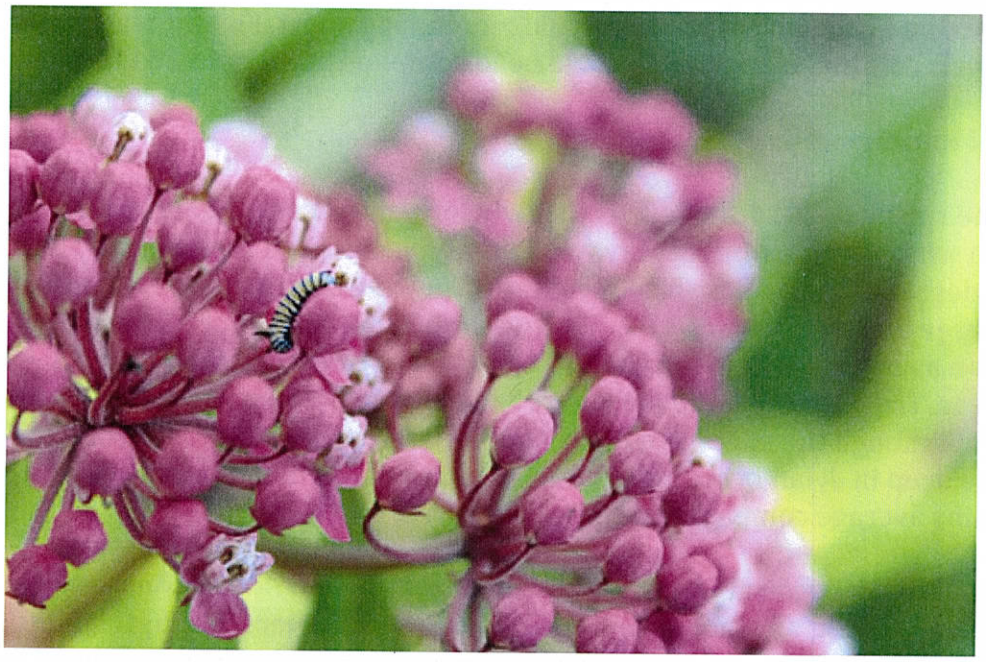
2014 Annual Report

Gull Lake View
Golf Club

Gull Lake View East & West
Stonehedge North & South
Bedford Valley



Anna Kornoelje
Director of Ecological Services

Kyle Bibby
Conservation Research Coordinator

Kalamazoo Nature Center
www.NatureCenter.org

Summary

2014 marked the nineteenth year of partnership between Gull Lake View Golf Courses and the Kalamazoo Nature Center. We are glad to have the opportunity to work with GLV in promoting healthy wildlife and waterways in southwest Michigan. KNC staff, Kyle Bibby and Anna Kornoelje worked to coordinate nestbox surveys, amphibian monitoring, and water sampling. Nestboxes at Gull Lake View East and West (GLVE & GLVW) were monitored by Randy Schau, a dedicated volunteer, and by citizen science intern, Evan Johnson. Tracey Tyler and James Friedrich monitored at Stonehedge Golf Course South (STOS), Doug McLoftlin monitored at Stonehedge Golf Course North (STON), and Richard Gendernalik monitored at Bedford Valley Golf Course (BEVA).

Data collected from the GLV golf course nestboxes has been entered into Nest Watch, a national database administered by the Cornell Lab of Ornithology. Nest Watch provides a clearinghouse for nestbox data for many cavity nesting birds, as well as tools for data analysis for its users. We have used Nest Watch analysis tools to show trends and patterns in nestbox productivity in this report. Amphibian survey results are submitted annually to the Michigan DNR's state-wide monitoring effort. Finally, water sampling for nitrate levels continued and results have been compiled starting in 2011 for each course.

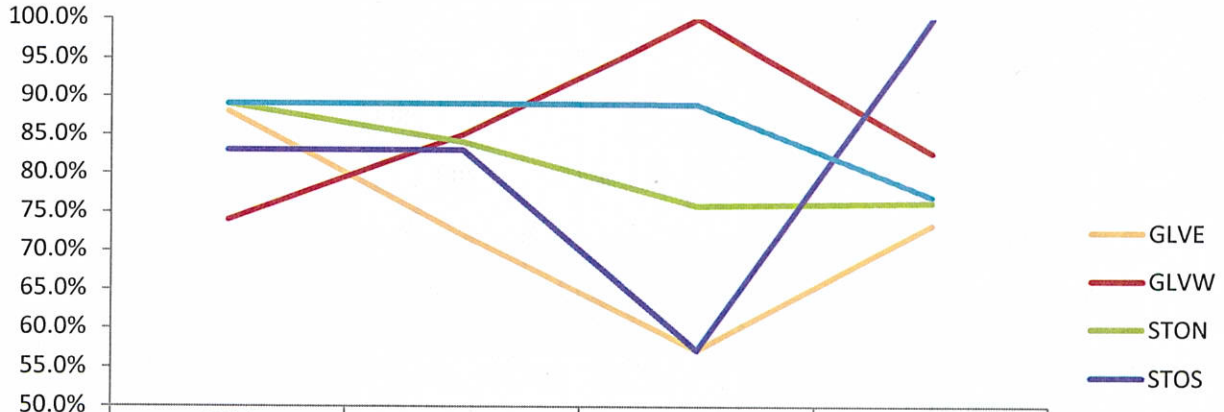
Nestbox Monitoring

The spring of 2014 started very slowly for most areas in West Michigan after a long and harsh winter. The month of May was fairly typical for the area compared to years past, only one degree off normal highs. Precipitation however, was about 2.62 inches compared to an average for the month of 3.87. June was much the same, but July was about 5 degrees cooler than average, only having about 10 days reach or exceed the normal highs for that time of year. The season for the most part had average precipitation, except for the month of August. Although the climate of the breeding season appeared to be normal, there was a noticeable drop in avian breeding productivity compared to the last few years. Productivity still remains average compared to 18 years prior.

