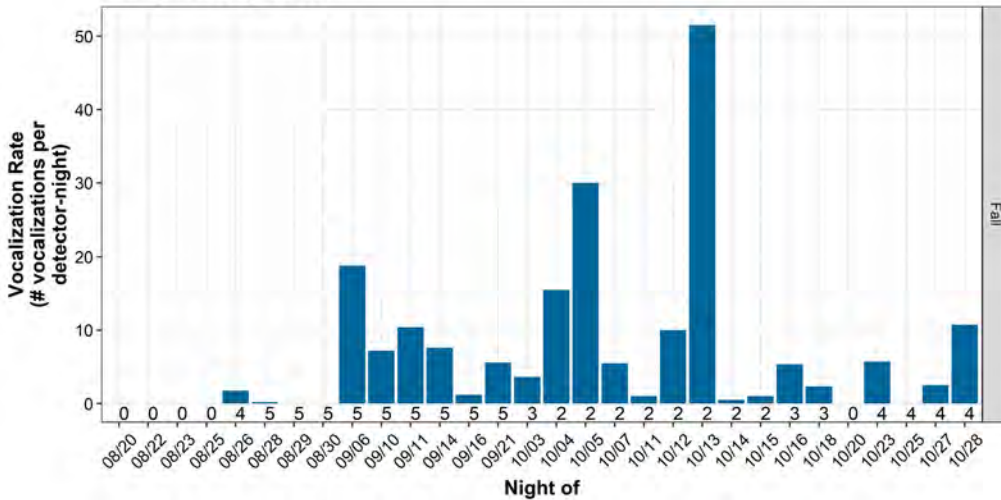
Hairy Woodpecker



Hairy Woodpecker

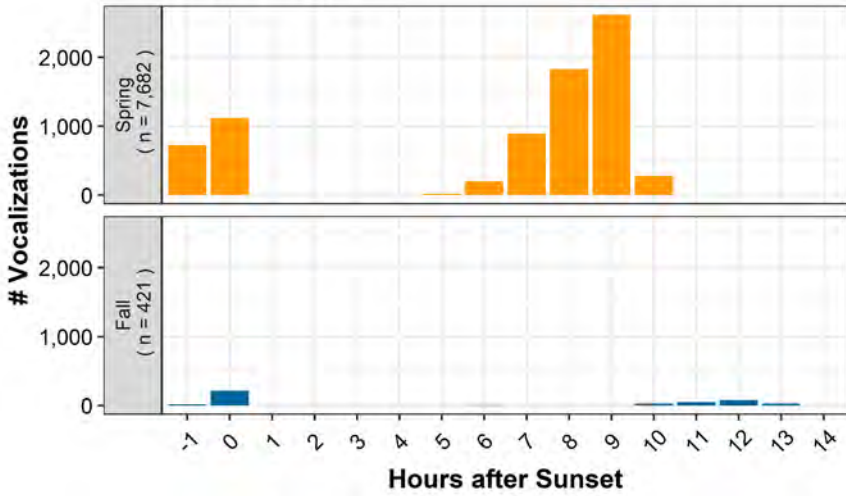


Hairy Woodpecker

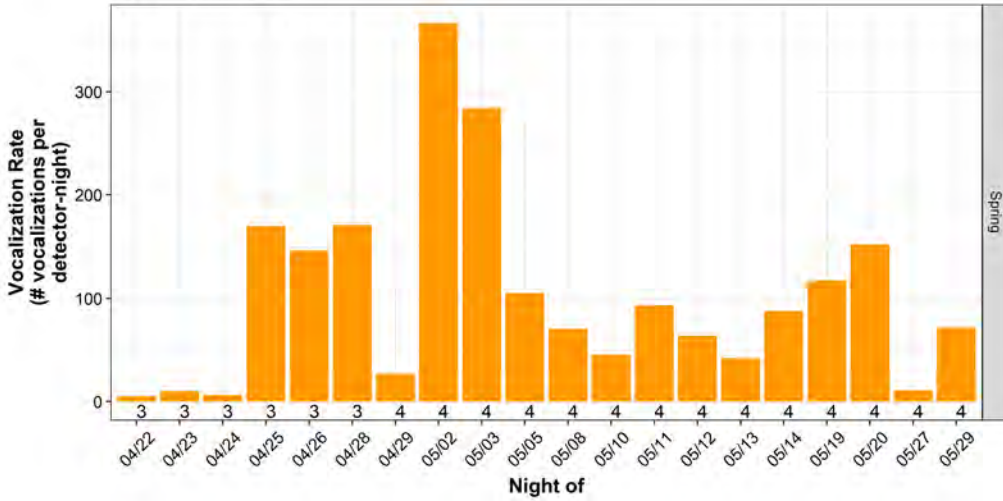


Appendix B Figure 44. Hairy Woodpecker– Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

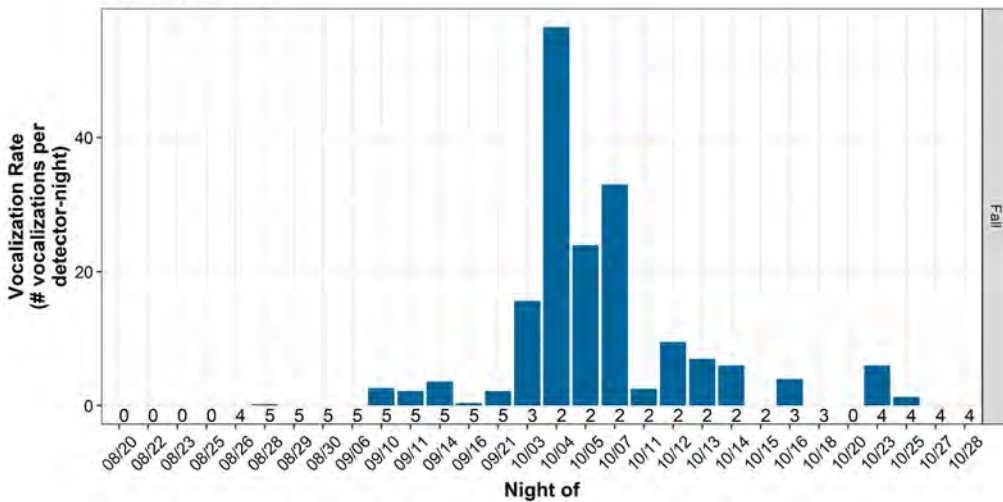
Hermit Thrush



Hermit Thrush

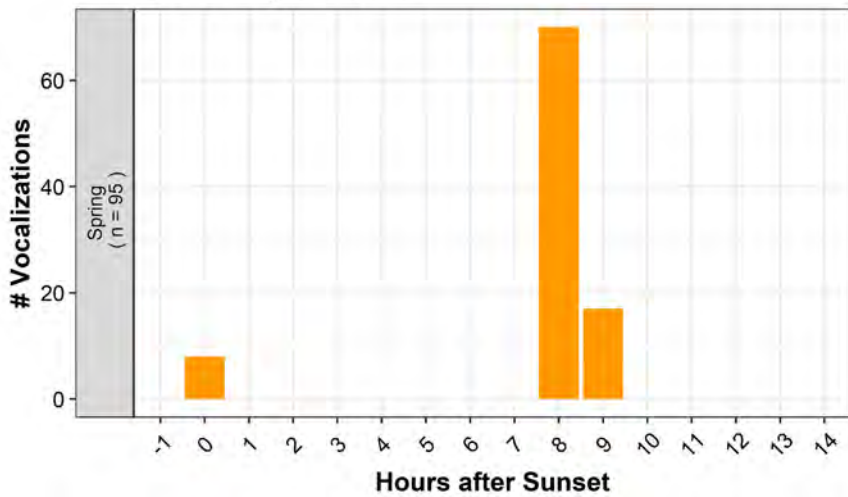


Hermit Thrush

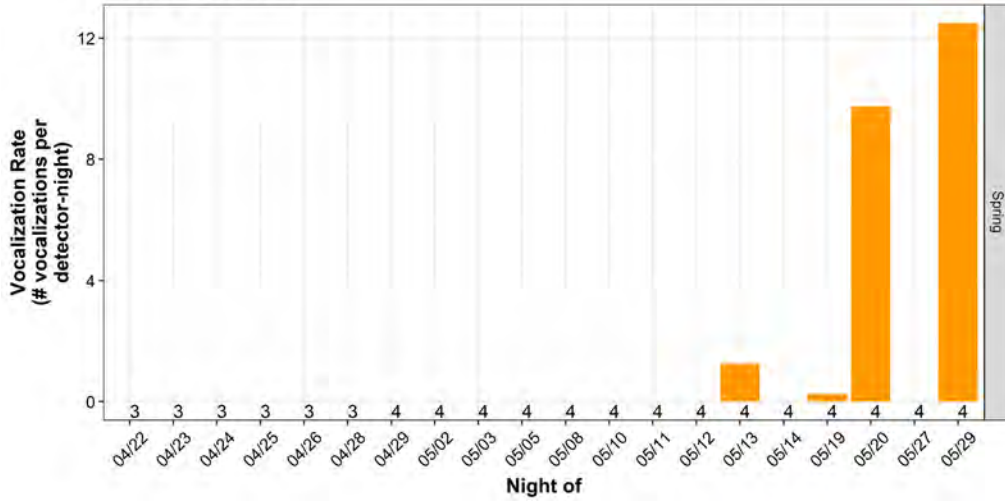


Appendix B Figure 45. Hermit Thrush – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

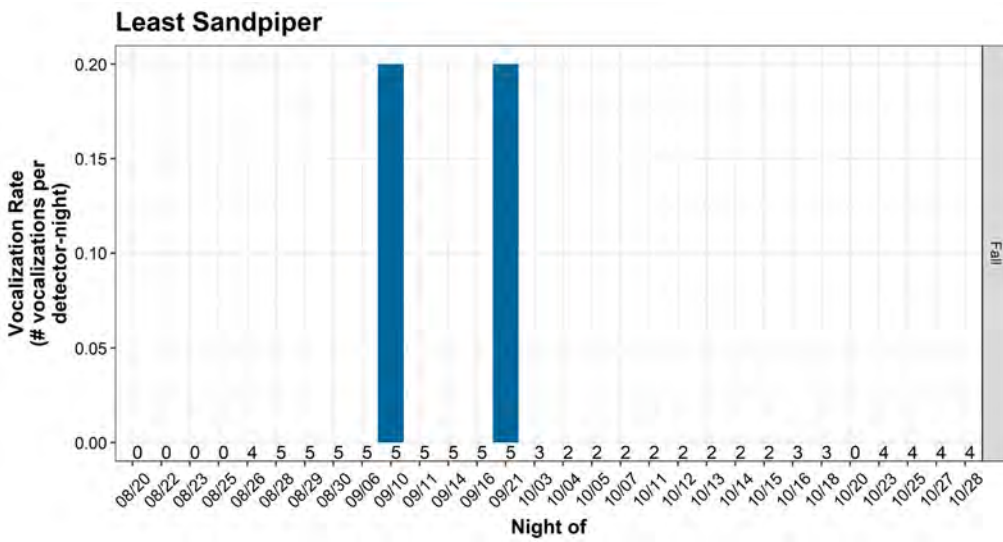
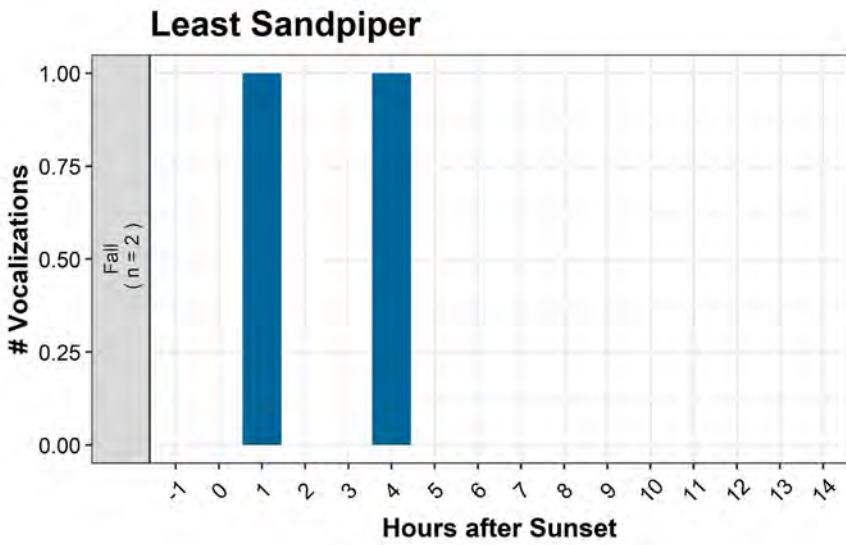
Least Flycatcher



Least Flycatcher

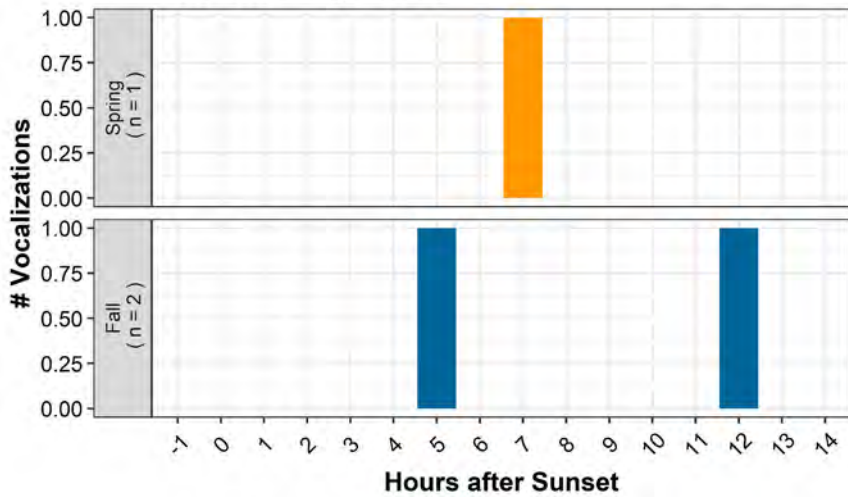


Appendix B Figure 46. Least Flycatcher – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

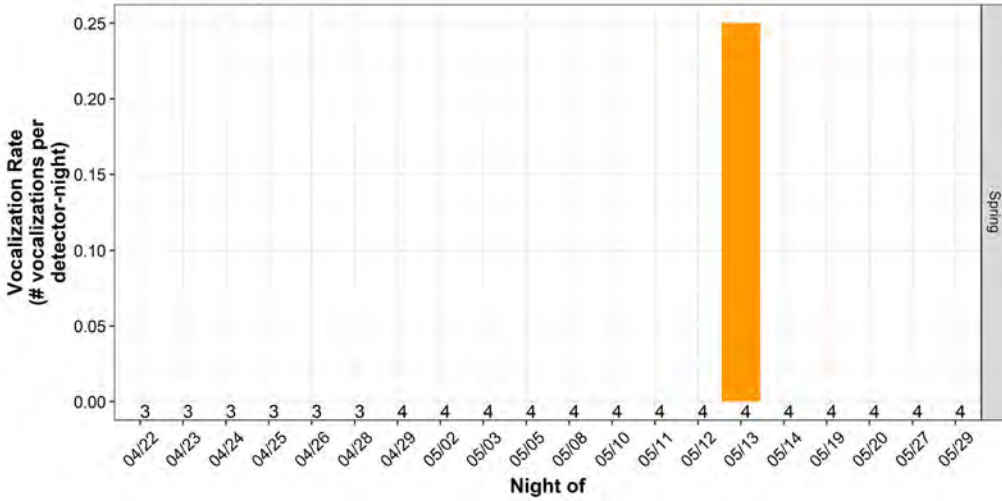


Appendix B Figure 47. Least Sandpiper – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in fall)

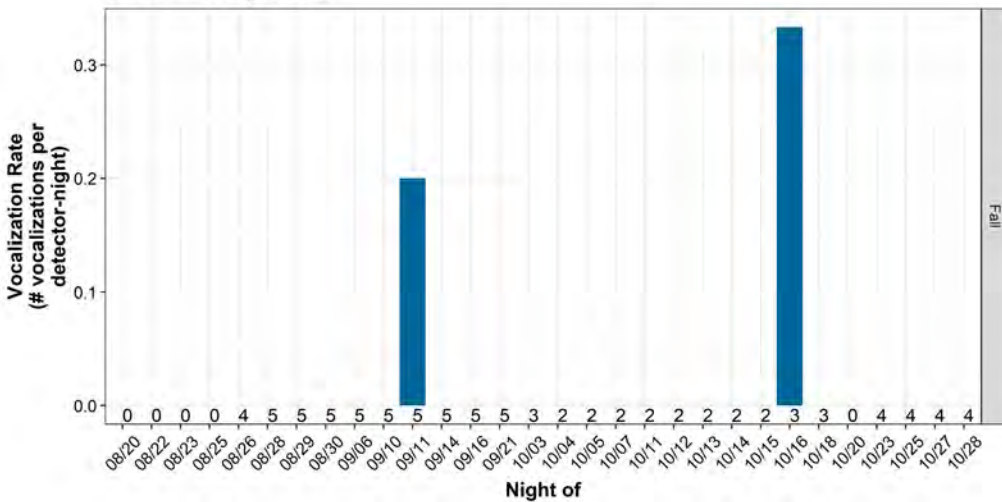
Lincoln's Sparrow



Lincoln's Sparrow

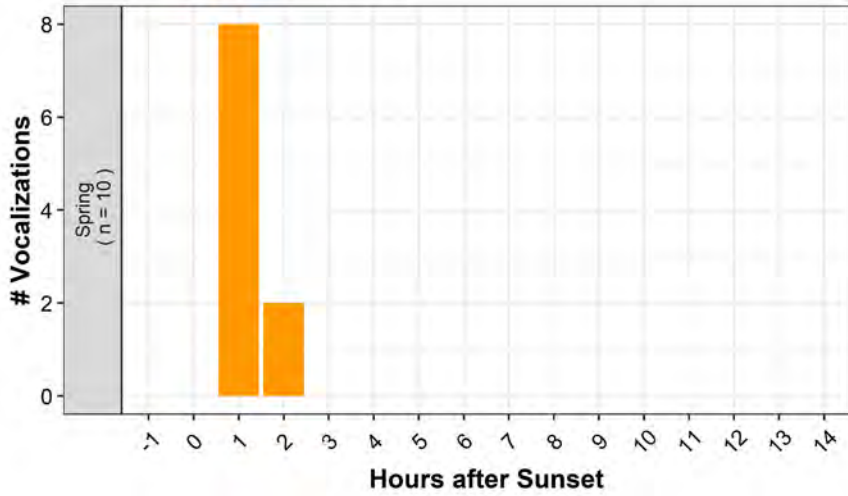


Lincoln's Sparrow

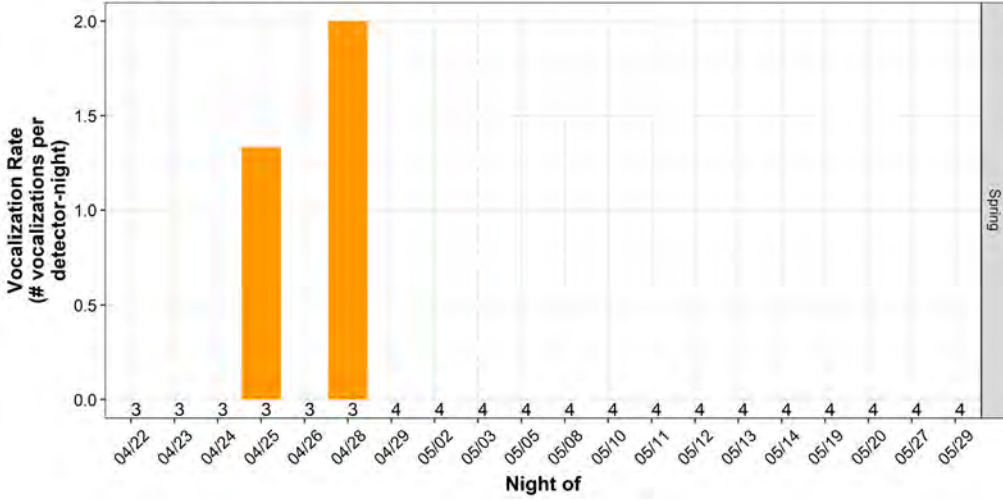


Appendix B Figure 48. Lincoln's Sparrow – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Long-tailed Duck