Monitoring began at all courses by the third week of April. Monitoring ended the third week of August, after it became clear no more birds were attempting nests. This was decided after seeing no activity at nestboxes for two weeks in a row, late in the season. See appendix I for nestbox locations and appendix II for box recommendation.

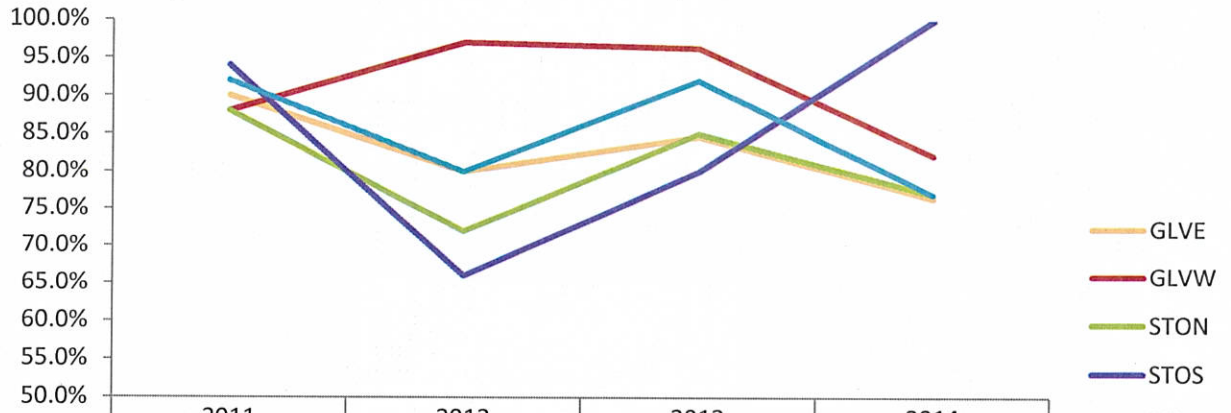
The success rate of Eastern Blue Birds (EABL) and Tree Swallows (TRES) are shown in Figures 1 and 2, along with previous years. Success is defined as having at least one fledgling from a nest. Both EABL and TRES appear to take slight losses in productivity for the majority of courses.

Figure 1. 2014 TRES Nest Success Rate by Course



	2011	2012	2013	2014
GLVE	88.0%	72.0%	57.1%	73.3%
GLVW	74.0%	85.0%	100.0%	82.6%
STON	89.0%	84.0%	75.8%	76.2%
STOS	83.0%	83.0%	57.1%	100.0%
BEVA	89.0%	89.0%	88.9%	76.9%

Figure 2. 2014 EABL Nest Success Rate by Course



	2011	2012	2013	2014
GLVE	90.0%	80.0%	84.6%	76.5%
GLVW	88.0%	97.0%	96.3%	82.1%
STON	88.0%	72.0%	85.0%	76.9%
STOS	94.0%	66.0%	80.0%	100.0%
BEVA	92.0%	80.0%	92.0%	76.9%

Both focus species showed a drop in productivity in 2014. EABL appeared to take more of a loss in productivity compared to TRES. This may represent a "leveling-off" for the two species, especially EABL, which had a productive spike in 2013. Productivity levels still remain higher than normal (Pinkowski, 1977). This can likely be attributed to predator guards. Table 1 shows nest success by course with totals of TRES and EABL combined. The first eggs of many nest attempts appeared in the first week of May, per usual. Unlike years past, there did not appear to be any actually nesting attempts from other species such as Black-capped Chickadees and Tufted Titmice. Nesting attempts by these species remain uncommon at the golf courses because most of the nest boxes were not designed or implemented with them in the mind.

Table 1. 2014 Nestbox Productivity by Course

	# Nests Attempts			Total # of Eggs			Total # of Nestlings			Total # of Fledglings			Successful Nest Attempts		
Course	EABL	TRES	Total	EABL	TRES	Total	EABL	TRES	Total	EABL	TRES	Total	EABL	TRES	Total
GLVE	17	15	32	68	58	126	54	41	95	52	38	90	13	11	24
GLVW	28	23	51	116	97	213	102	88	190	98	85	183	23	19	42
STON	13	21	34	59	105	164	42	89	131	36	81	117	10	16	26
STOS	10	3	13	43	17	60	40	17	57	38	17	55	10	3	13
BEVA	13	13	26	59	58	117	58	57	115	50	50	100	10	10	20
Totals	**81**	**75**	**156**	**345**	**335**	**680**	**296**	**292**	**588**	**274**	**271**	**545**	**66**	**59**	**125**

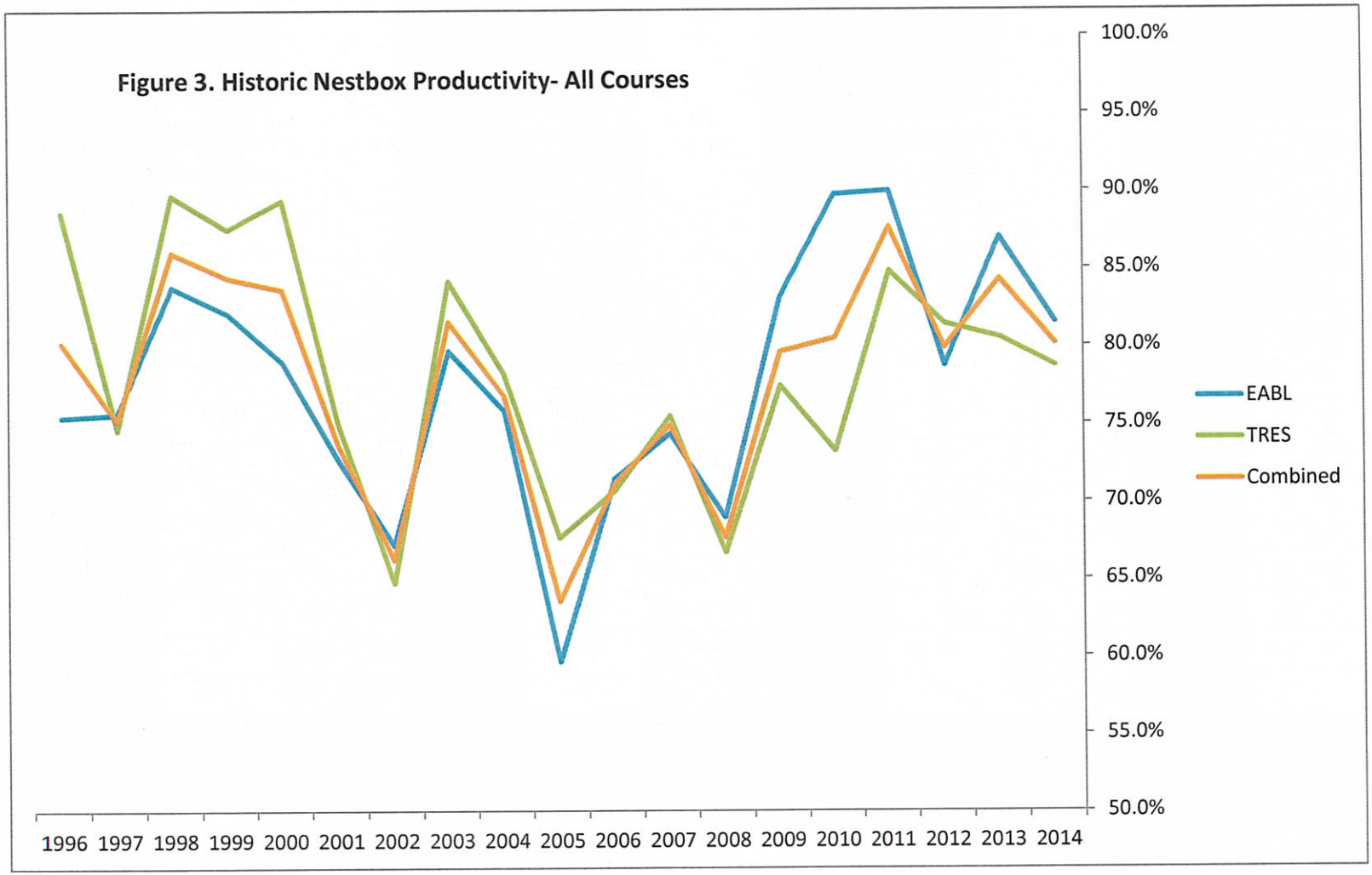
Table 2 shows the production for all courses by species beginning in 1996. The table shows the drop in productivity for 2014. Numbers are low across the board, but particularly in the number of fledglings. There is still strong success compared to the 19-year average. Next year will mark both 3000 nesting attempts by EABL and 3000 successful nesting attempts by both species.

Table 2. Historic Nestbox Productivity- All Courses

	# Nests Attempts			Total # of Fledgings			Successful Nest Attempts			Nest Success Rate		
Year	EABL	TRES	Total	EABL	TRES	Total	EABL	TRES	Total	EABL	TRES	Combined
2014	**81**	**75**	**156**	**274**	**271**	**545**	**66**	**59**	**125**	**81.5%**	**78.7%**	**80.1%**
2013	115	82	197	505	378	883	100	66	166	87.0%	80.5%	84.3%
2012	136	102	238	487	365	852	107	83	190	78.7%	81.4%	79.8%
2011	129	105	234	469	428	897	116	89	205	89.9%	84.8%	87.6%
2010	97	123	220	362	393	755	87	90	177	89.7%	73.2%	80.5%
2009	71	115	186	268	458	726	59	89	148	83.1%	77.4%	79.6%
2008	103	138	241	277	442	719	71	92	163	68.9%	66.7%	67.6%
2007	109	110	219	331	411	742	81	83	164	74.3%	75.5%	74.9%
2006	154	109	263	438	347	785	110	77	187	71.4%	70.6%	71.1%
2005	109	105	214	249	325	574	65	71	136	59.6%	67.6%	63.6%
2004	124	87	211	386	315	701	94	68	162	75.8%	78.2%	76.8%
2003	113	82	195	342	310	652	90	69	159	79.6%	84.1%	81.5%
2002	140	85	225	325	250	575	94	55	149	67.1%	64.7%	66.2%
2001	139	100	239	396	378	774	101	75	176	72.7%	75.0%	73.6%
2000	114	94	208	351	409	760	90	84	174	78.9%	89.4%	83.7%
1999	106	80	186	330	344	674	87	70	157	82.1%	87.5%	84.4%
1998	111	68	179	371	286	657	93	61	154	83.8%	89.7%	86.0%
1997	82	59	141	222	214	436	62	44	106	75.6%	74.6%	75.2%
1996	61	35	96	160	171	331	46	31	77	75.4%	88.6%	80.2%
Totals	**2094**	**1754**	**3848**	**6543**	**6495**	**13038**	**1619**	**1356**	**2975**	**77.6%**	**78.3%**	**77.7%**

*Total values under nest success rate represent the 19 year average

Figure 3 shows historic nest box productivity for all courses since monitoring began in 1996. The 2015 season will mark 20 years of nest box monitoring seasons.