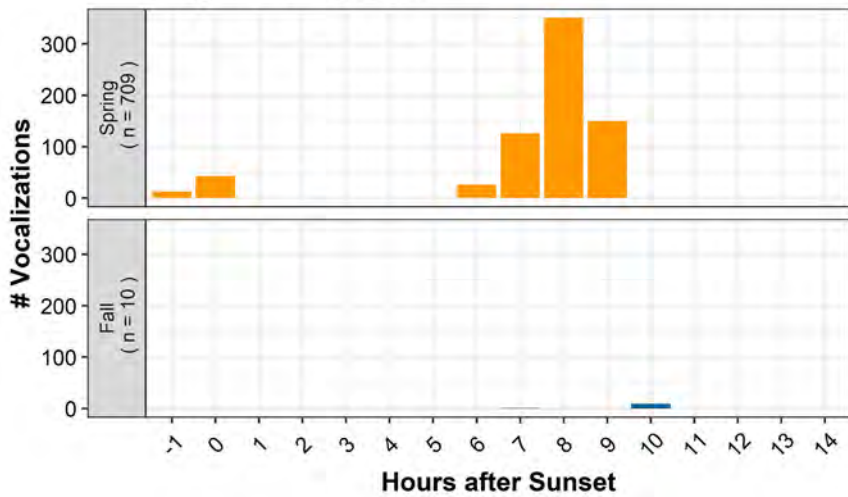


Long-tailed Duck

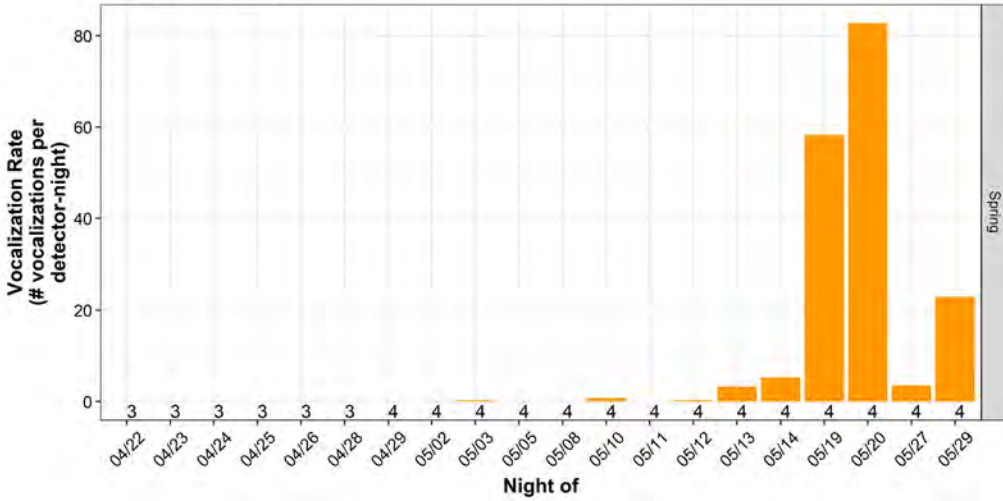


Appendix B Figure 49. Long-tailed Duck – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

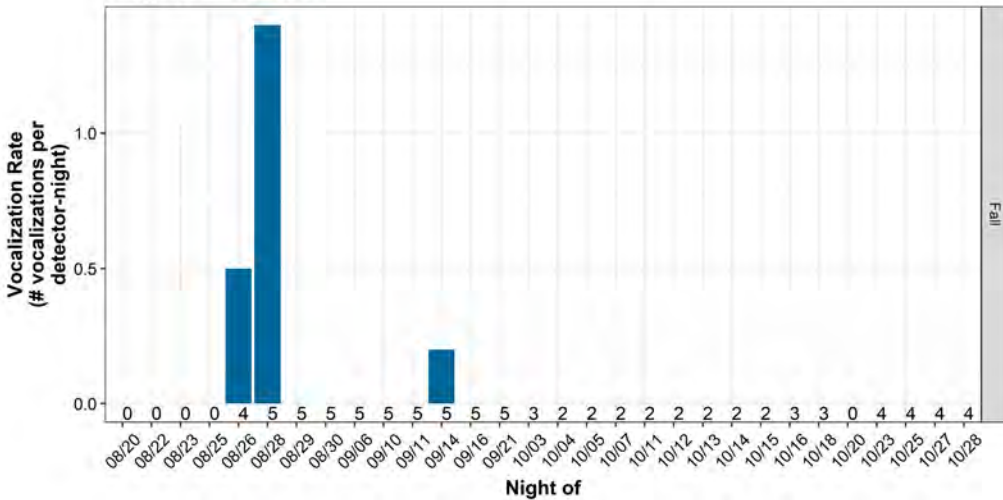
Magnolia Warbler



Magnolia Warbler

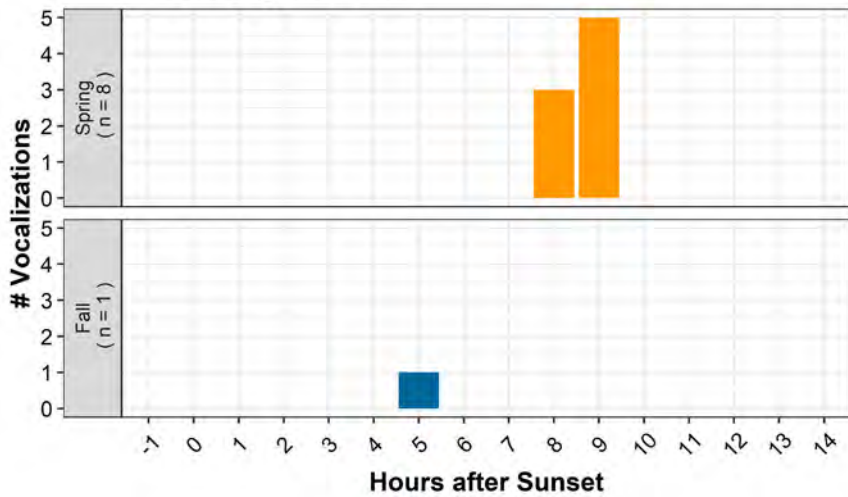


Magnolia Warbler

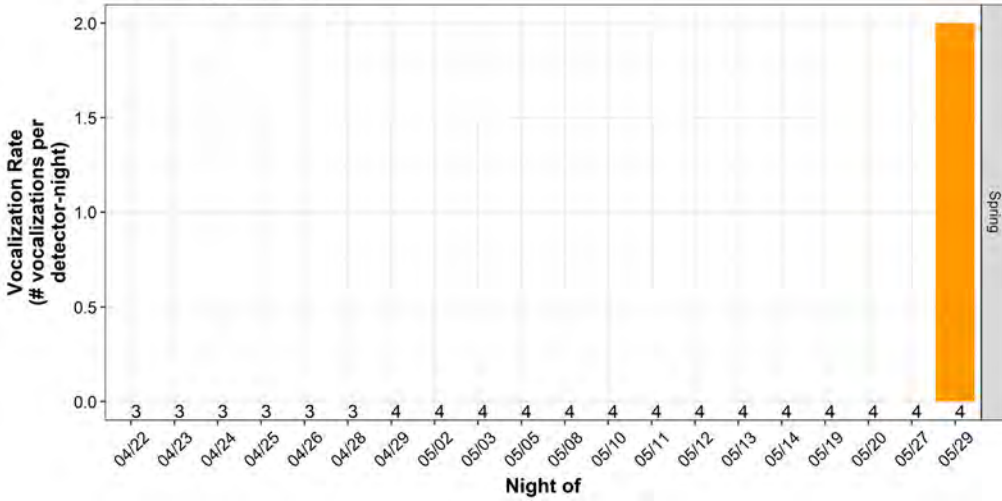


Appendix B Figure 50. Magnolia Warbler – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

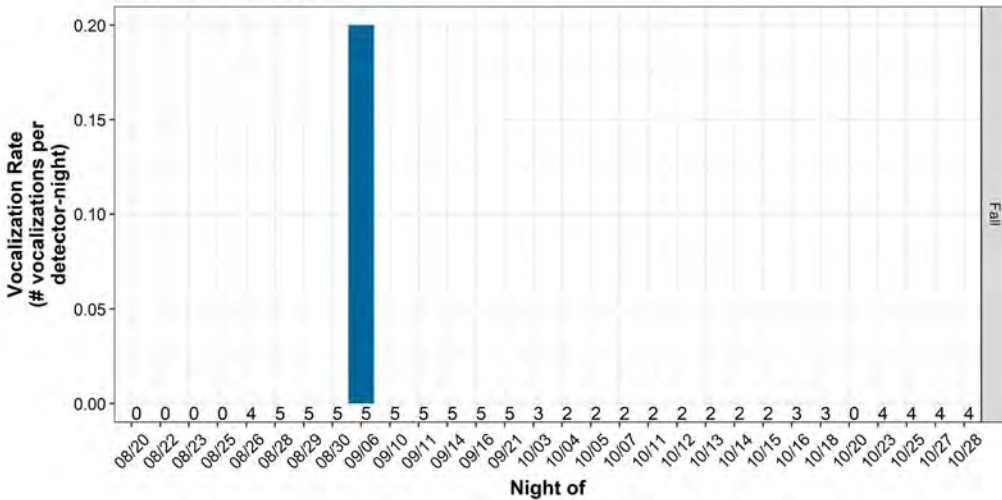
Mourning Warbler



Mourning Warbler

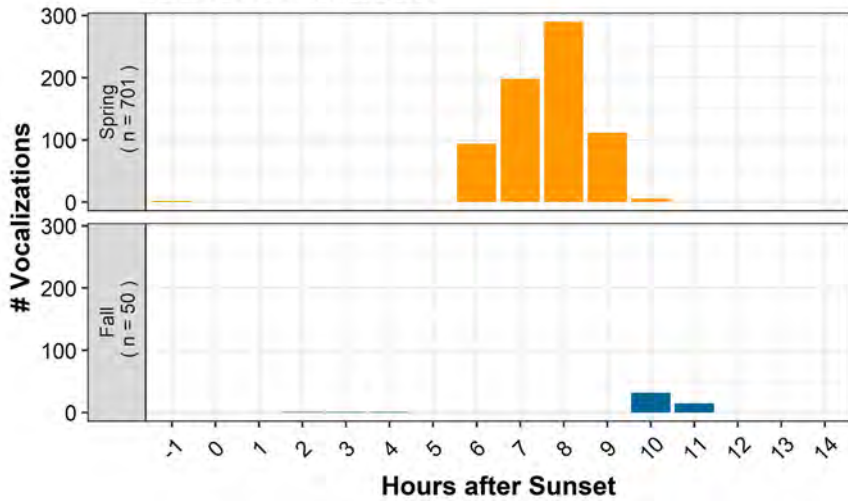


Mourning Warbler

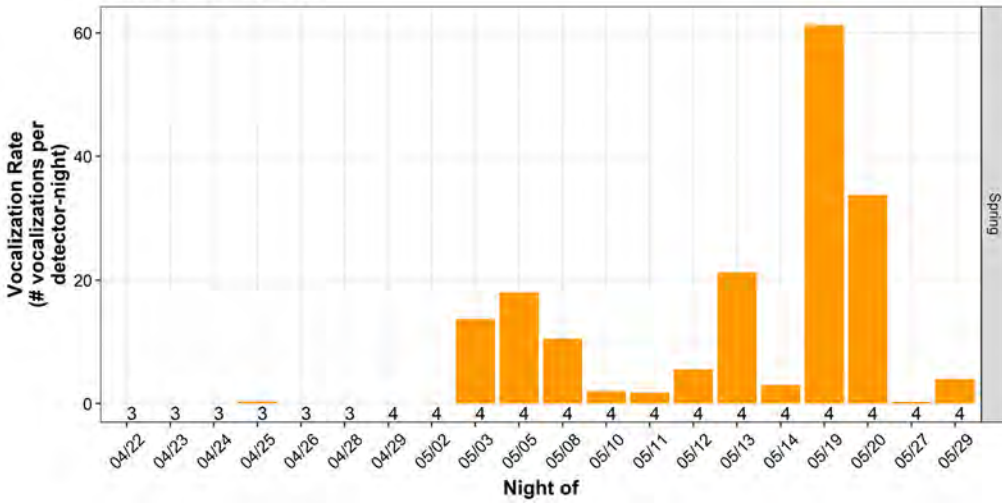


Appendix B Figure 51. Mourning Warbler – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

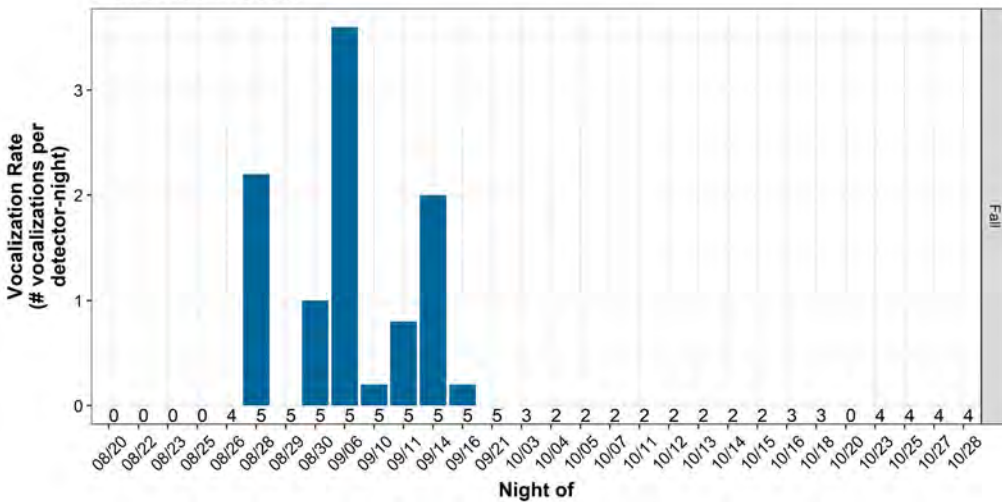
Nashville Warbler



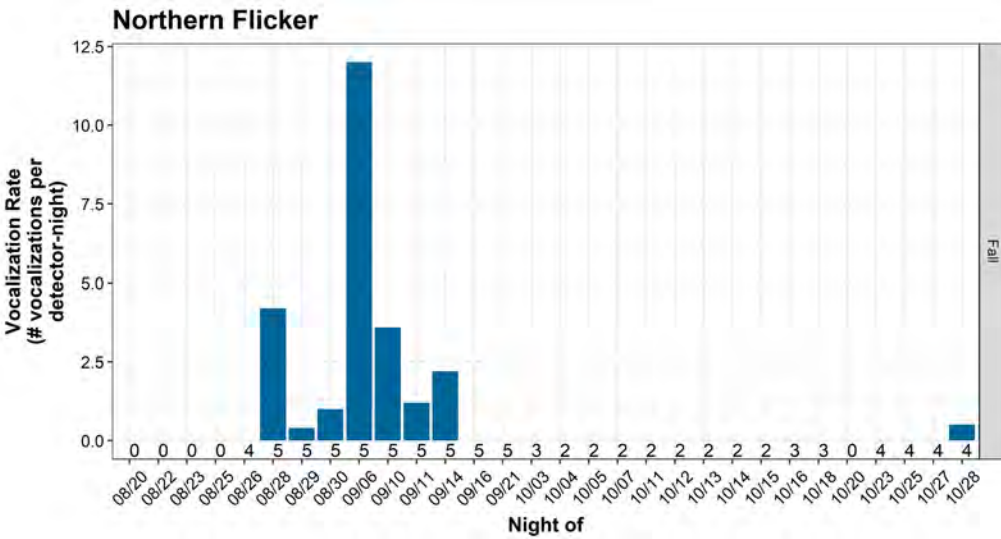
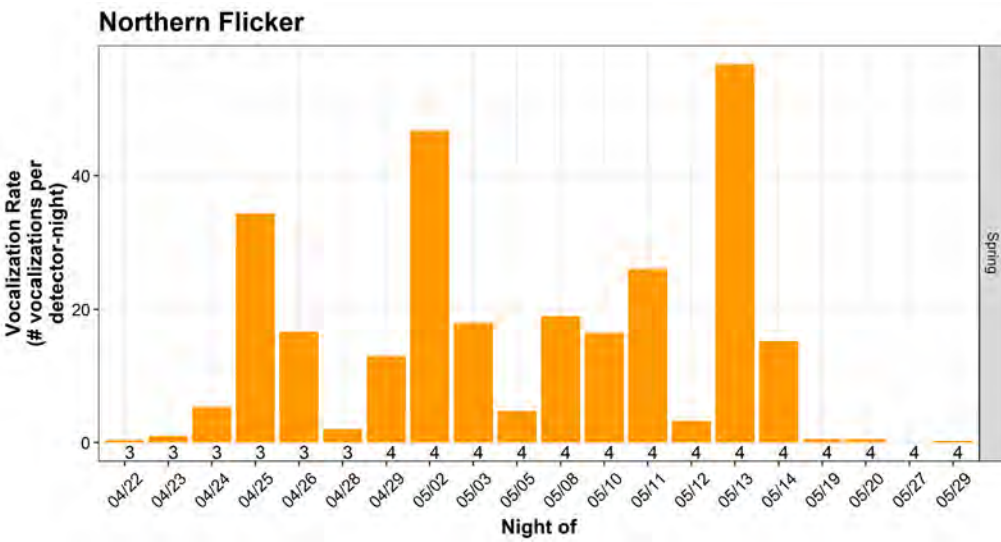
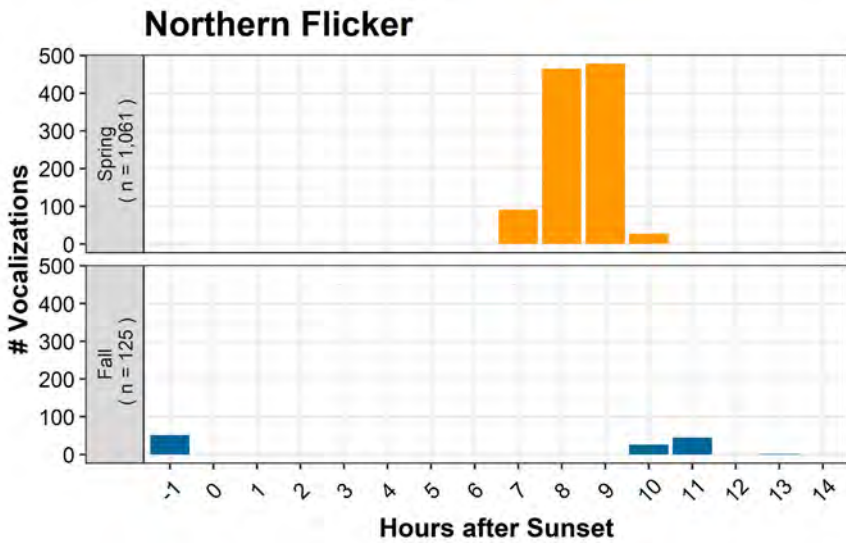
Nashville Warbler



Nashville Warbler

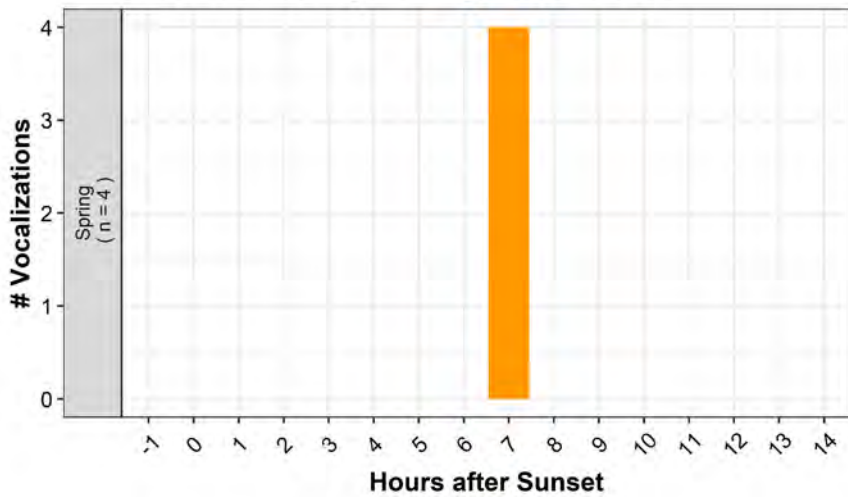


Appendix B Figure 52. Nashville Warbler – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

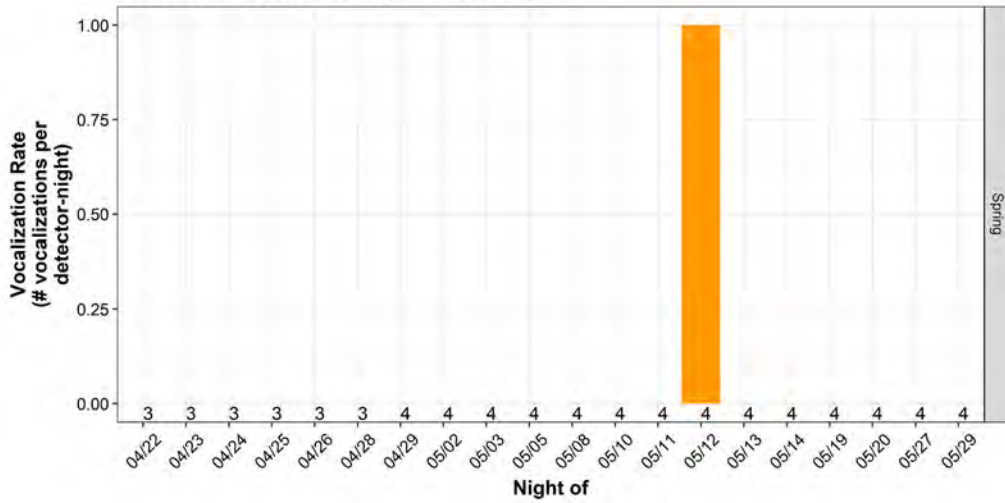


Appendix B Figure 53. Northern Flicker – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Northern Rough-winged Swallow