Although it was a less productive year for both species compared to the most recent years, the success rate of TRES and EABL compared to the 19-year average is relatively similar

Breeding Bird Recaptures

The United State Fish and Wildlife provides permits to trained individuals to capture birds, record data on them such as age, sex, and weight, and secure aluminum band to the bird's leg in order track it in case of recapture. This allows for researchers to track the life history of several species and collect valuable data such as migration behavior and, life span, overall health of populations. Volunteers were trained to safely capture, handle, and release birds that remained on the nest when checking boxes. Unfortunately, no recaptures appeared this monitoring season.

Water Sampling

Nitrates were sampled in the same ponds as years past. Maps of these locations can be found in appendix I.

Nitrogen is a very commonly found element, making up the largest portion of our atmosphere by far. Nitrogen naturally occurs in soils in the form of nitrates. Nitrates can also be deposited into the soil by human activity, mostly by fertilizers, septic systems, and rearing livestock. Excess nitrogen can cause overstimulation of growth of aquatic plants and algae. Excessive growth of these organisms, in turn, can clog water intakes, use up dissolved oxygen as they decompose, and block light to deeper waters. Lake and reservoir eutrophication can occur, which produces unsightly scums of algae on the water surface, can occasionally result in fish kills, and can even "kill" a lake by depriving it of oxygen. Surface water in undisturbed ecosystems usually has very low concentration of nitrates, typically around 1 milligram/liter (mg/L). Nitrates are generally safe for consumption at levels below 10 mg/L. Concentrations greater than 10 mg/L may start to become toxic to warm-blooded animals under certain conditions (EPA, 2014).

Nitrates levels at all GLV course ponds have been at low levels since data collection began. Although concentrations are higher than undisturbed ecosystems, this is to be expected in a human-impacted environment. Although the pond's nitrate levels may be impacted by human activity, the ponds still support many forms of life. In particular, amphibian breeding is observed in several ponds and large tadpoles can been seen in many of them. Tables 3, 4, and 5 show results of three sampling sessions during the year. Figures 4, 5, and 6 show nitrate level trends. Although some trends show increases, concentrations remain low.

Table 3. Spring Water Samples, 2014				2014	2013	2012	2011
Course	Site	Date	Air Temp (F)	Nitrate mg/L*	Nitrate mg/L*	Nitrate mg/L*	Nitrate mg/L*
GLVE	3	2-Jul	65	0.5	0.7	1.1	0.4
GLVE	11	2-Jul	65	1.2	1.4	0.4	1.7
GLVE	14	2-Jul	65	0.7	0.6	0.0	0.2
GLVE	17	2-Jul	65	2	2.1	0.9	1.4
GLVW	10	2-Jul	67	2.1	2.3	1.6	0.9
GLVW	18	2-Jul	67	2.3	2.4	1.5	0.0
GLVW	12	2-Jul	67	1.8	1.3	1.4	0.9
GLVW	15	2-Jul	67	1.6	1.6	0.9	1.0
BEVA	3	2-Jul	72	0.5	1.1	0.0	0.3
BEVA	6	2-Jul	72	1.7	1.4	0.4	2.4
BEVA	16	2-Jul	72	1.4	2.6	1.2	1.3
STOS	Parking lot	2-Jul	70	0	0.2	0.0	0.0
STON	11	2-Jul	70	1.1	1.1	0.5	0.7
STON	16	2-Jul	70	1.6	1.5	2.8	0.1
STON	6	2-Jul	70	1.7	1.9	0.5	1.4
*milligrams/liter							

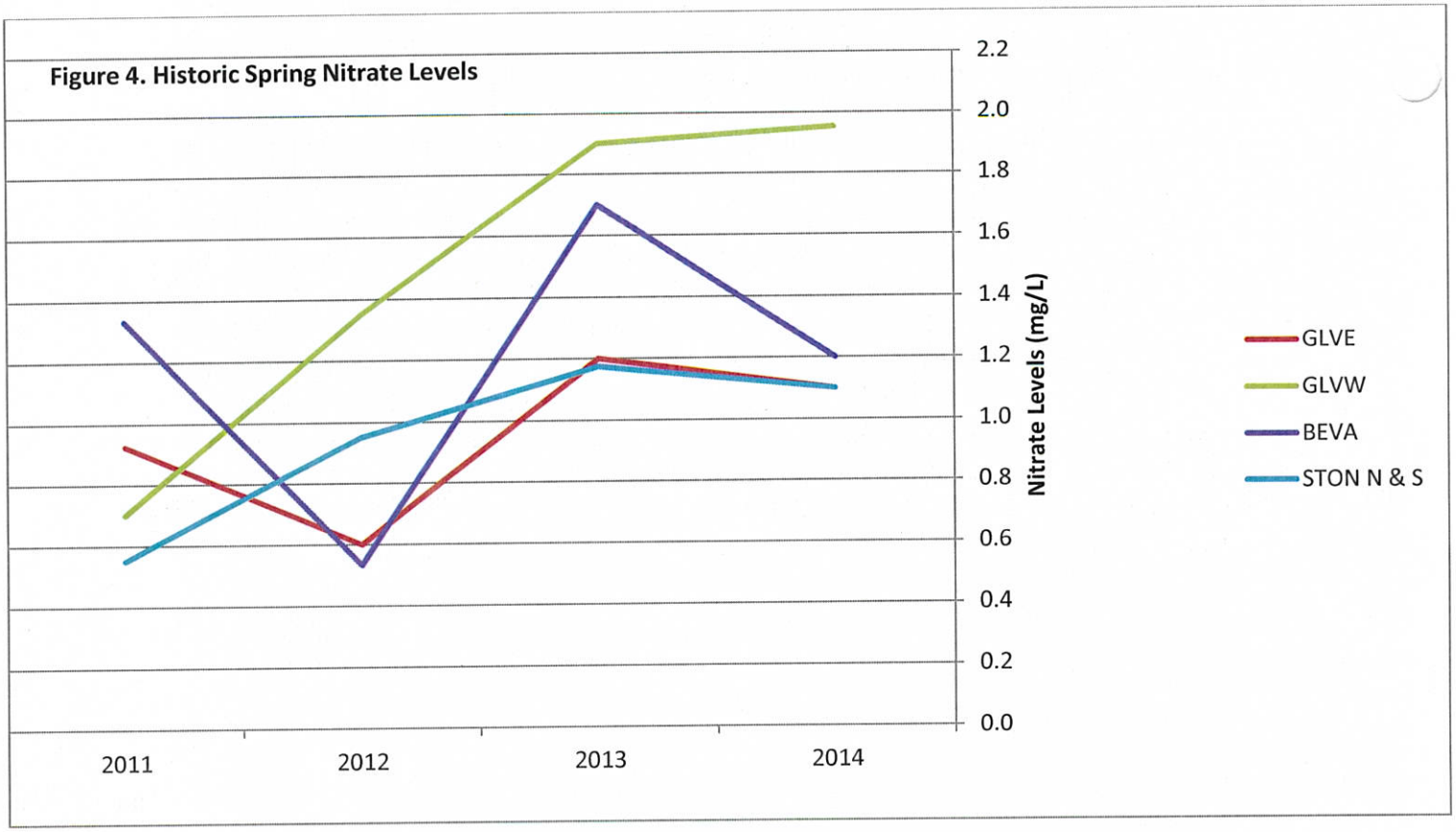


Table 4. Summer Water Samples, 2014				2014	2013	2012	2011
Golf Course	Site	Date	Air Temp (F)	Nitrate mg/L*	Nitrate mg/L*	Nitrate mg/L*	Nitrate mg/L*
GLVE	3	25-Aug	80	0.1	1.0	1.5	0.0
GLVE	11	25-Aug	80	3.9	1.7	2.2	0.4
GLVE	14	25-Aug	80	0.2	0.6	1.0	0.0
GLVE	17	25-Aug	80	0.3	1.3	1.2	0.3
GLVW	10	25-Aug	82	4.3	2.0	1.4	1.0
GLVW	18	25-Aug	82	0.4	2.3	1.7	2.3
GLVW	12	25-Aug	82	7.3	1.3	5.5	1.0
GLVW	15	25-Aug	82	0.8	1.7	0.3	1.3
BEVA	3	25-Aug	90	0.5	0.3	1.7	1.6
BEVA	6	25-Aug	90	0.3	0.6	0.0	2.2
BEVA	16	25-Aug	90	1.1	1.2	1.0	1.3
STOS	Parking lot	25-Aug	85	1.9	1.7	0.0	1.2
STON	11	25-Aug	85	1.4	1.2	0.4	0.3
STON	16	25-Aug	85	1.5	1.5	Low water	0.2
STON	6	25-Aug	85	1.3	1.5	0.0	1.0
*milligrams/liter							