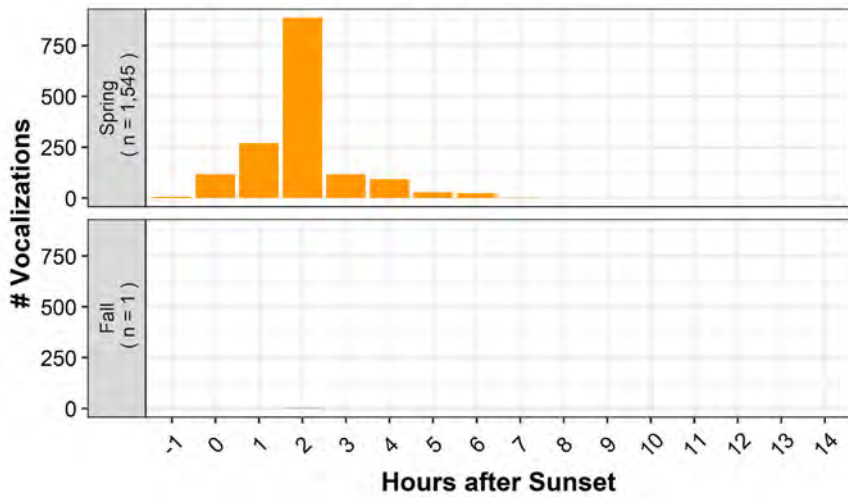


Northern Rough-winged Swallow

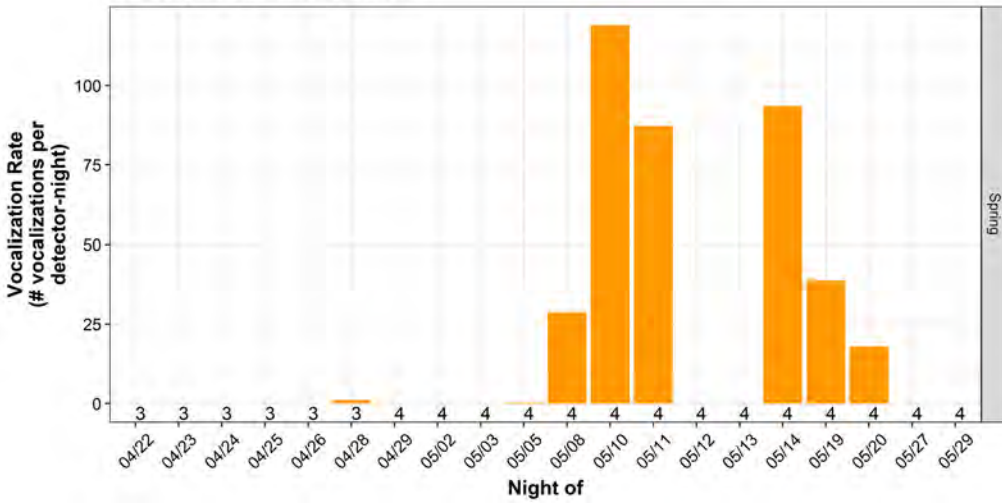


Appendix B Figure 54. Northern Rough-winged Swallow – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

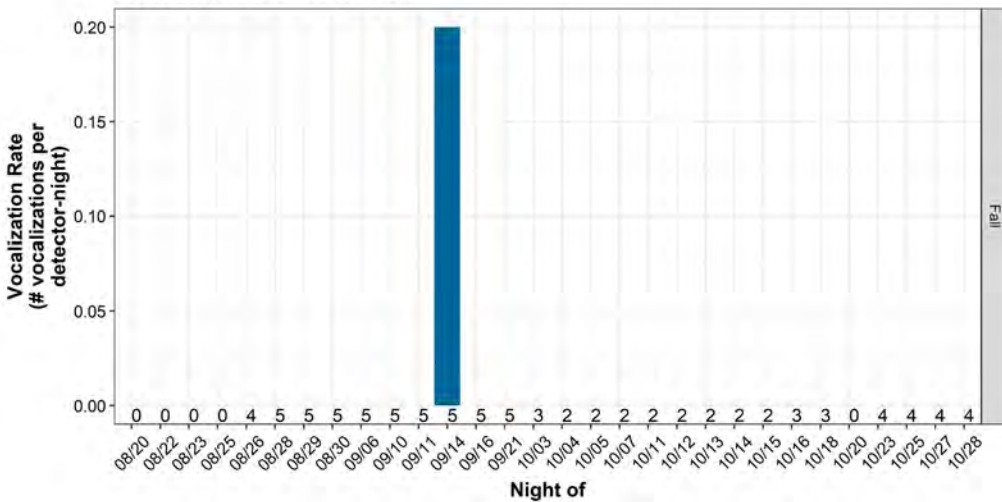
Northern Saw-whet Owl



Northern Saw-whet Owl

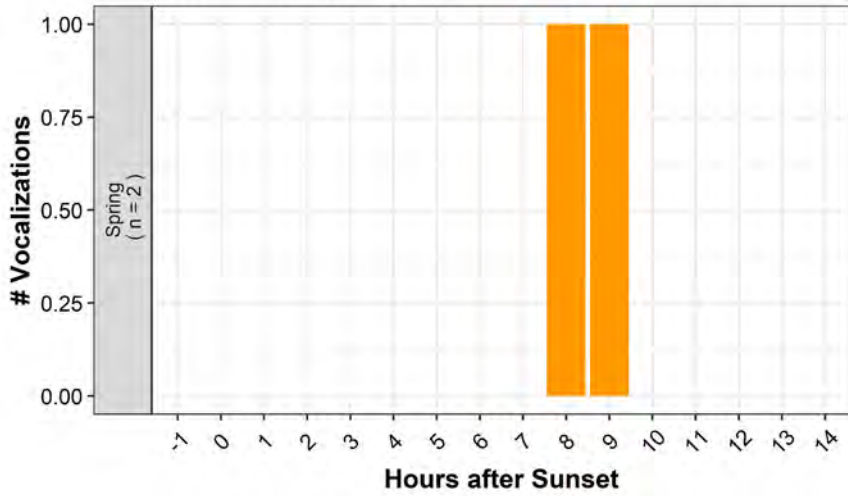


Northern Saw-whet Owl

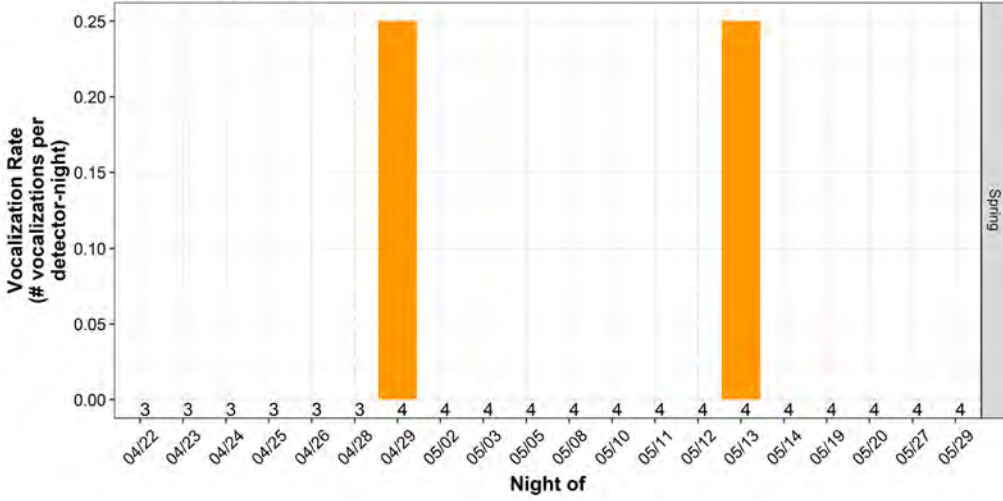


Appendix B Figure 55. Northern Saw-whet Owl – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Olive-sided Flycatcher

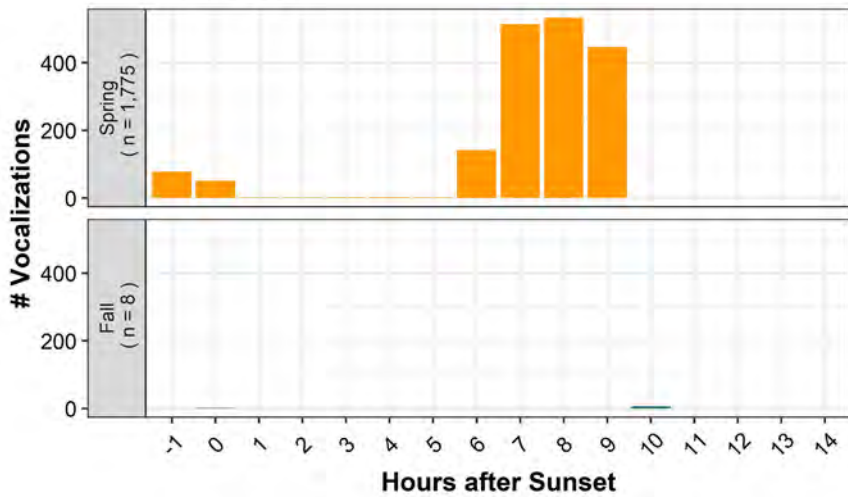


Olive-sided Flycatcher

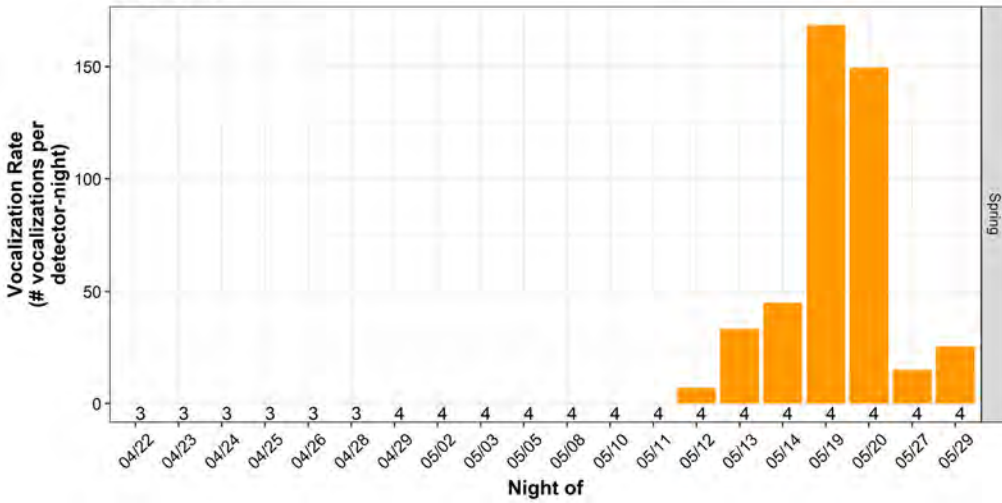


Appendix B Figure 56. Olive-sided Flycatcher – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

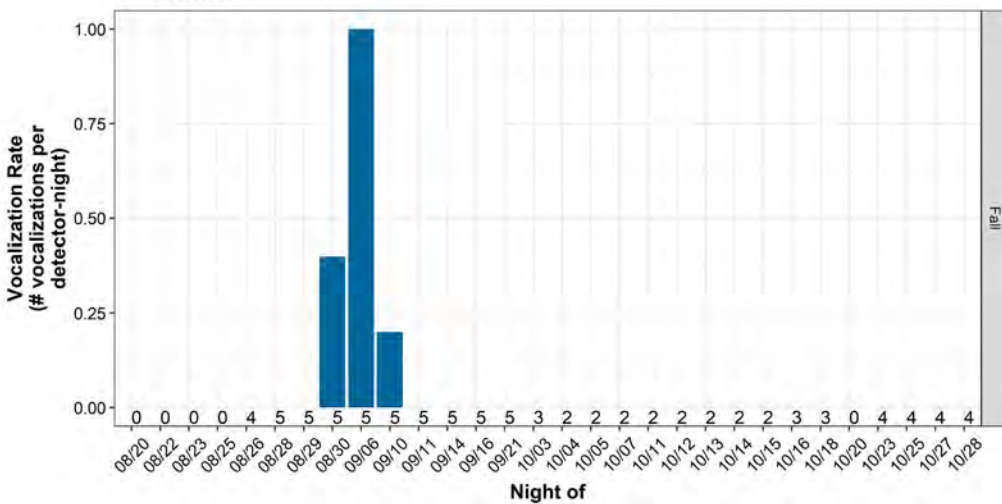
Ovenbird



Ovenbird

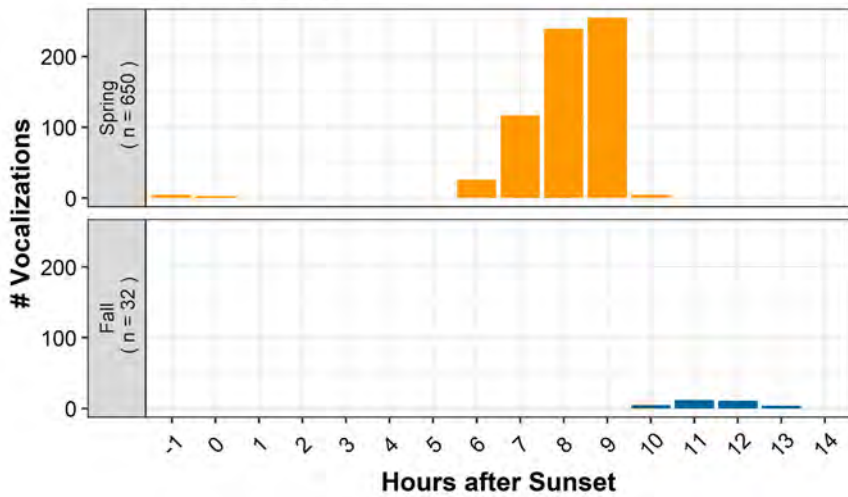


Ovenbird

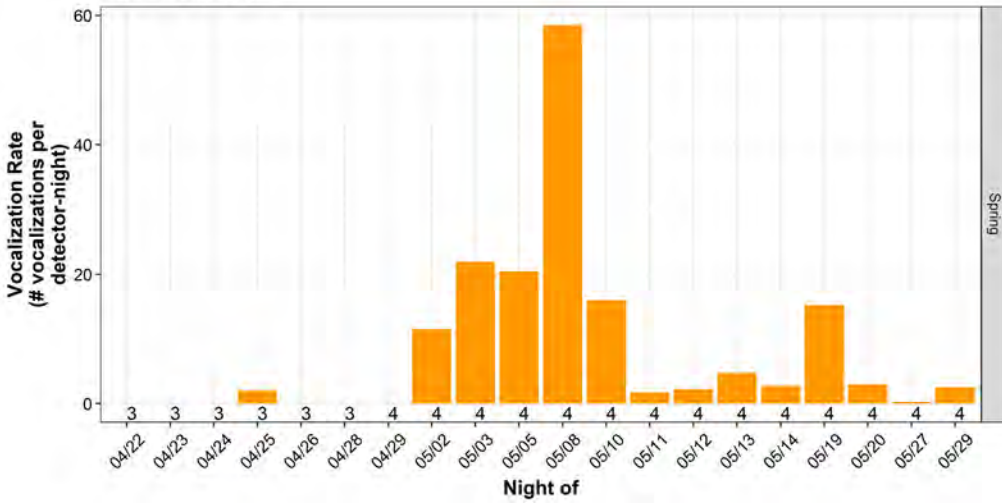


Appendix B Figure 57. Ovenbird – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

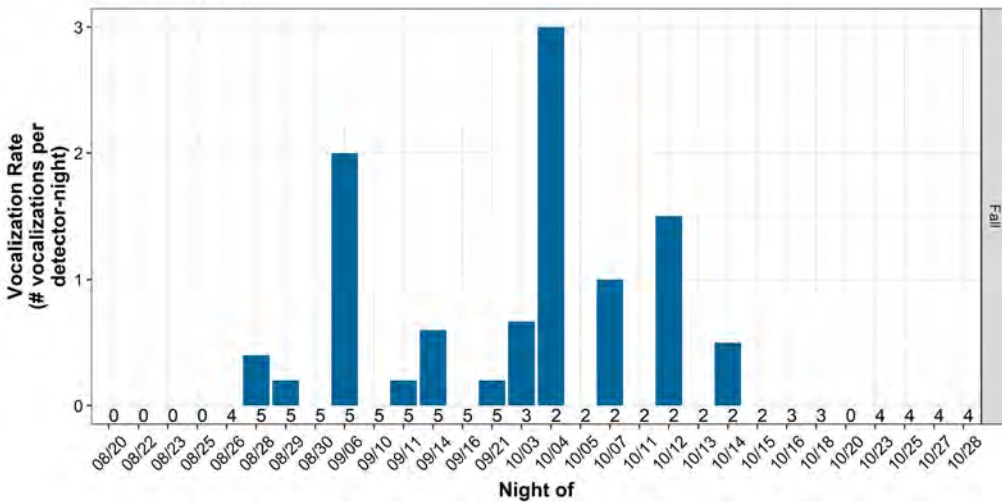
Palm Warbler



Palm Warbler

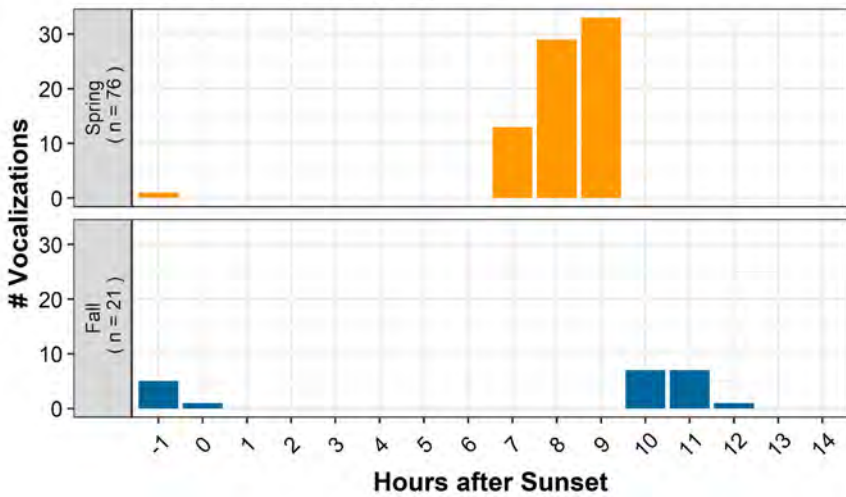


Palm Warbler

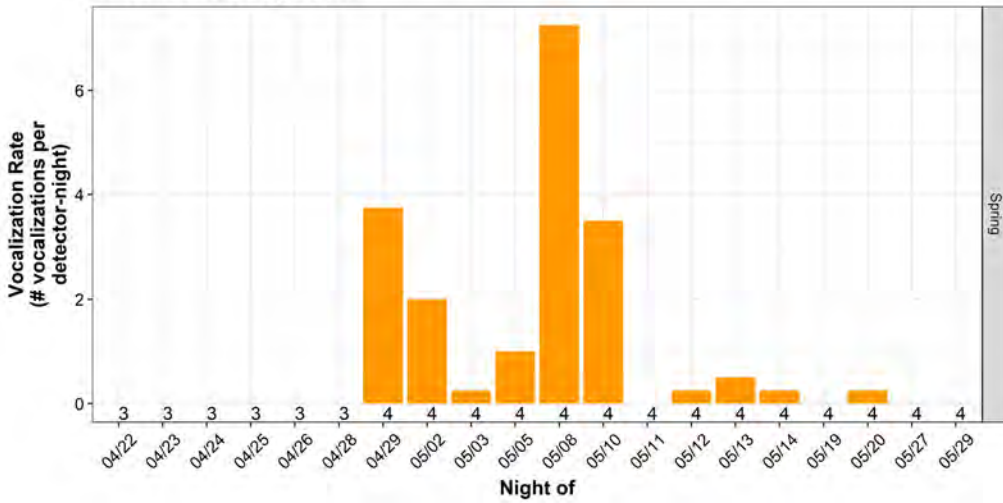


Appendix B Figure 58. Palm Warbler – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

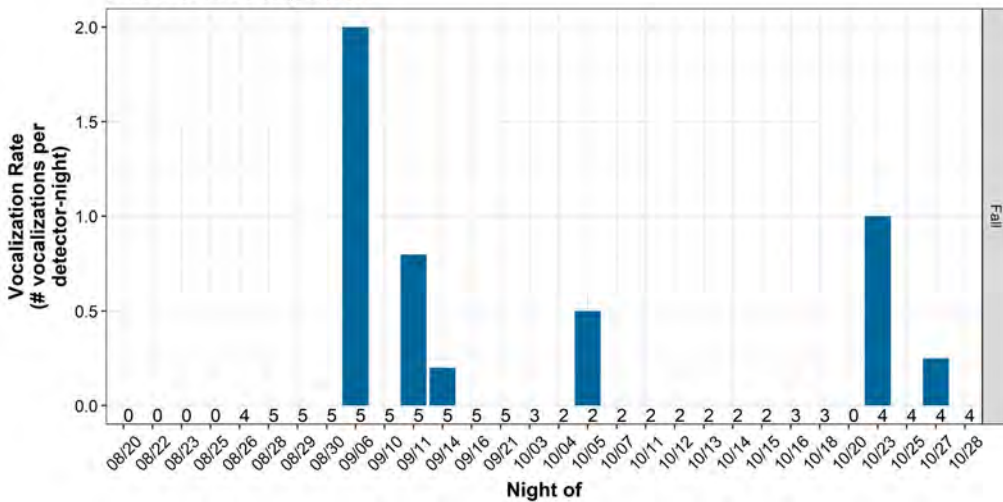
Pileated Woodpecker



Pileated Woodpecker

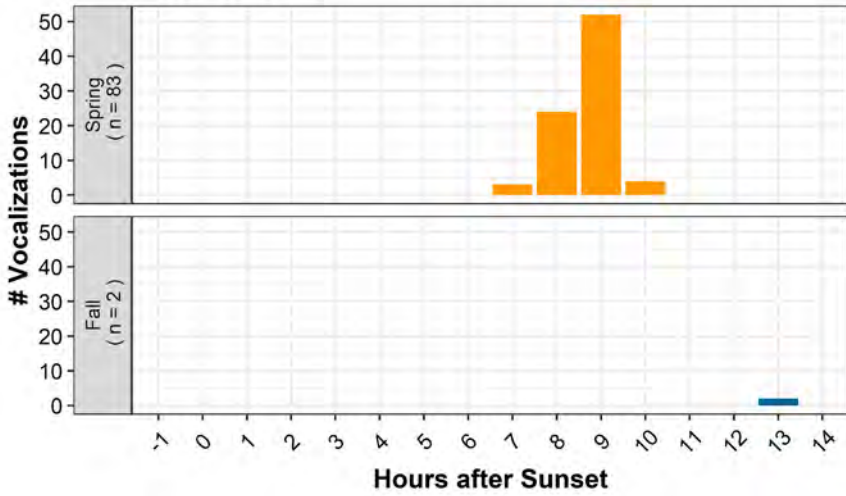


Pileated Woodpecker

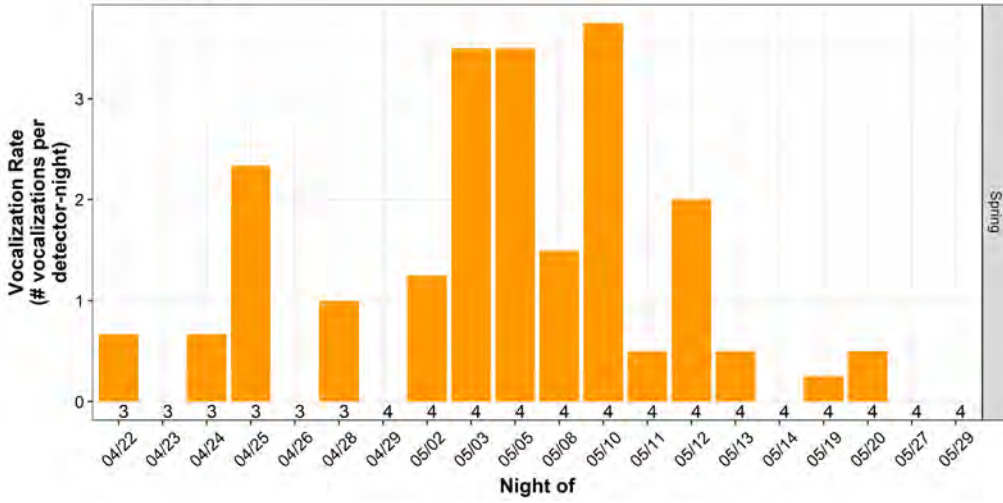


Appendix B Figure 59. Pileated Woodpecker – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

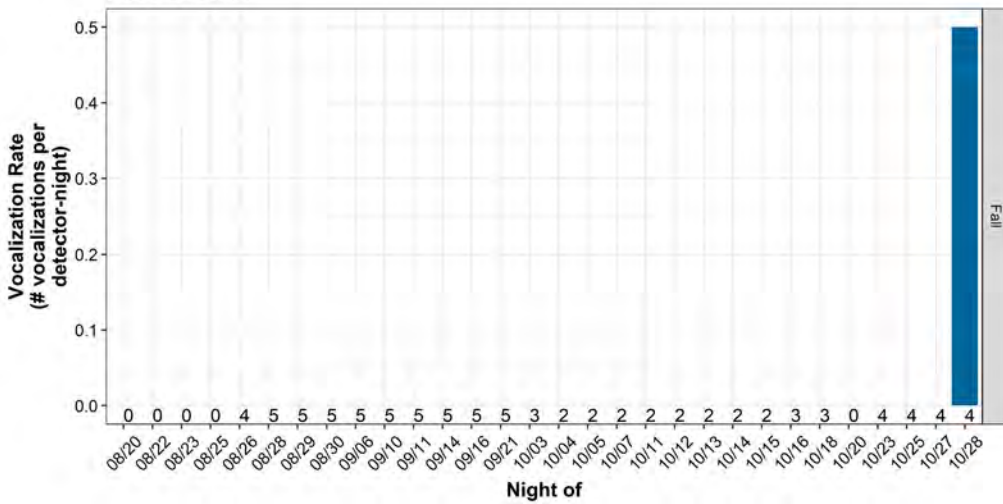
Pine Siskin



Pine Siskin

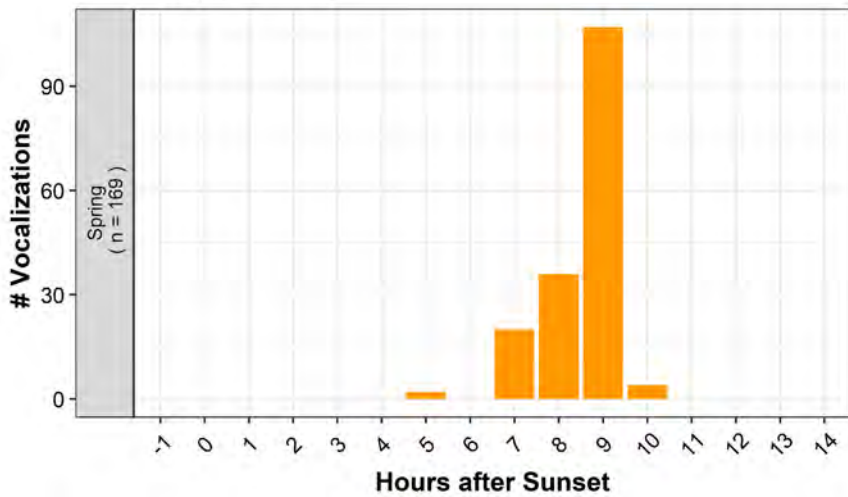


Pine Siskin

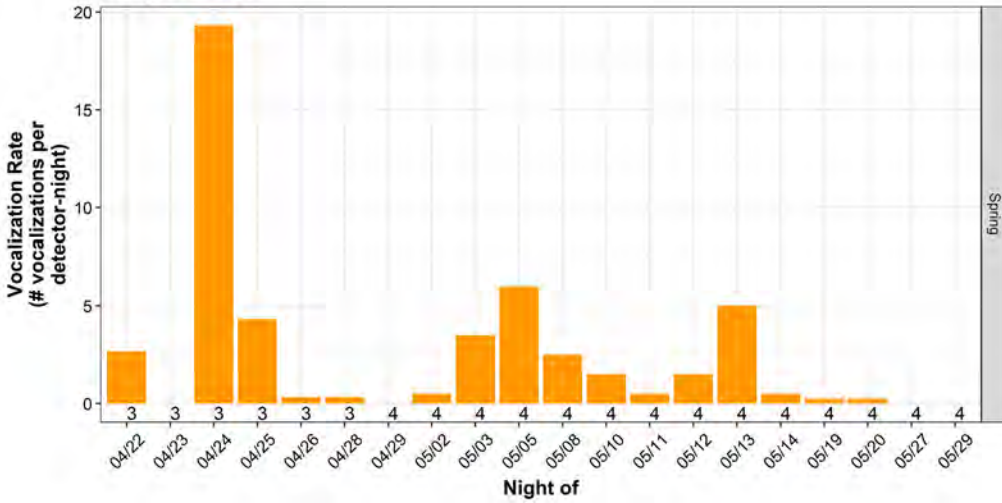


Appendix B Figure 60. Pine Siskin – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Purple Finch

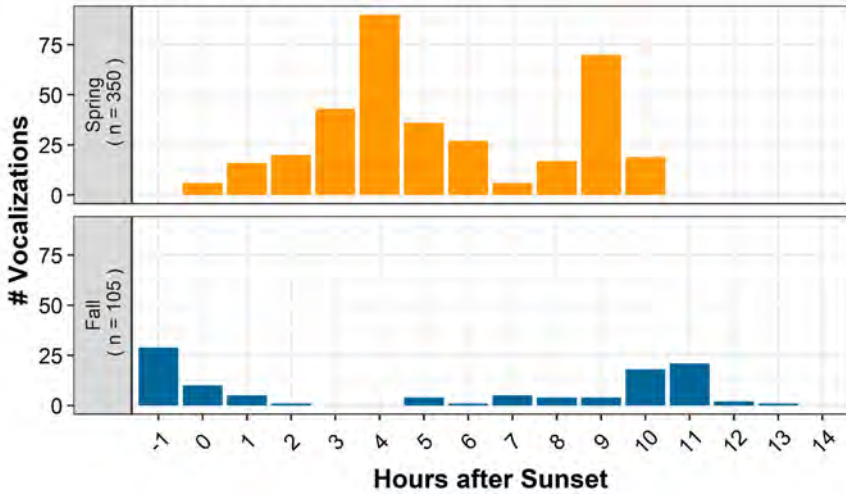


Purple Finch

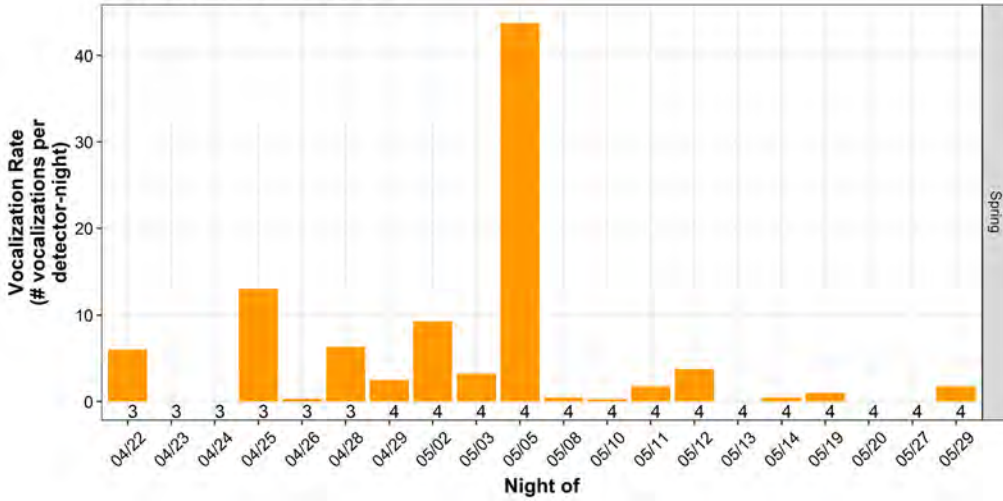


Appendix B Figure 61. Purple Finch – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

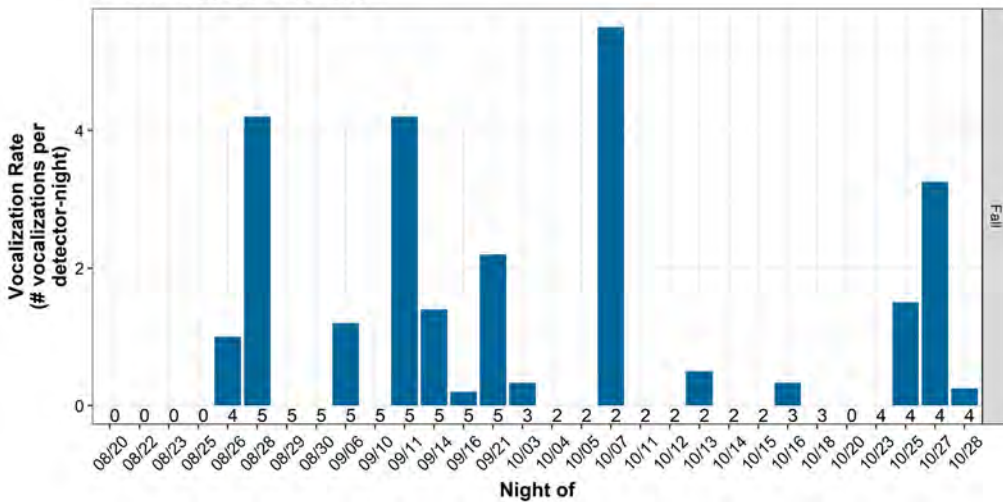
Red-breasted Nuthatch



Red-breasted Nuthatch

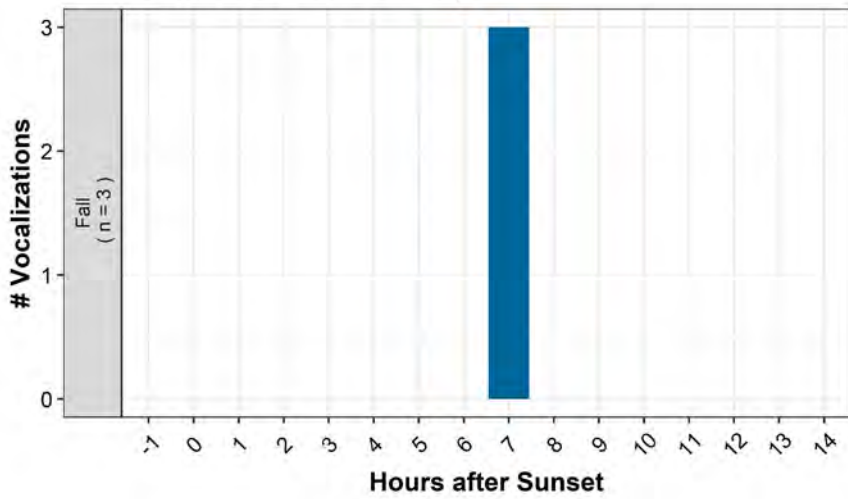


Red-breasted Nuthatch

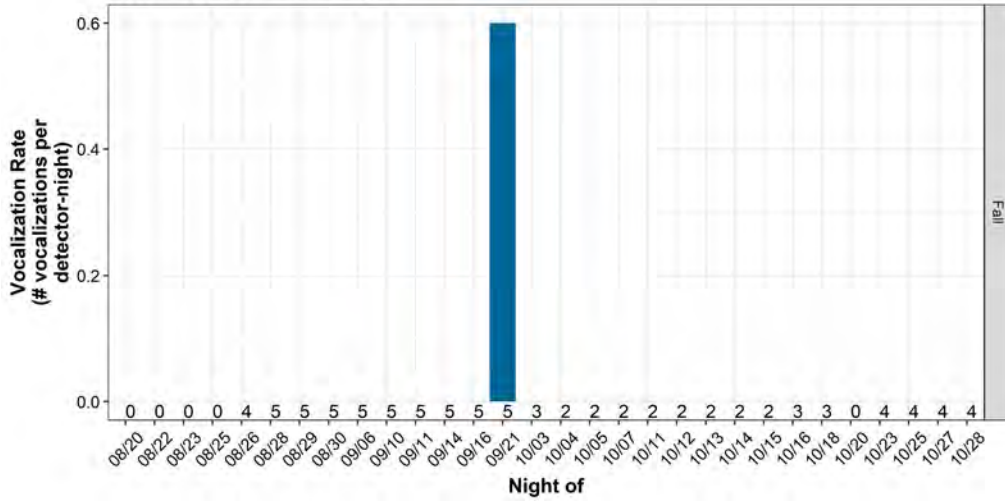


Appendix B Figure 62. Red-breasted Nuthatch – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Red-necked Phalarope

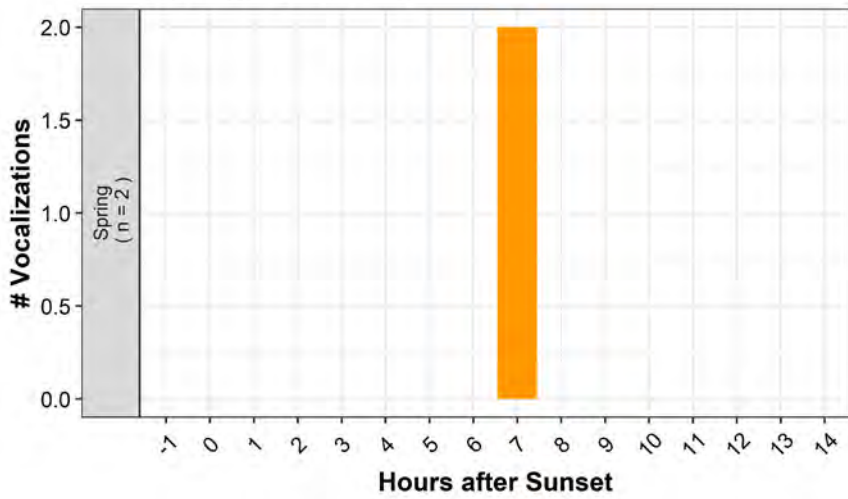


Red-necked Phalarope

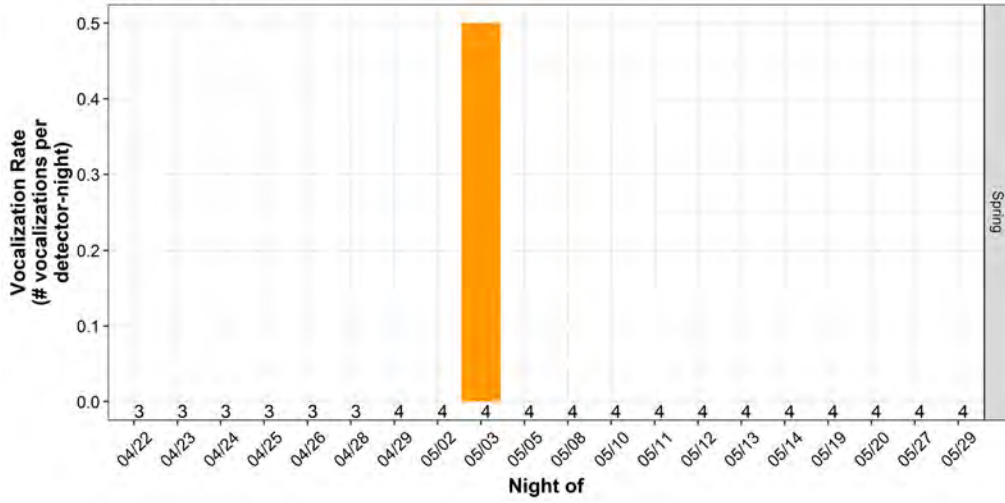


Appendix B Figure 63. Red-necked Phalarope – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in fall)