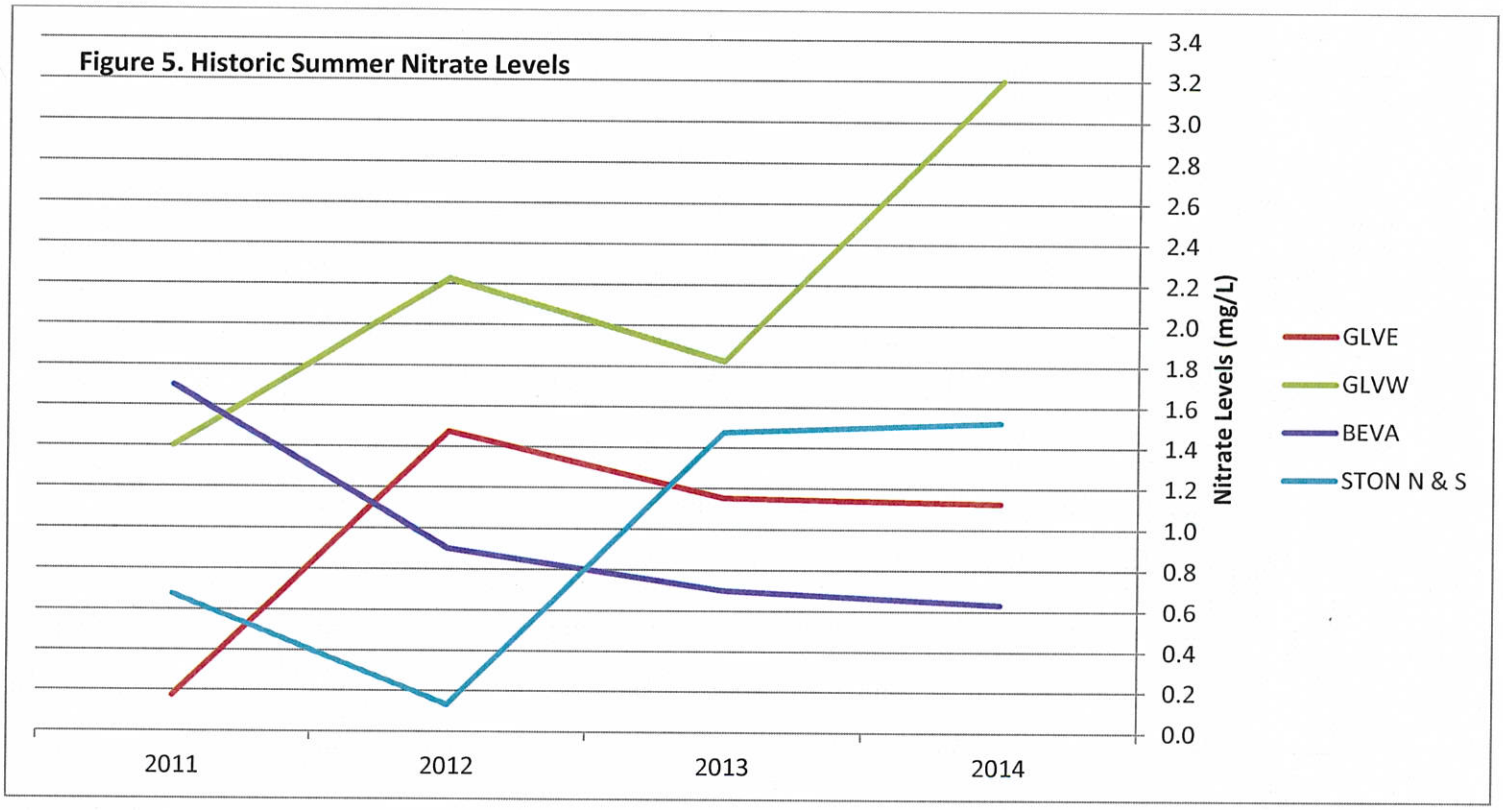
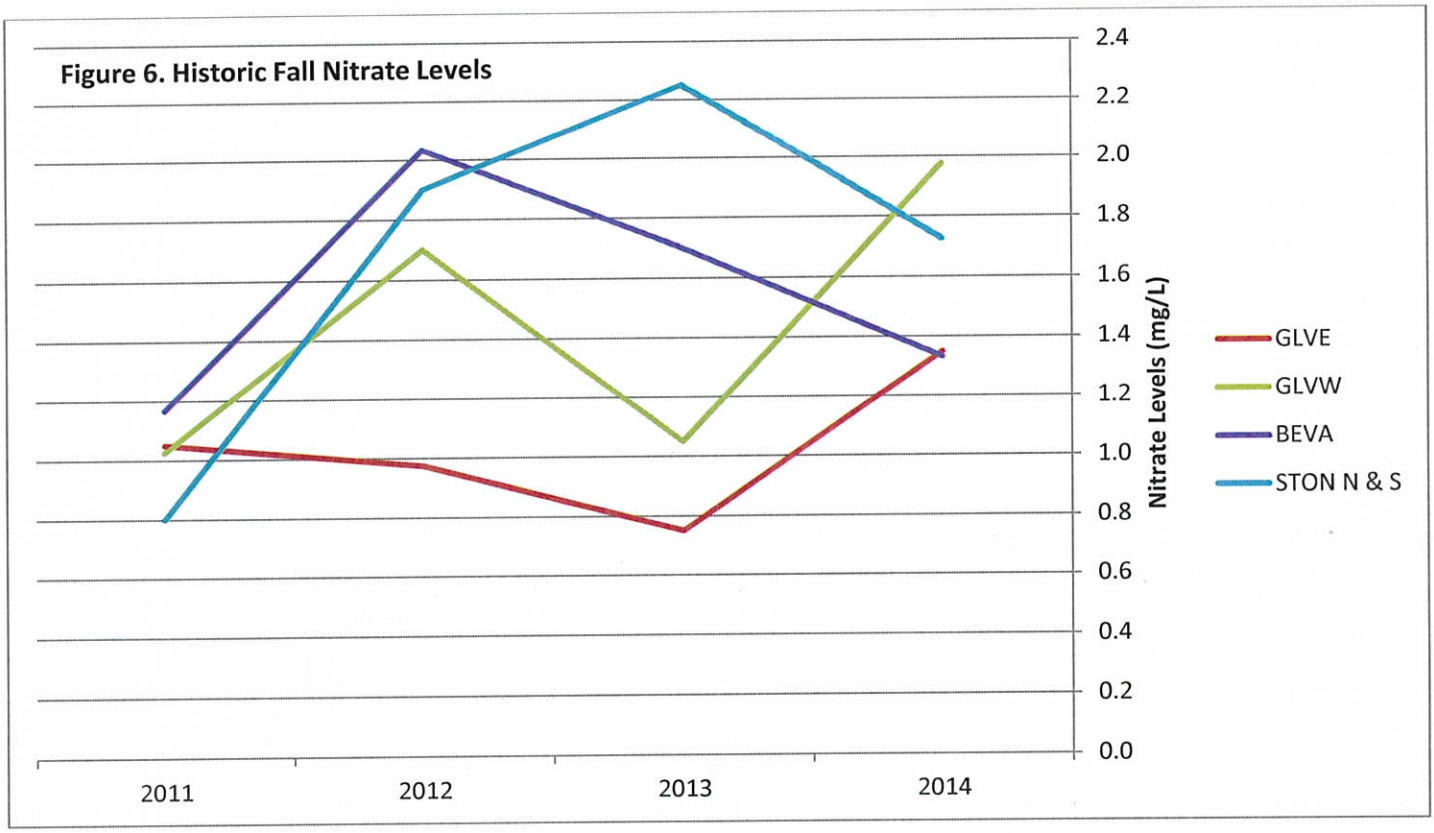


Table 5. Fall Water Samples, 2014				2014	2013	2012	2011
Golf Course	Site	Date	Air Temp (F)	Nitrate mg/L*	Nitrate mg/L*	Nitrate mg/L*	Nitrate mg/L*
GLVE	3	10-Oct	57	0.8	1.3	1.7	1.2
GLVE	11	10-Oct	63	1.0	0.8	0.5	0.8
GLVE	14	10-Oct	68	0.4	0.1	1.1	1.0
GLVE	17	10-Oct	68	3.2	0.8	0.6	1.2
GLVW	10	10-Oct	70	0.1	0.5	1.5	1.1
GLVW	18	10-Oct	70	2.9	2.1	1.6	1.6
GLVW	12	10-Oct	70	2.3	1.0	0.9	0.2
GLVW	15	10-Oct	68	2.6	0.6	2.8	1.2
BEVA	3	21-Oct	48	1.6	3.5	1.8	0.6
BEVA	6	21-Oct	48	0.8	0.5	2.1	1.9
BEVA	16	21-Oct	48	1.6	1.1	2.2	1.0
STOS	Parking lot	21-Oct	50	1.7	2.6	1.8	0.3
STON	11	21-Oct	50	1.3	2.4	1.2	1.0
STON	16	21-Oct	50	2.1	3.0	Low water	0.8
STON	6	21-Oct	50	1.8	1.0	2.7	1.1

*milligrams/liter



Amphibian Surveys

Frog and Toad surveys were conducted following the Michigan Department of Natural Resources' annual frog and toad survey protocol. Frogs and toads call during active breeding times in order to attract mates. The ponds at the GLV courses provide quality environments for this. The protocol calls for two surveys in the spring and one in the summer in order to gather data from a variety of species, since species call at different times of the year. Amphibians are listed on the table in the order of when each species calls during the season. The surveys are conducted after sunset, typically starting around 8:30-9:30. For each location surveyed, a monitor sits close by for 3-10 minutes and records the species heard and the frequency at which they were heard. To gauge the frequency of calls, the protocol uses the following call rating system:

1= 1-5 individuals can be heard
2= 6-12 individuals can be heard
3= 12 or more individuals can be heard

Spring peepers were very abundant in early spring. During the late spring and summer, Eastern Gray Tree Frogs were also found to be very abundant. Last year, Tree Frogs were only seen during the summer survey and only at a few locations. See appendix I for pond locations.

Table 6. Amphibian Survey Data: Early Spring, 2014

Date: 5/6, Start time: 9:33 pm End time: 11:23 pm, Air temp: 60 F, Wind: 2, Sky: 0% CC

Observers: Anna Kornoelje

SITE NAME	SITE NUMBER	Fowler's Toad	Wood Frog	Chorus Frog	Spring Peeper	Leopard Frog	Pickerel Frog	American Toad	Eastern Gray Tree Frog	Cope's Gray Tree Frog	Cricket Frog	Green Frog	Bullfrog
GLVW	10												
GLVW	18				1								
GLVW	12E				1								
GLVW	12W				1								
GLVW	15												
GLVE	17				1								
GLVE	14				1	1							
GLVE	11												
GLVE	2				2				1				
STOS	Driving range				2								
STOS	Parking lot												
STON	11				3				1				
BEVA	3				1								
BEVA	6				1								
BEVA	16				2	1							

In 2012, Spring Peepers were only seen in 5 locations and had an average call index of 2. In 2013, Spring Peepers were seen in all but one location and mostly registered a 3 on the call index. This year, Spring Peepers were seen in many locations but registered lower call indexes than past years. Noticeably absent was American Toads. There were none seen in 2014, but 2013 had a presence in all but 5 locations.

Table 7. Amphibian Survey Data: Late Spring, 2014

Date: 5/21, Start time: 10:03 End time: 12:30, Air temp: 68 F, Wind: 0, Sky: 0% CC

Observers: Kyle Bibby

SITE NAME	SITE NUMBER	Fowler's Toad	Wood Frog	Chorus Frog	Spring Peeper	Leopard Frog	Pickerel Frog	American Toad	Eastern Gray Tree Frog	Cope's Gray Tree Frog	Cricket Frog	Green Frog	Bullfrog
GLVW	10				1				2			2	
GLVW	18				1				2			1	
GLVW	12E				1				3			1	
GLVW	12W								3			1	
GLVW	15								2			1	
GLVE	17											1	1
GLVE	14				2				3				
GLVE	11			1	2				3				
GLVE	2			1	1				3				
STOS	Driving range				2				3				
STOS	Parking lot				1				1			1	
STON	11				2				3			2	
BEVA	3											1	
BEVA	6								2			2	1
BEVA	16											3	

The 2012 late spring survey showed hardly any frogs. Spring Peepers were only seen at two locations and chorus frogs only at one, all of which registered a 1. In 2013, Peepers and Tree Frogs were much more abundant than in 2012. In addition, Leopard Frogs were heard. In 2014, Green Frogs were very common, there were none heard last year. Bull Frogs were also heard, but last year there were none. The 2014 year also saw much higher call indexes for Gray Tree Frogs but similar frequencies compared to 2013. Chorus Frogs were also recorded this year. In 2012, there were three ponds that registered a 1 for these frogs, in 2013, there were none.