Red-tailed Hawk

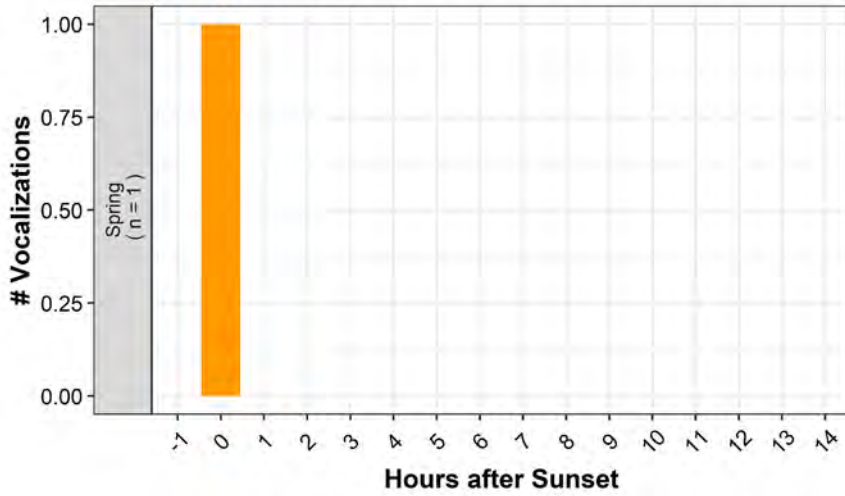


Red-tailed Hawk

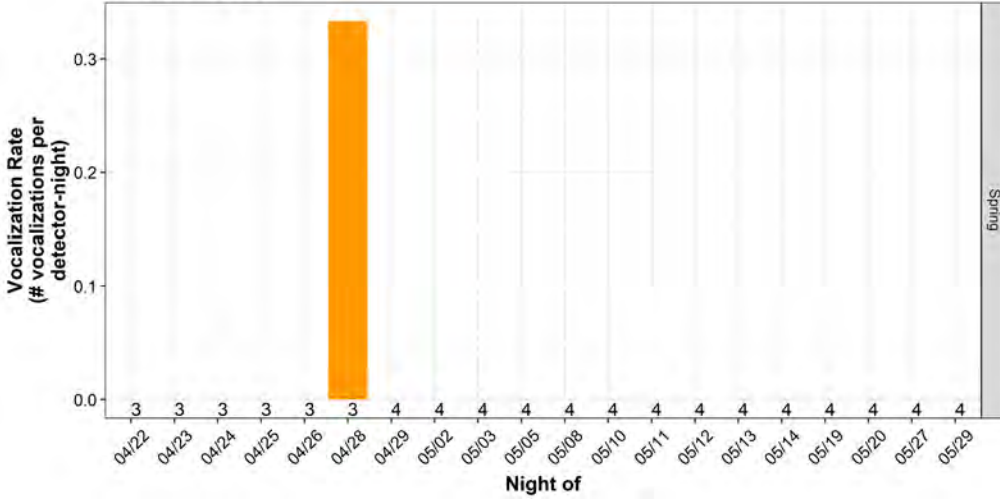


Appendix B Figure 64. Red-tailed Hawk – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

Ring-billed Gull

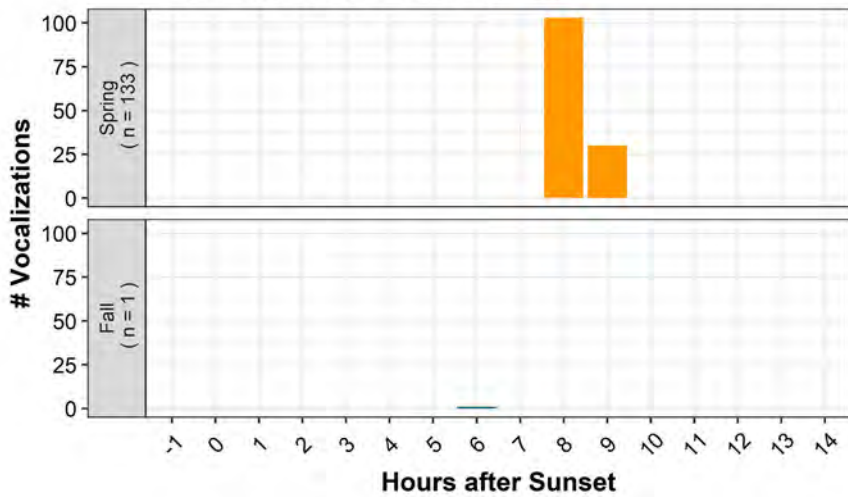


Ring-billed Gull

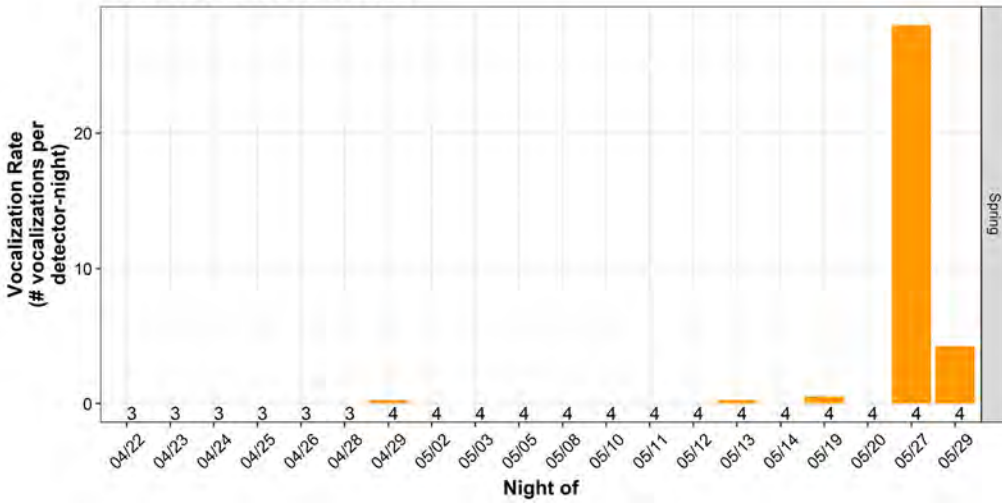


Appendix B Figure 65. Ring-billed Gull – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

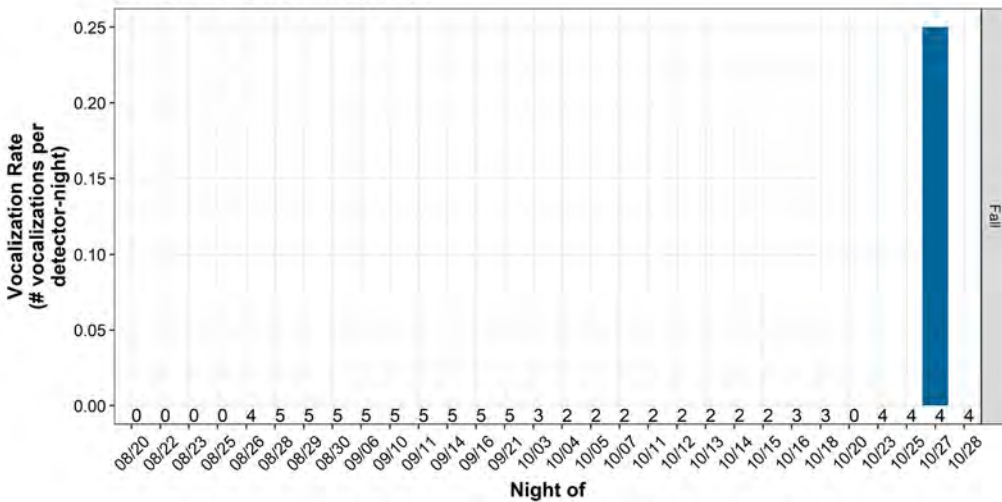
Rose-breasted Grosbeak



Rose-breasted Grosbeak

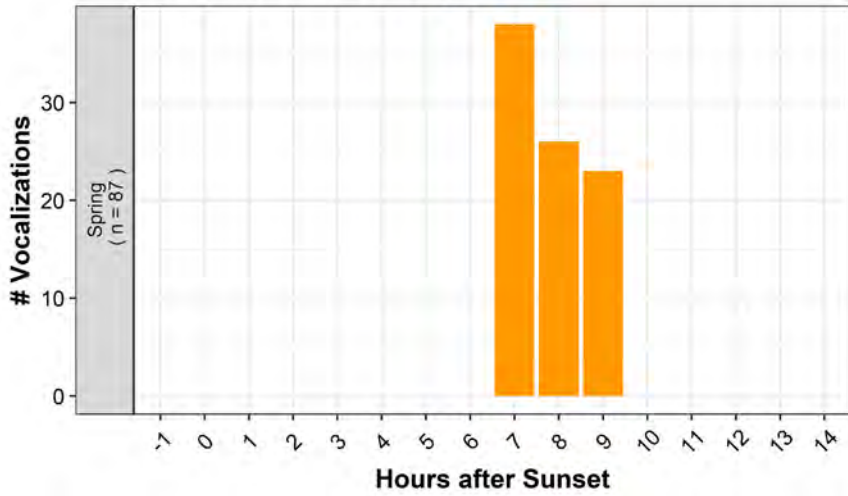


Rose-breasted Grosbeak

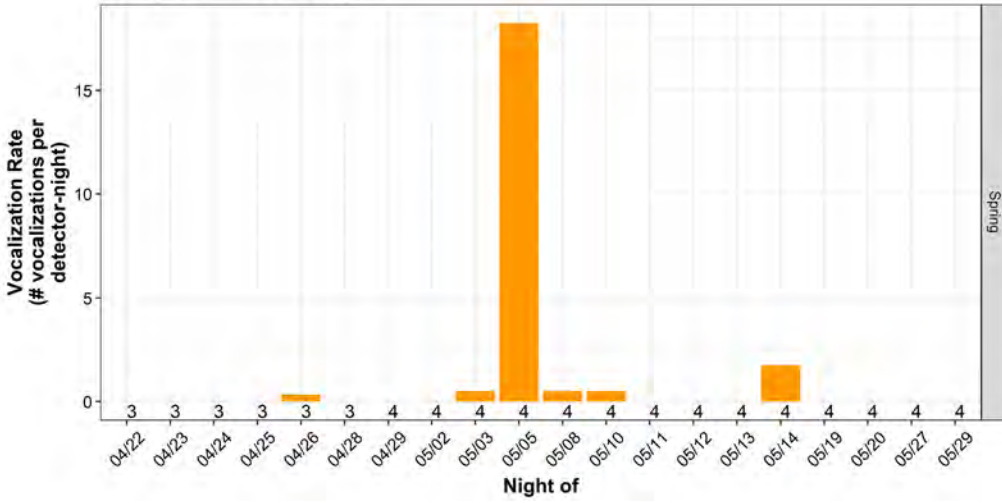


Appendix B Figure 66. Rose-breasted Grosbeak – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Ruby-crowned Kinglet

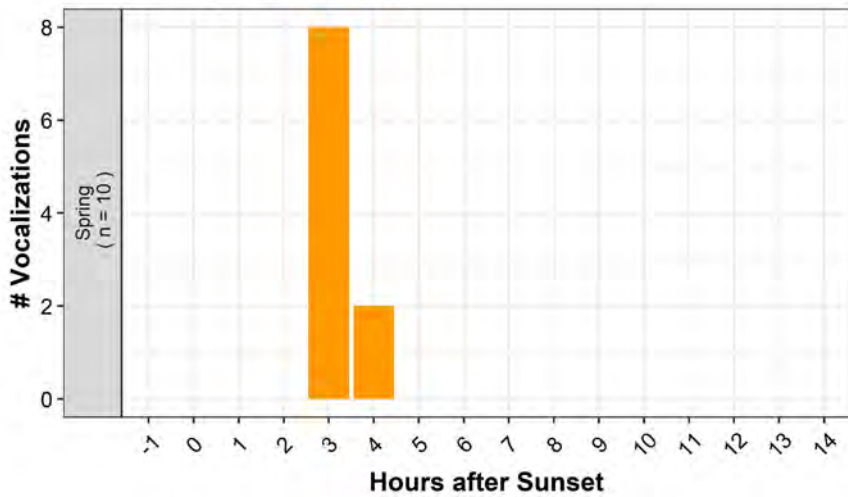


Ruby-crowned Kinglet

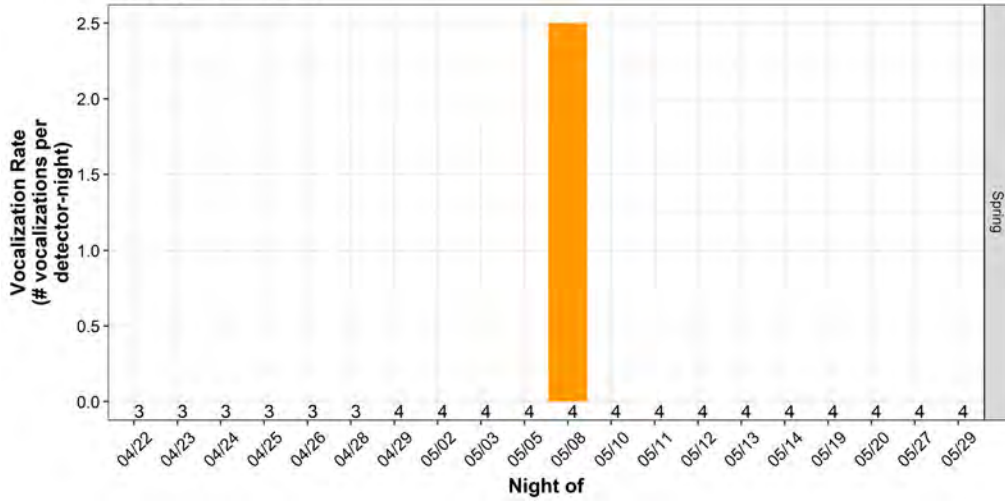


Appendix B Figure 67. Ruby-crowned Kinglet – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

Ruddy Turnstone

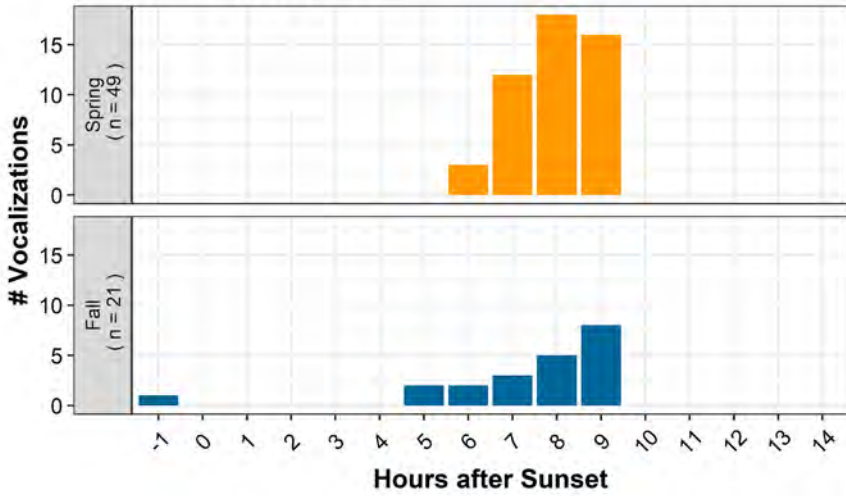


Ruddy Turnstone

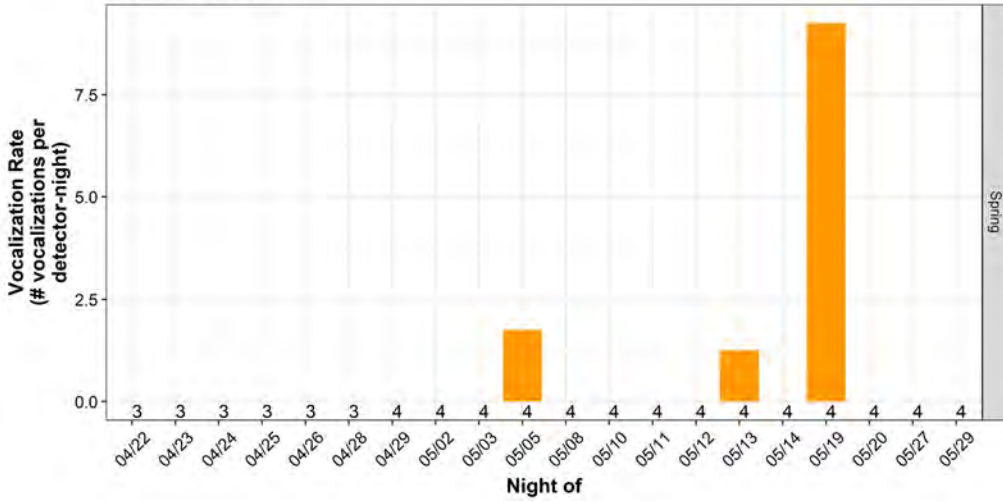


Appendix B Figure 68. Ruddy Turnstone – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

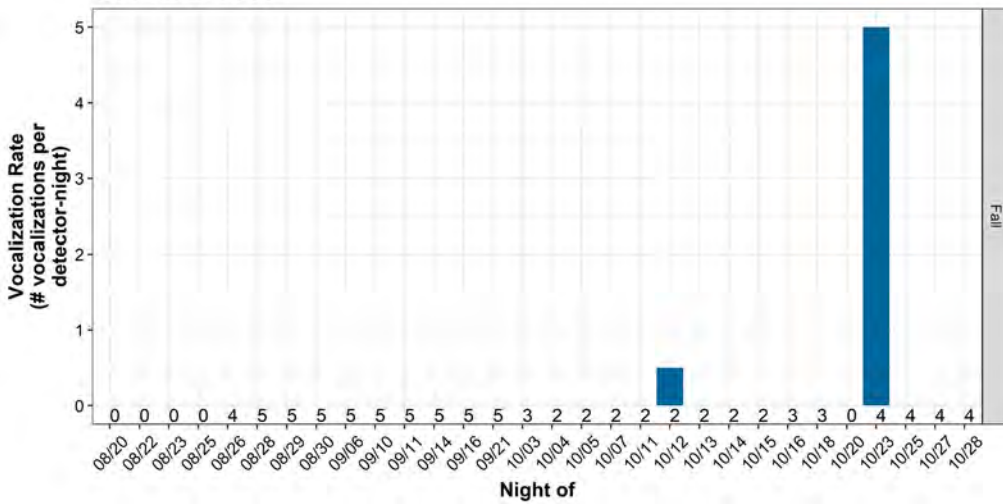
Ruffed Grouse



Ruffed Grouse

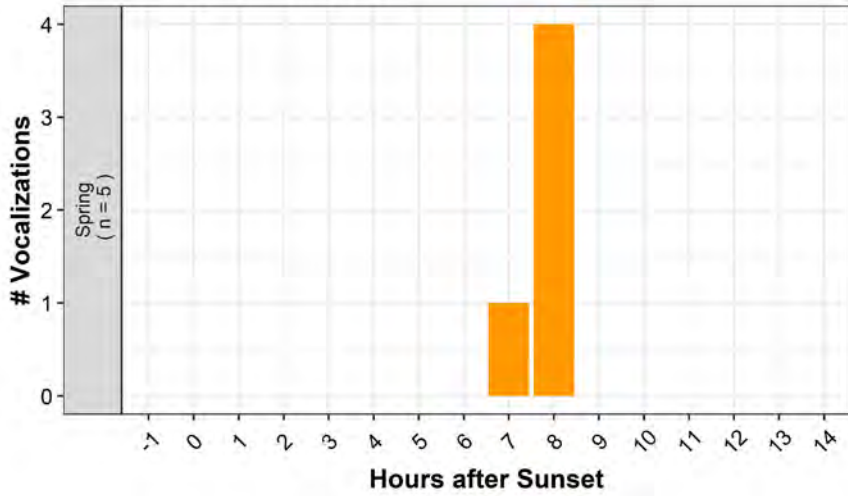


Ruffed Grouse

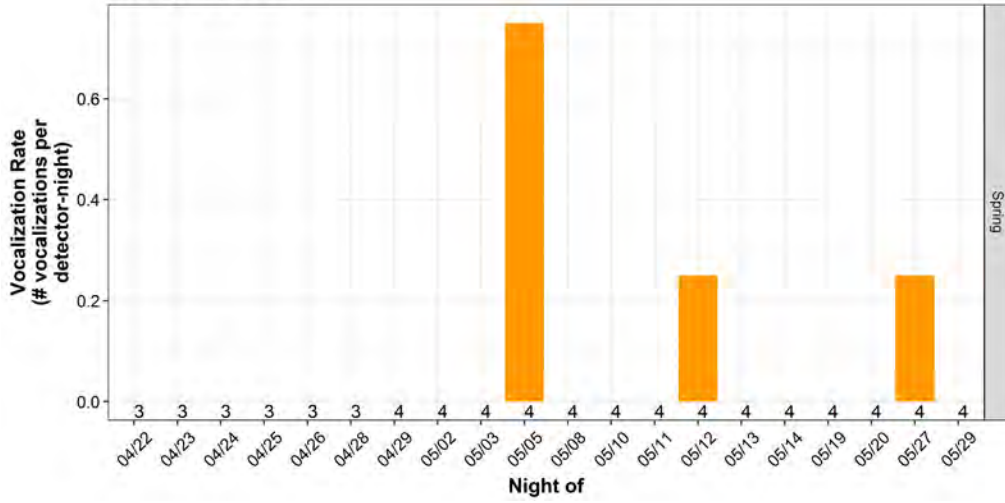


Appendix B Figure 69. Ruffed Grouse – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Rusty Blackbird

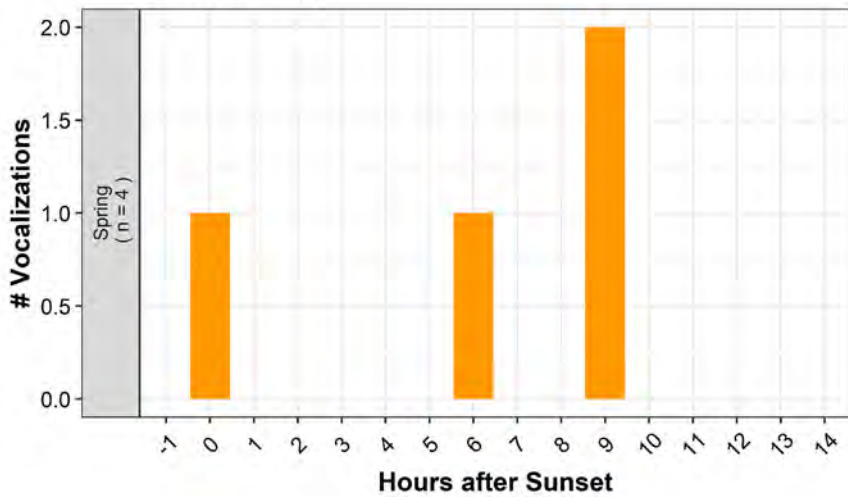


Rusty Blackbird

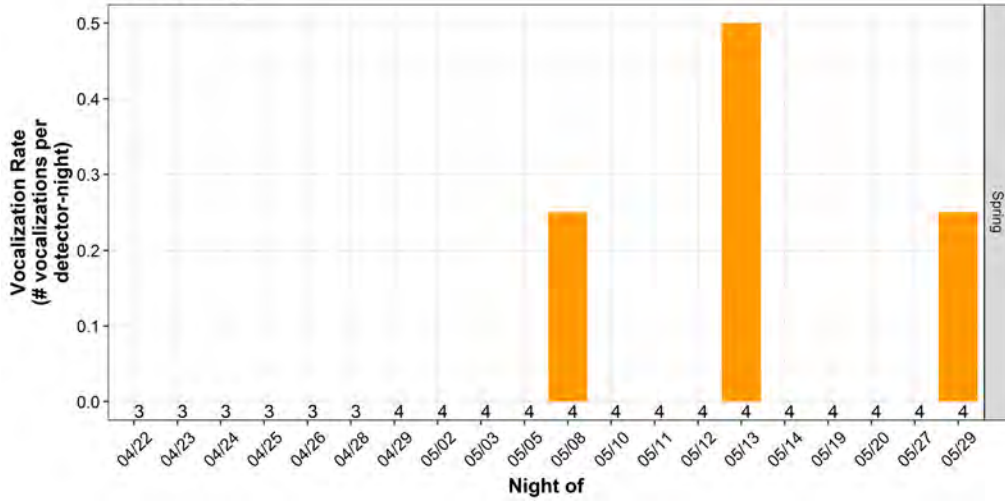


Appendix B Figure 70. Rusty Blackbird – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

Sanderling

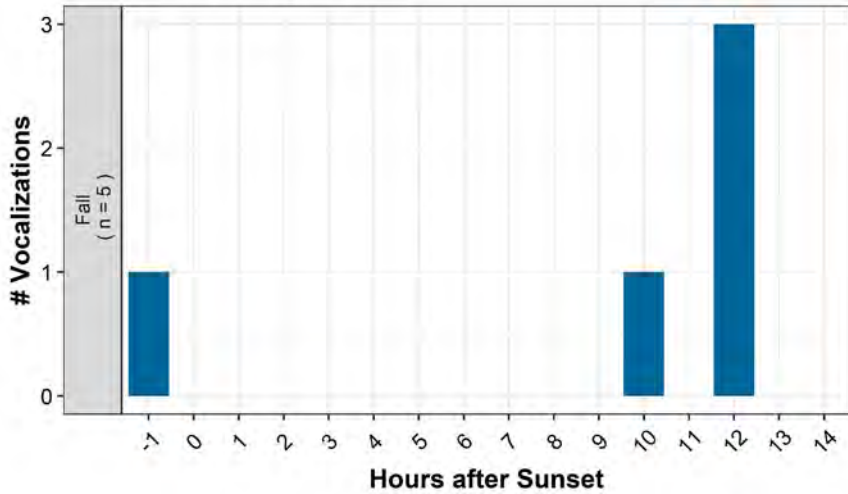


Sanderling

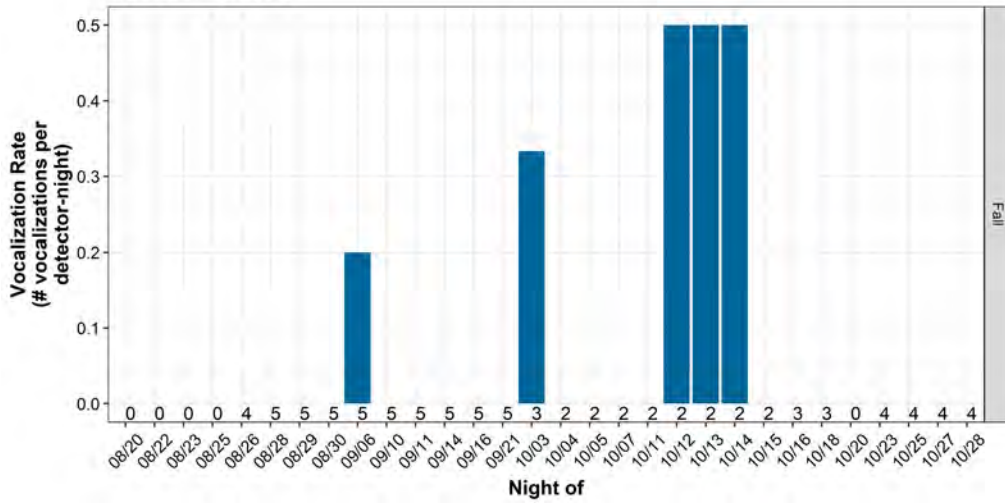


Appendix B Figure 71. Sanderling – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

Sandhill Crane

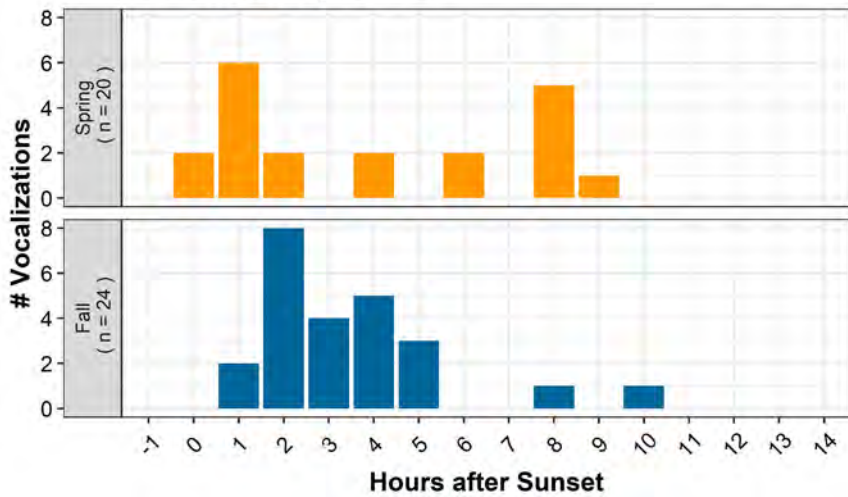


Sandhill Crane

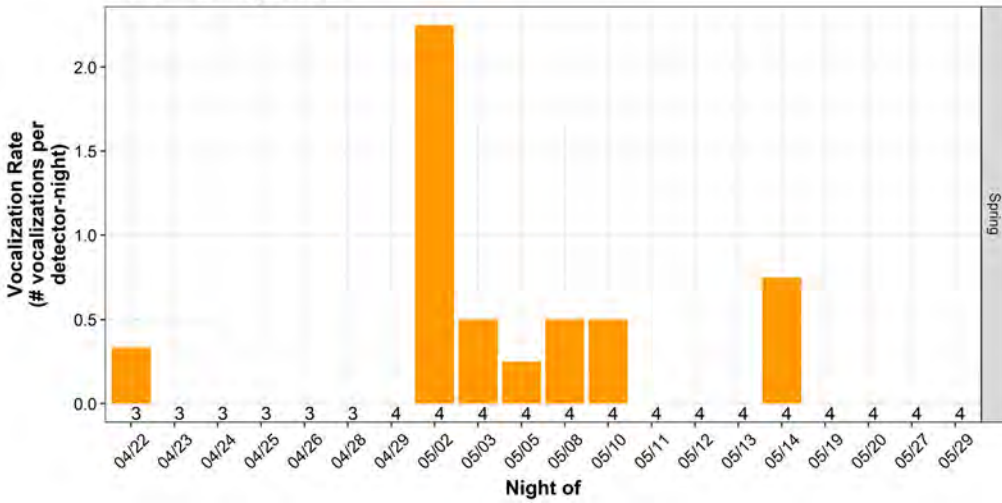


Appendix B Figure 72. Sandhill Crane – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in fall)

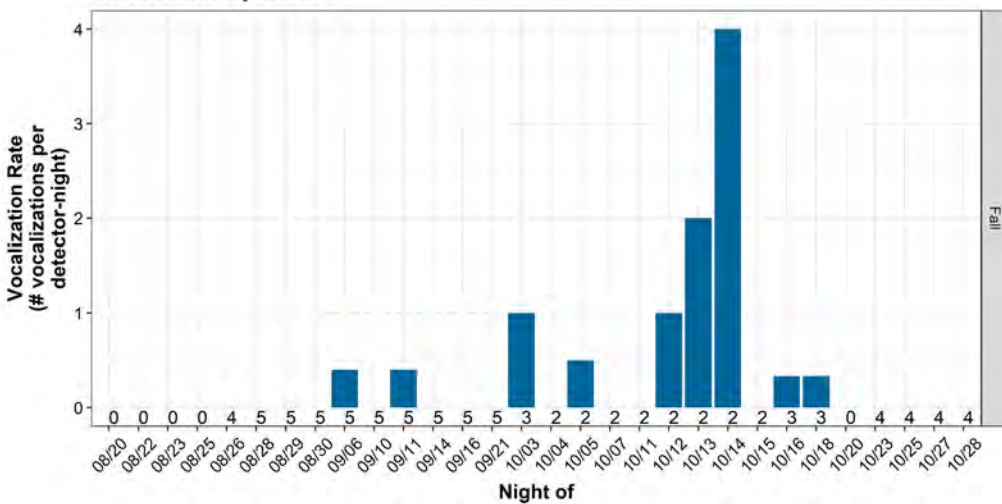
Savannah Sparrow



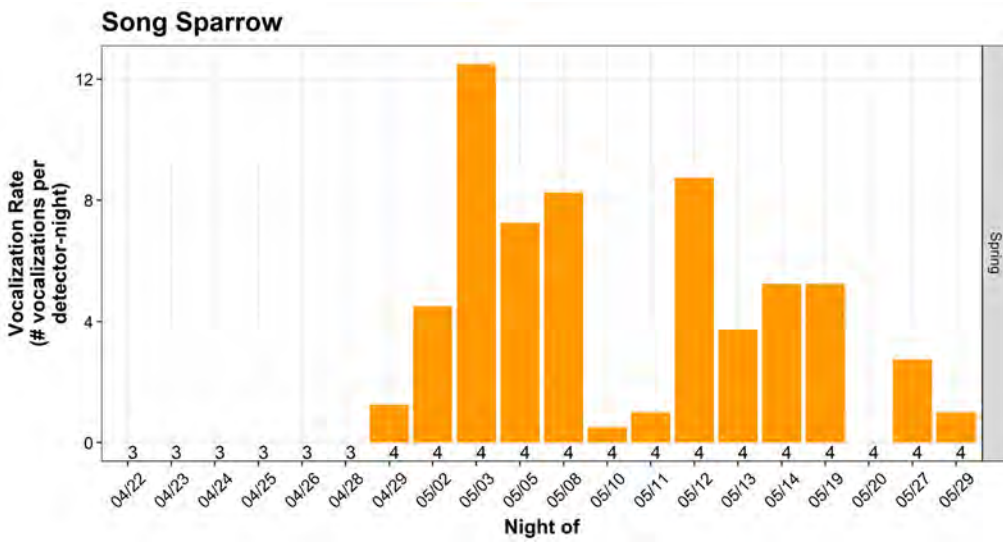
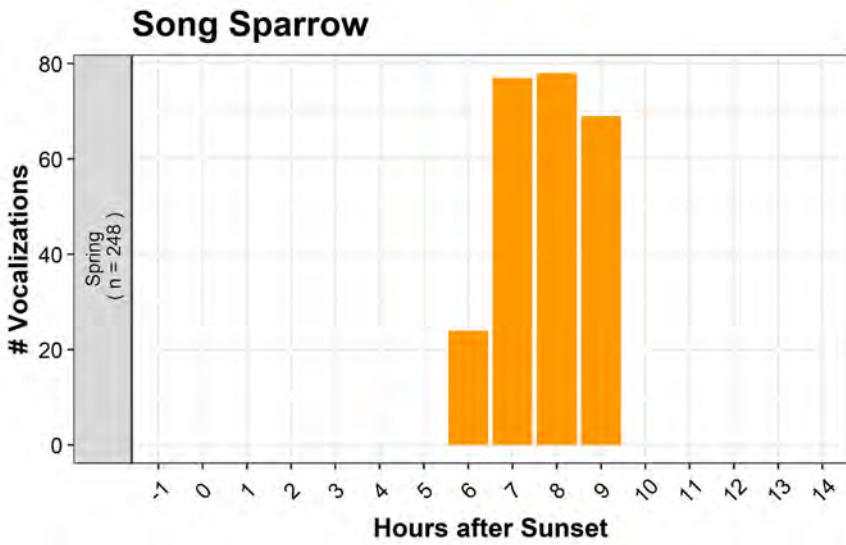
Savannah Sparrow



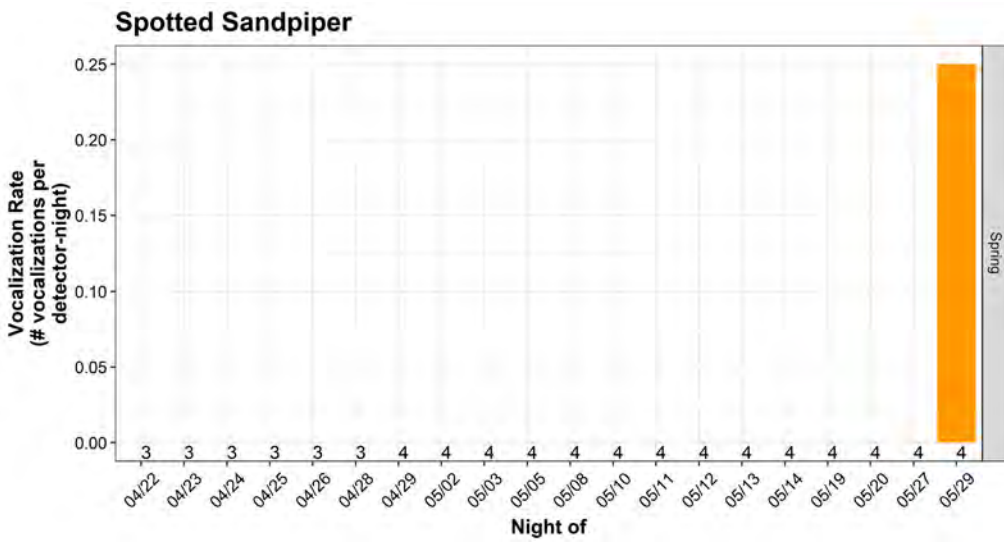
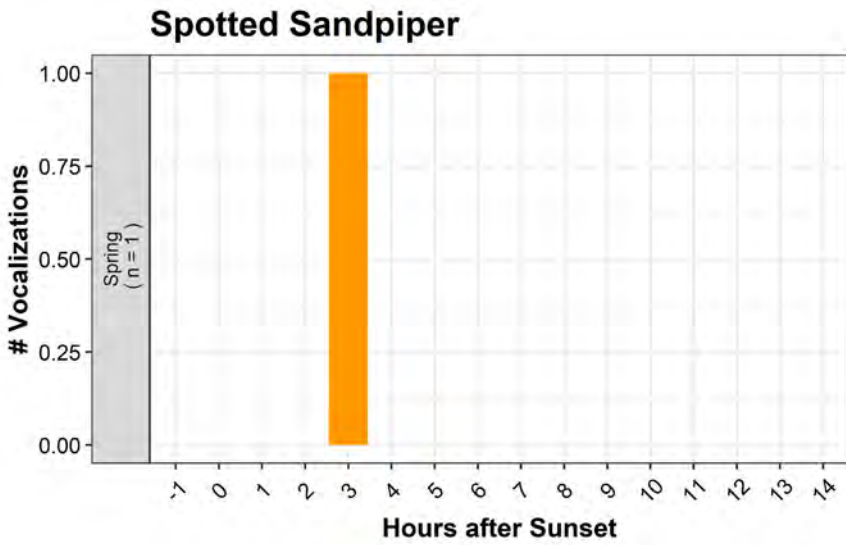
Savannah Sparrow



Appendix B Figure 73. Savannah Sparrow – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

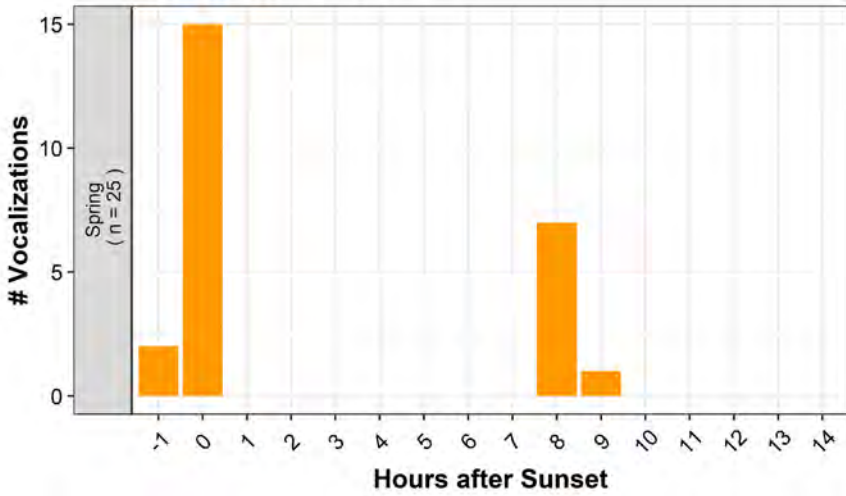


Appendix B Figure 74. Song Sparrow – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

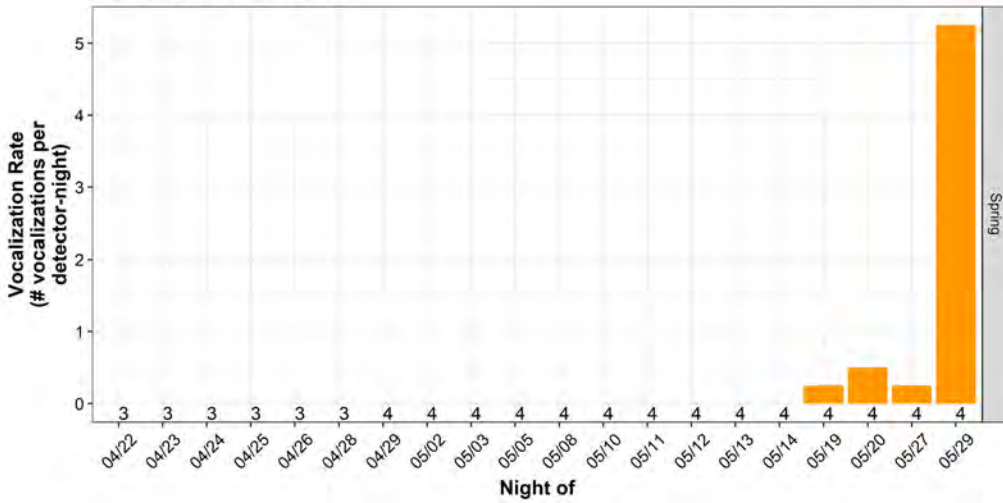


Appendix B Figure 75. Spotted Sandpiper – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

Swainson's Thrush

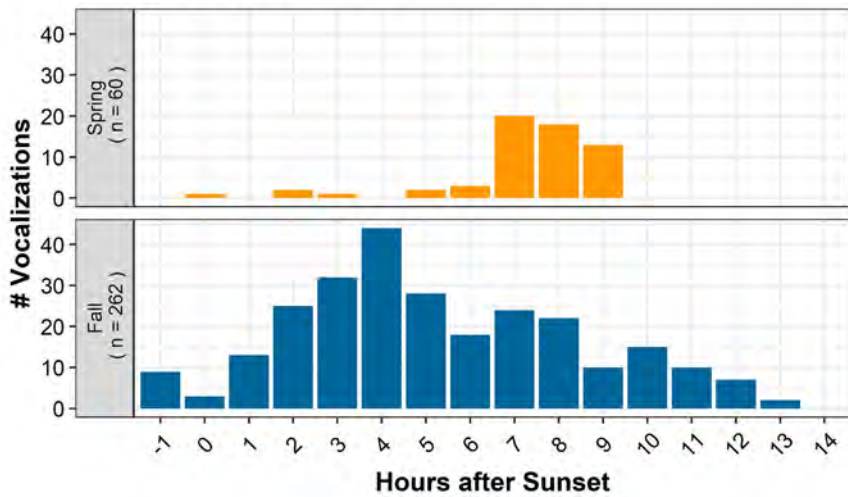


Swainson's Thrush

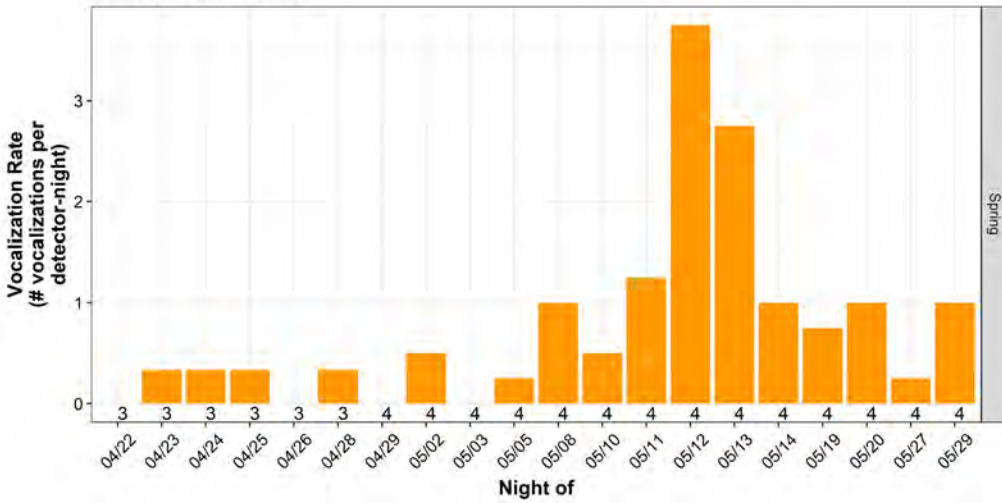


Appendix B Figure 76. Swainson's Thrush – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

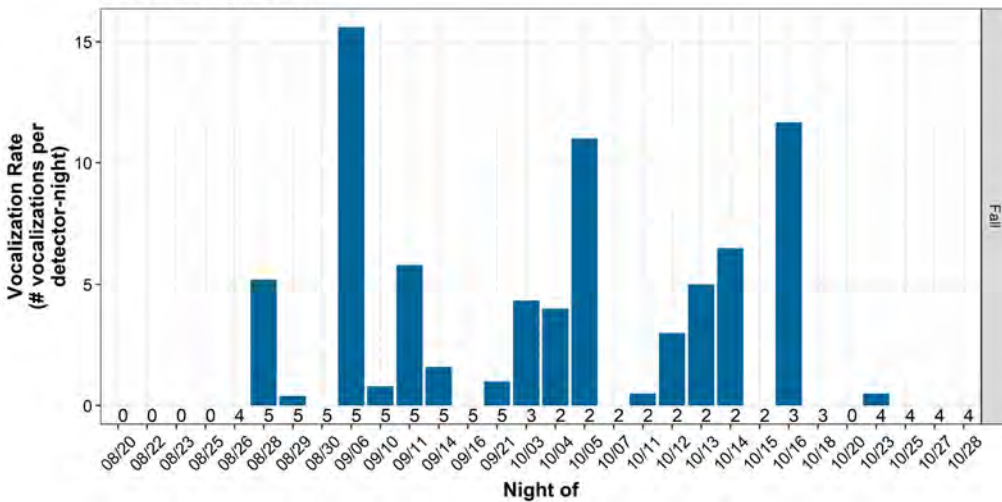
Unidentified Bird



Unidentified Bird

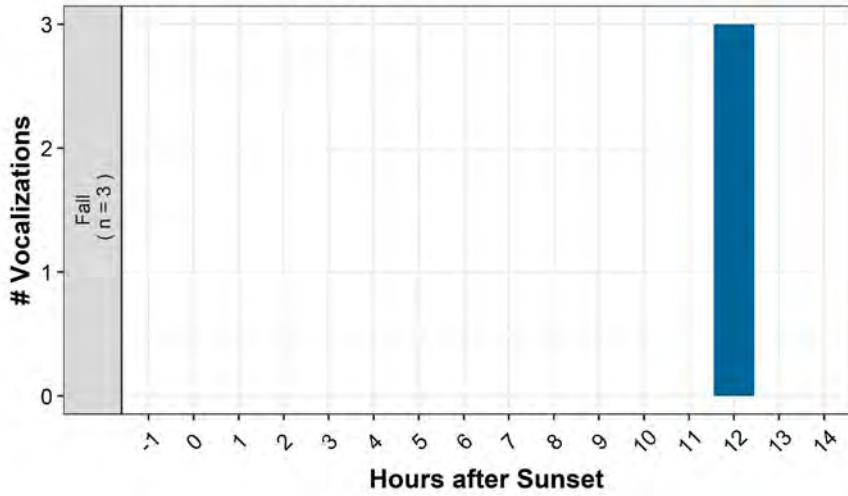


Unidentified Bird

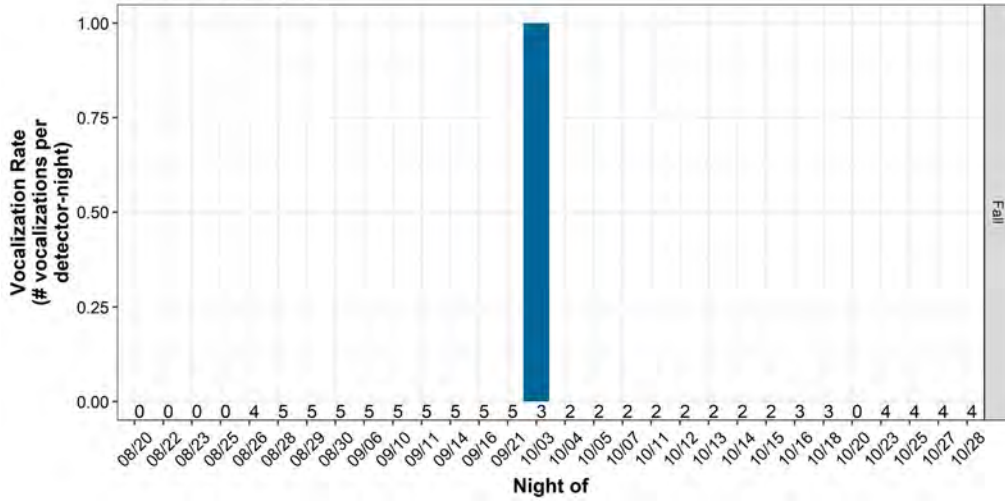


Appendix B Figure 77. Unidentified Bird– Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

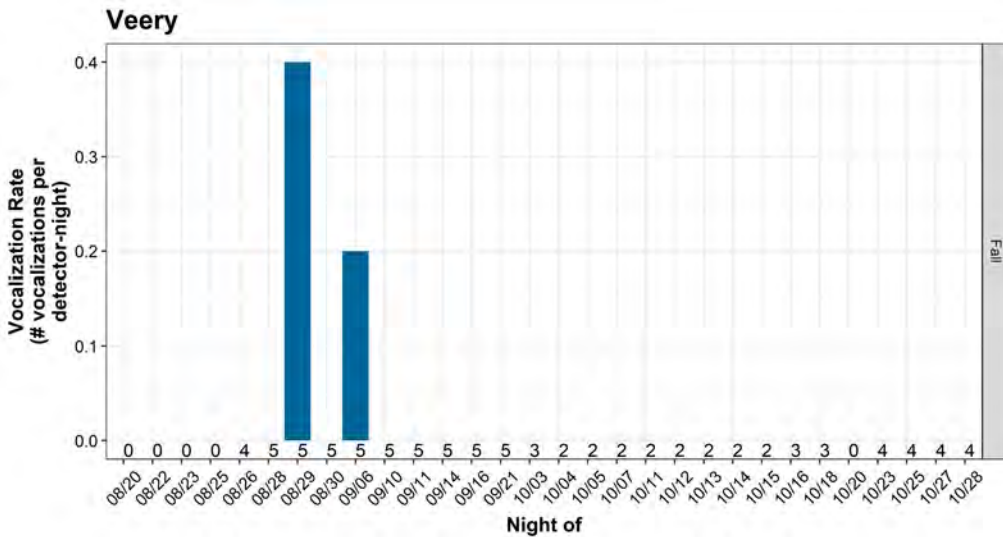
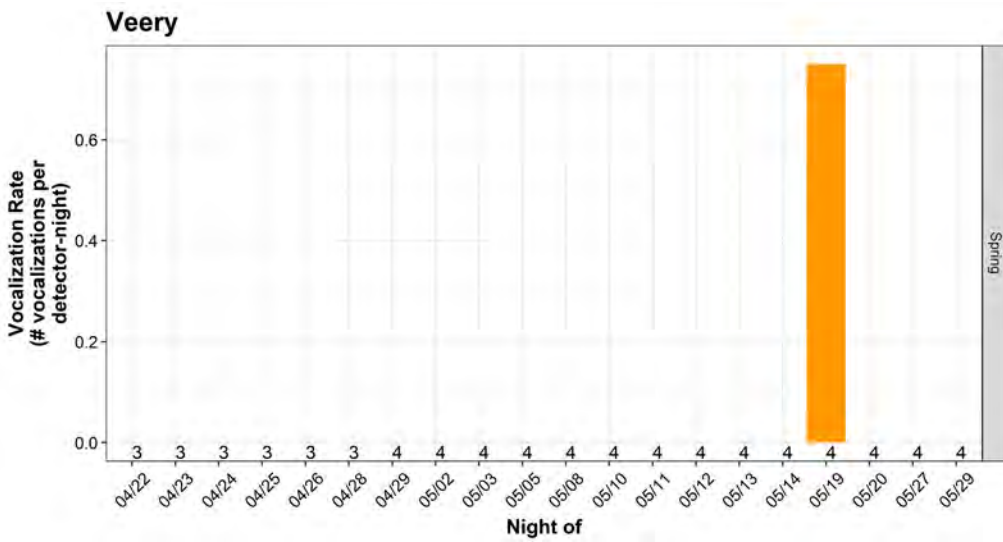
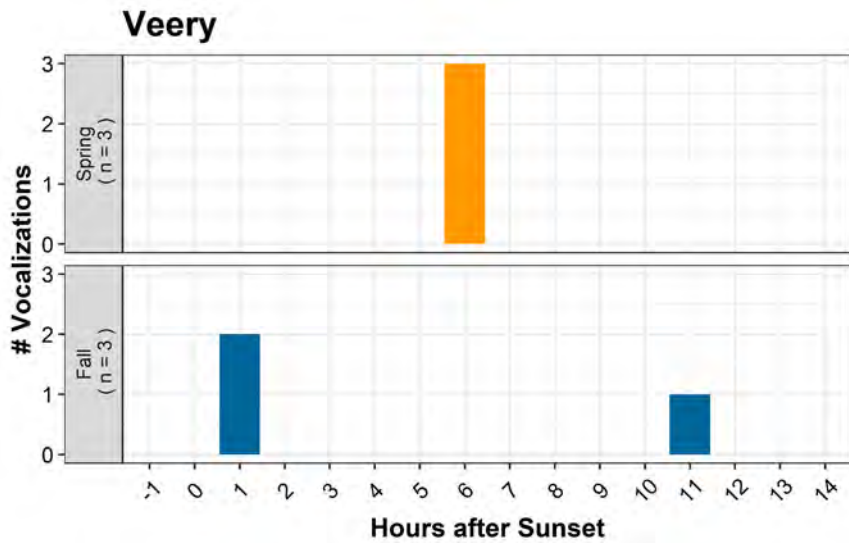
Upland Sandpiper



Upland Sandpiper

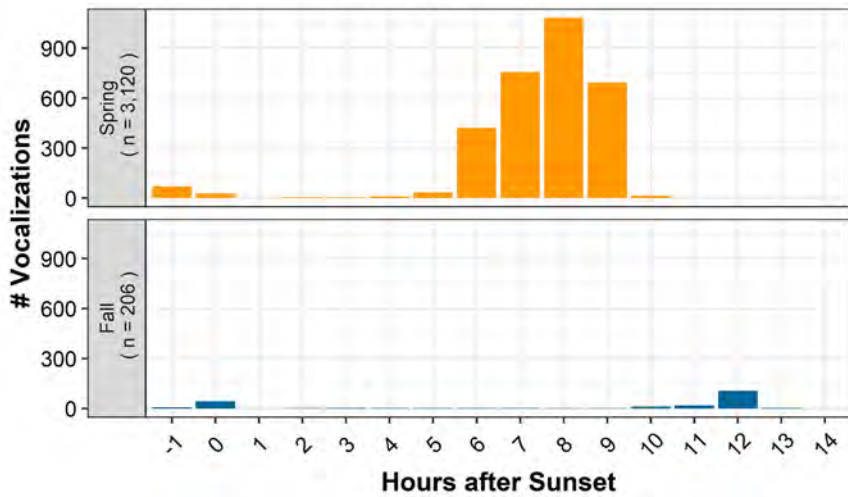


Appendix B Figure 78. Upland Sandpiper – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in fall)

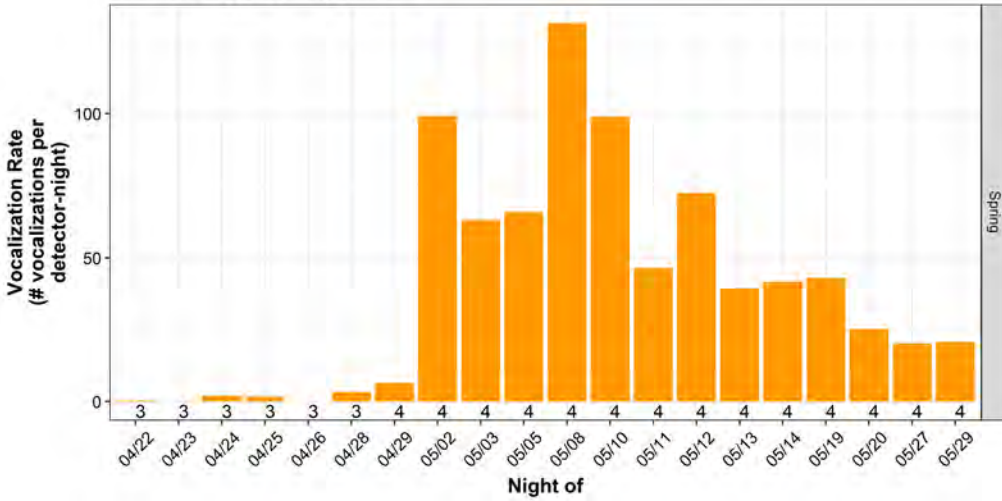


Appendix B Figure 79. Veery – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

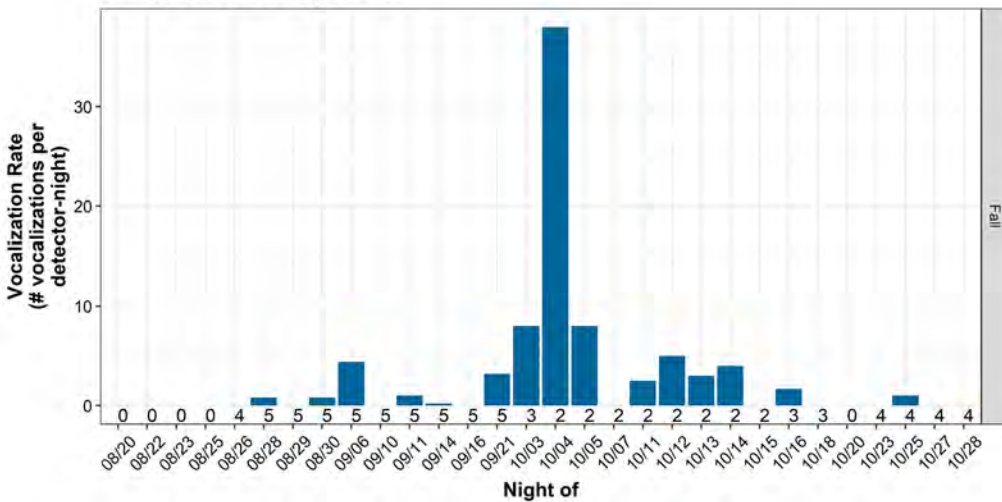
White-throated Sparrow



White-throated Sparrow

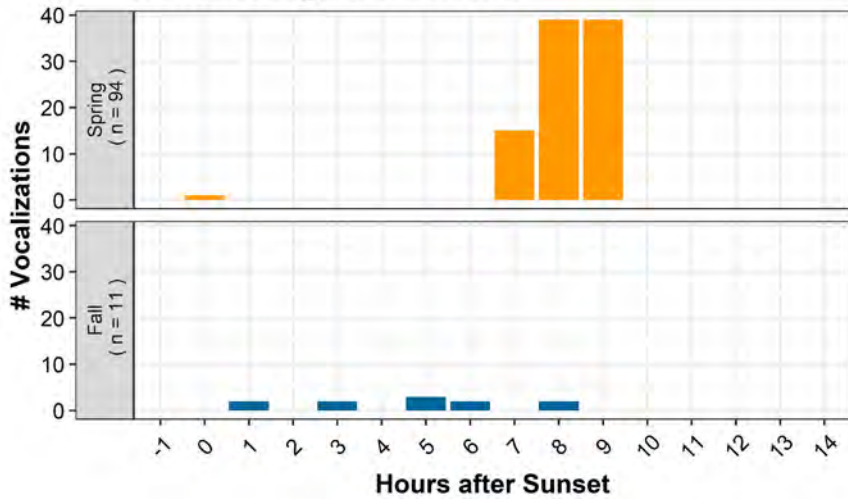


White-throated Sparrow

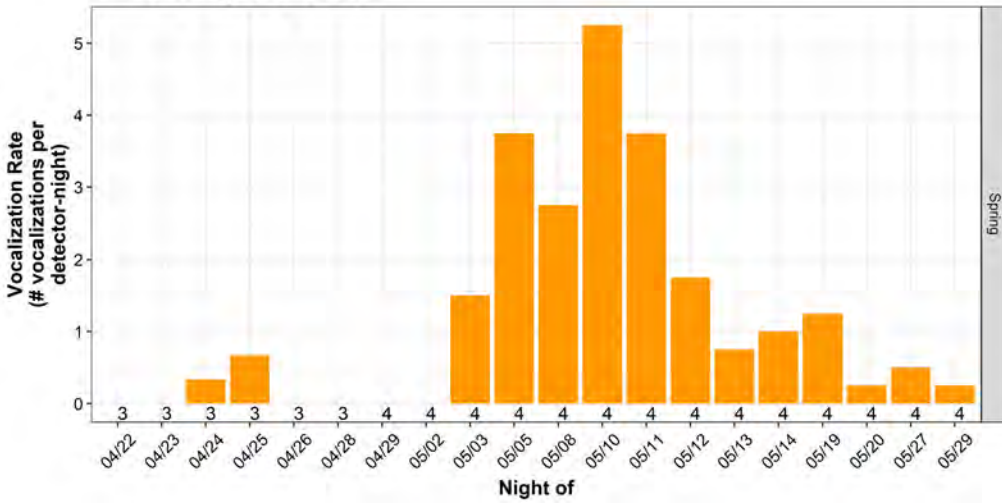


Appendix B Figure 80. White-throated Sparrow – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

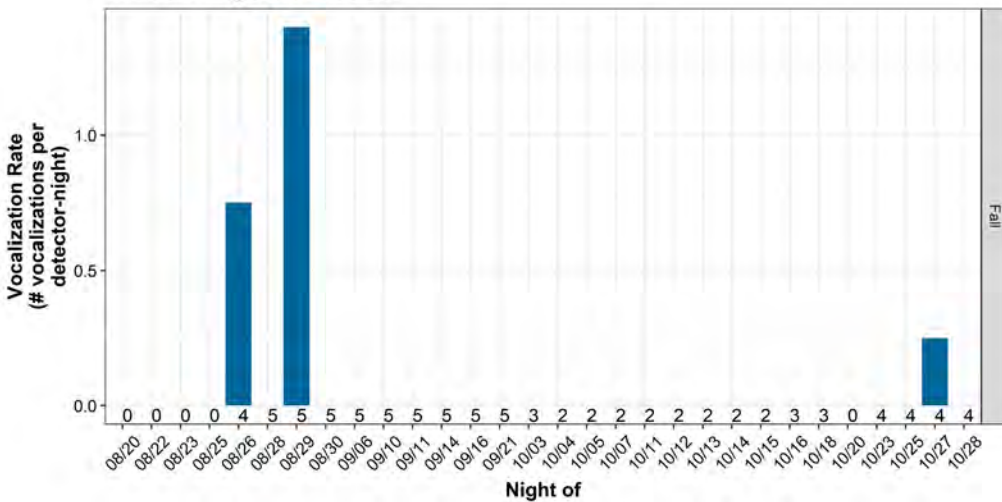
White-winged Crossbill



White-winged Crossbill

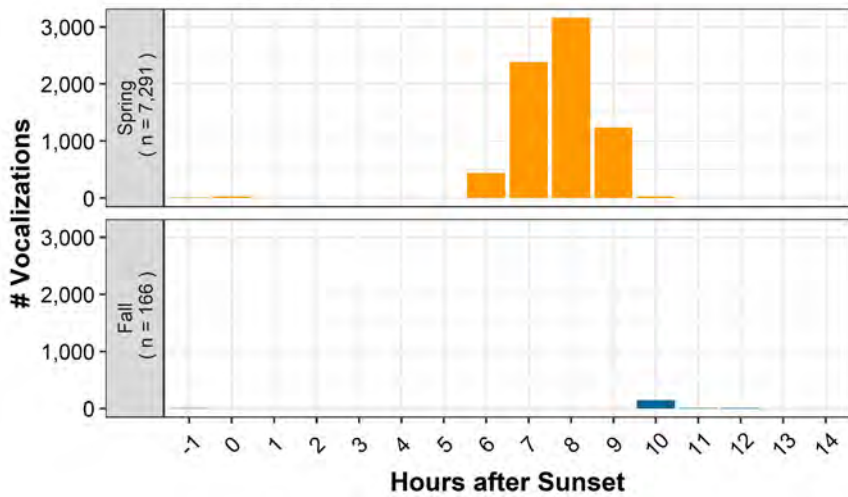


White-winged Crossbill

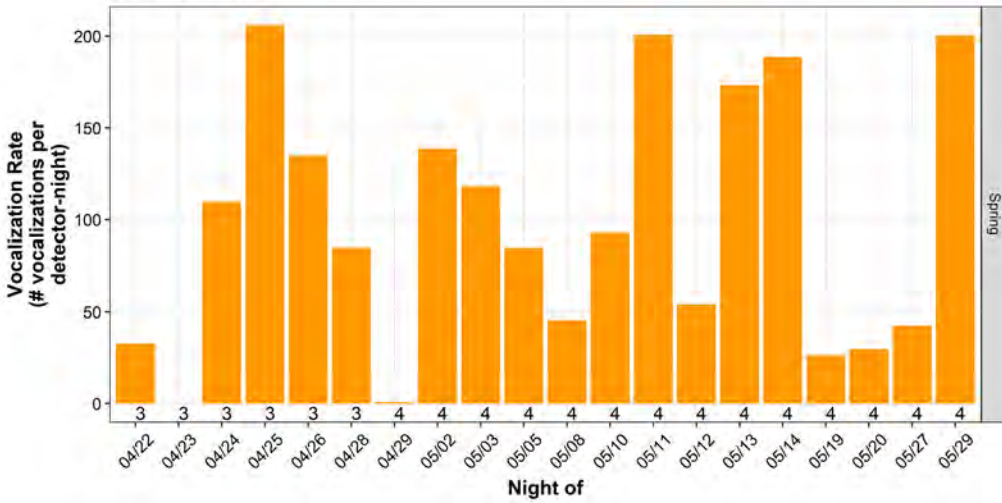


Appendix B Figure 81. White-winged Crossbill – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

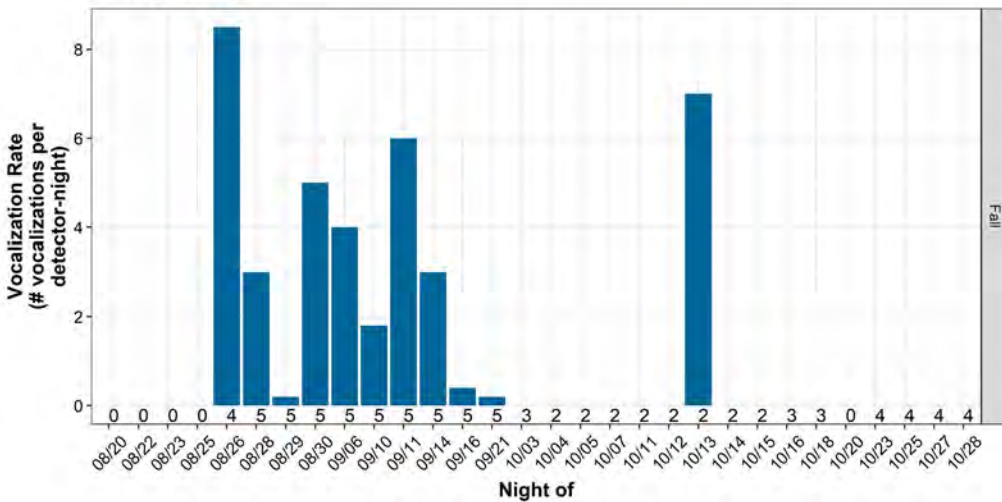
Winter Wren



Winter Wren

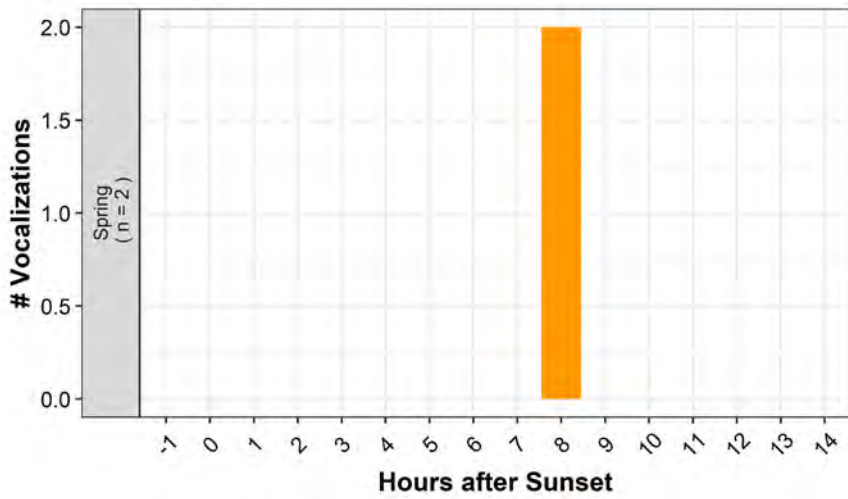


Winter Wren

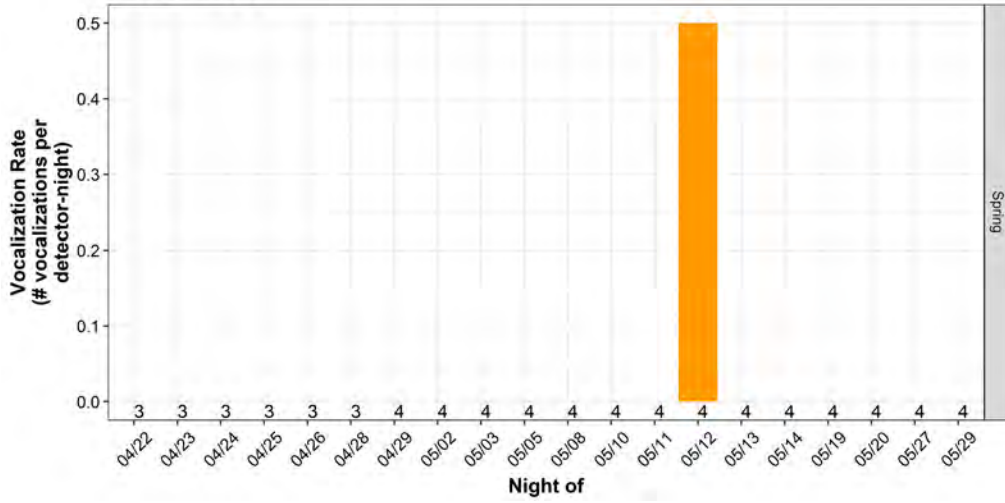


Appendix B Figure 82. Winter Wren – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Wood Duck

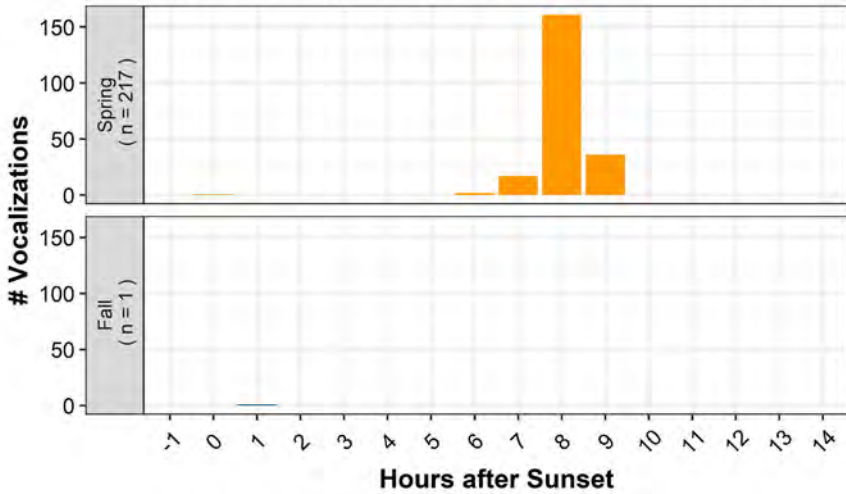


Wood Duck

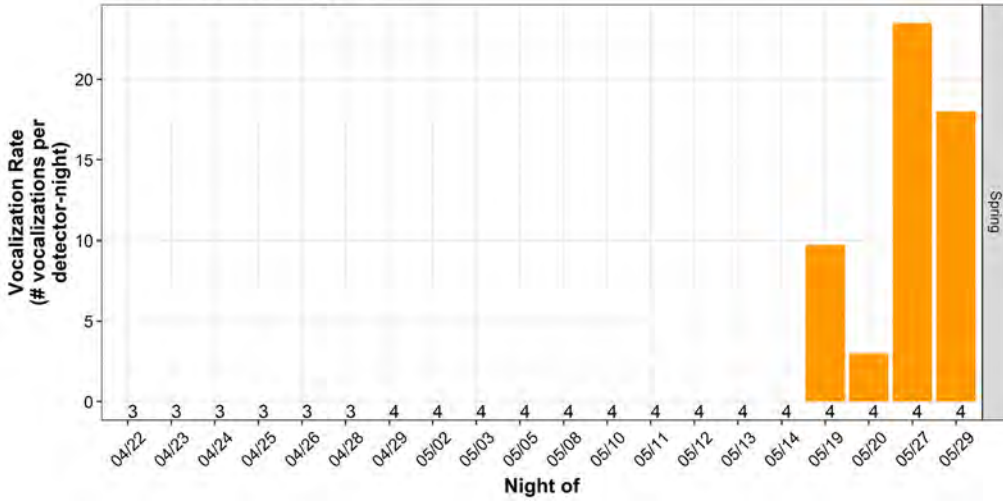


Appendix B Figure 83. Wood Duck – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

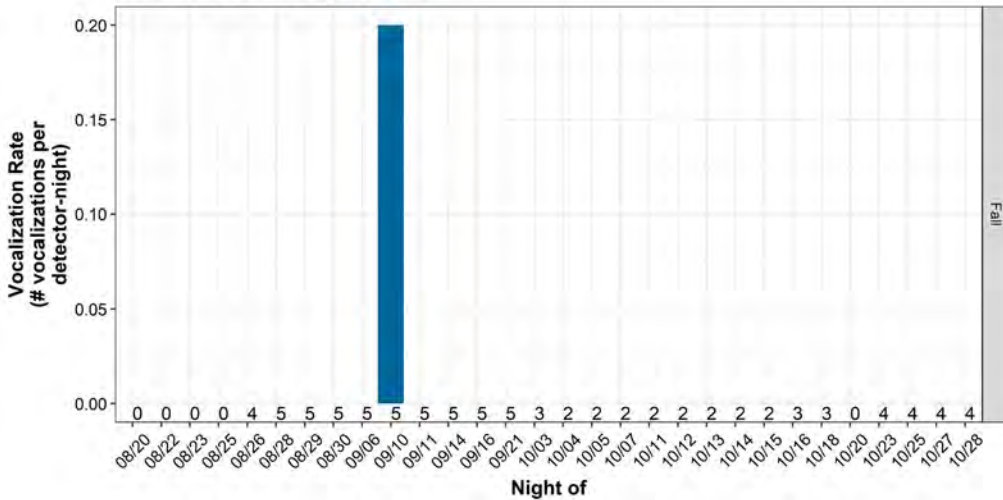
Yellow-bellied Flycatcher



Yellow-bellied Flycatcher

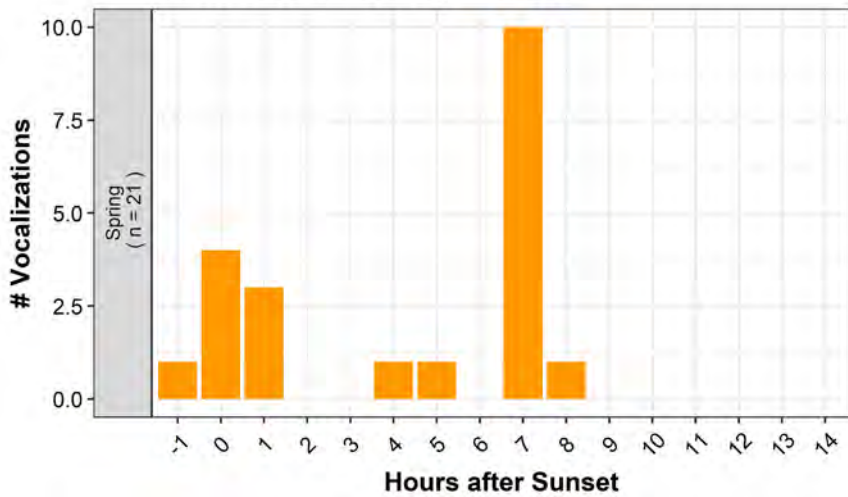


Yellow-bellied Flycatcher

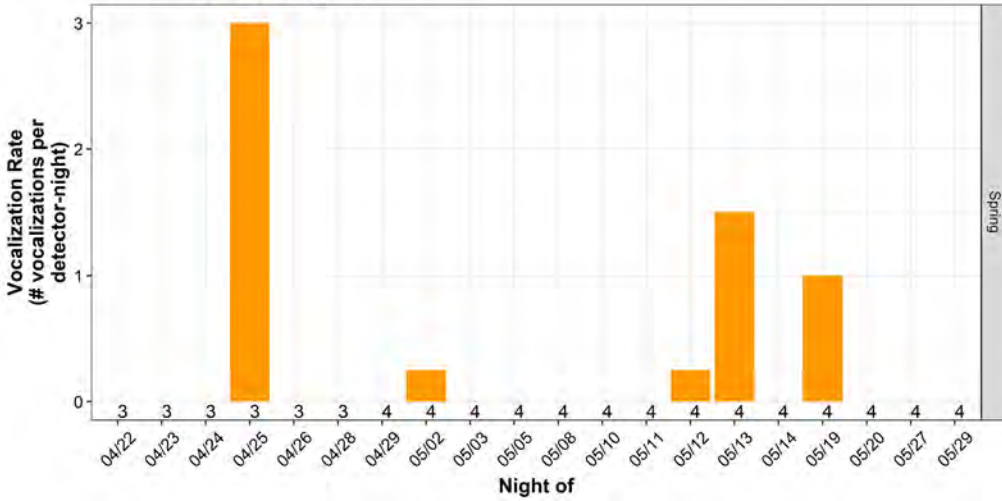


Appendix B Figure 84. Yellow-bellied Flycatcher – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys

Yellow-bellied Sapsucker

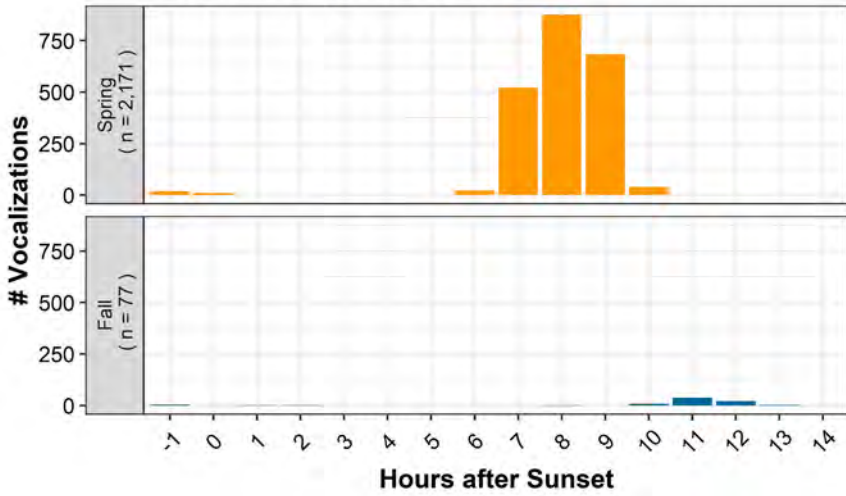


Yellow-bellied Sapsucker

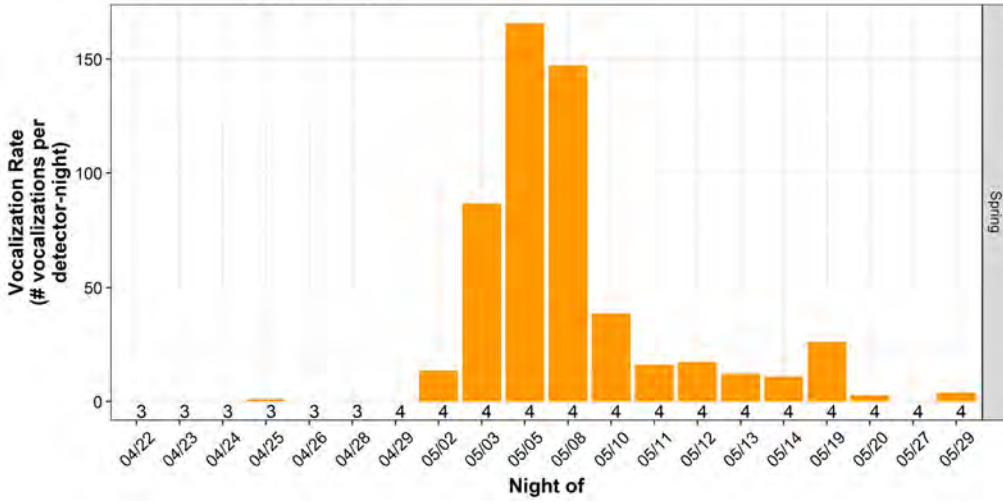


Appendix B Figure 85. Yellow-bellied Sapsucker – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys (only observed in spring)

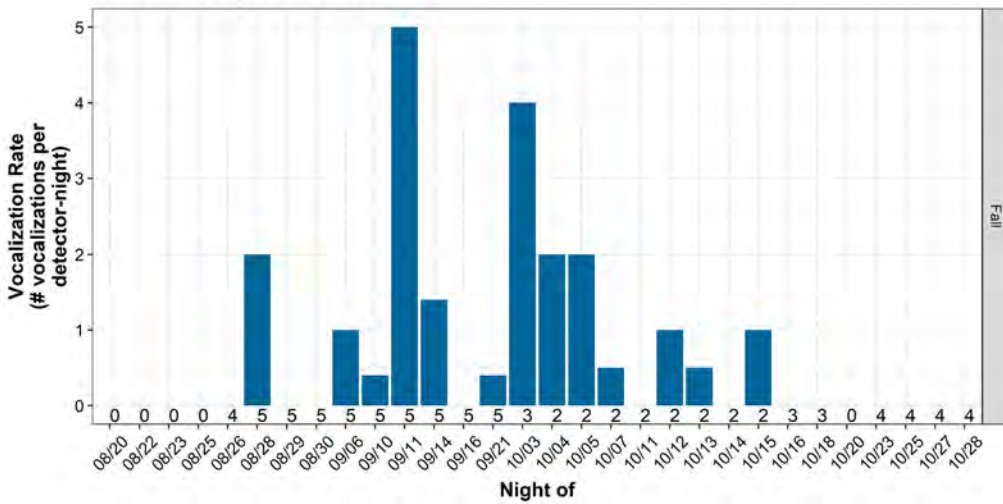
Yellow-rumped Warbler



Yellow-rumped Warbler



Yellow-rumped Warbler



Appendix B Figure 86. Yellow-rumped Warbler – Acoustic Results by Time of Day and Date During Spring and Fall 2022 Avian Acoustic Surveys