Table 8. Amphibian Survey Data: Summer, 2014

Date: 6/5, Start time: 9:21 End time: 11:41, Air temp: 66F, Wind: 1, Sky: 5% CC

Observer: Anna Kornoelje

SITE NAME	SITE NUMBER	Fowler's Toad	Wood Frog	Chorus Frog	Spring Peeper	Leopard Frog	Pickerel Frog	American Toad	Eastern Gray Tree Frog	Cope's Gray Tree Frog	Cricket Frog	Green Frog	Bullfrog
GLVW	10											1	
GLVW	18												
GLVW	12E											1	1
GLVW	12W								1				
GLVW	15											1	
GLVE	17												1
GLVE	14								2				1
GLVE	11								1			1	1
GLVE	2								1				1
STOS	Driving range								1			2	
STOS	Parking lot											1	
STON	11				1				2			2	
BEVA	3								1			1	
BEVA	6											1	1
BEVA	16								1			2	1

The summer surveys of 2012 and 2013 occurred only two days apart as well and showed similar results for Green Frogs and Bull Frogs. Gray Tree Frogs however, were much more abundant in 2013 compared to 2012. This year showed very similar results compared to past years but had three ponds that registered higher call indexes for Green Frogs.

Recommendations

With increasing ecological stressors affecting species, it is important that high quality habitat be preserved. Gull Lake View Golf Courses provide habitat and resources for a variety of species.

- Great efforts are underway to conserve and protect Monarch butterflies. GLV could be a part to this effort by planting common milkweed in natural areas. KNC can help with planting, and creating interpretive signs and educational programs. We can also offer special programs to teach GLV staff or golfers how to tag and release Monarchs.

- Purple loosestrife be monitored and managed at GLV W pond 15 and GLVE pond 17. Contact us for information about using Purple Loosestrife Beetles or place an order. These beetles are a very effecting method of management.

- Continue to maintain and promote native planting buffers surrounding ponds, especially focusing on the milkweed near GLVE boxes 17G1 and 17G2 and BEVA water sampling pond 6. Only mowing where necessary promotes a diversity of butterfly species.

- Consider installing native gardens into the landscape or butterfly gardens around clubhouses of other locations. You can contact us about either of these services.

- Continue to monitor and maintain nestboxes weekly in order to collect data and manage house sparrows. See appendix III.

Wildlife Observations

Birds

The mix of canopy covers, wet areas, and open spaces attracts a variety of birds. The golf courses act as both habitats during the breeding season and as stop-over sites for birds traveling to more northern breeding ranges. A variety of warblers were heard in the wooded areas of the courses. Great Blue Herons were also seen in the wet areas of Gull Lake East and Bedford Valley. Green Herons were also seen at Gull Lake View East. A full list of observations can be found on page 17.

Killdeer

A breeding pair was once again seen in the gravel and shrub area north of Bedford Valley. The woods to the north remain an area of high bird and butterfly diversity. It is recommended this year remain undisturbed.

Red-tailed Hawks

A pair of Red-tailed Hawks was frequently seen in the wooded areas near the center of Gull Lake View West. Though a nest was never seen, it is likely that this is a breeding pair that is using the golf course as a nesting site.

Amphibians and Herps

The golf courses remain very active breeding grounds for the variety of amphibians that are monitored. Tadpoles can be seen in nearly every larger water hazard and pond Gull Lake View East pond two had especially high number of tadpoles that were seen on a few occasions this years. In addition, Painted Turtles and Northern Water Snakes were seen at the Gull Lake View courses and Bedford Valley.

Butterflies

The 2013 season was a poor year for butterfly diversity. Only a few species were commonly seen. It was an especially poor year for monarchs. The 2014 season saw much higher diversity and density, including many more monarchs. The diversity of habitats found at the golf courses including open spaces, native grasses, wet areas, and woods foster this high diversity. Butterflies act as indicators to environmental health. The best method for keeping butterfly populations high is to manage land for a diverse array of plants. This can be done by spraying chemicals and mowing only where need be. The following table is a full observation list.

Table 9. 2014 Butterfly Observations – All Courses

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Black Swallowtail	X	X		X	X	X	X	X	X	X	X	X			X		X		X
Spicebush Swallowtail	X			X	X		X			X			X	X					
Eastern Tiger Swallowtail	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Giant Swallowtail		X		X						X					X		X		X
Cabbage White	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Clouded Sulfur	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X
Orange Sulfur				X	X	X	X		X		X	X							X
American Copper				X	X		X		X		X	X							
Northern Metalmark						X													
Banded Hairstreak				X															
Spring/Summer Azure		X		X	X	X	X	X	X	X	X	X	X	X	X				X
Eastern Tailed Blue	X				X	X	X		X			X					X		X
Baltimore	X	X	X	X	X	X	X	X	X		X								
Great Spangled Fritillary		X		X		X		X	X	X	X	X	X	X	X				X
Aphrodite Fritillary				X	X	X													
Northern Pearl Crescent	X	X	X	X	X	X	X	X	X	X	X	X							X
Question Mark				X		X	X												X
Eastern Comma	X		X	X				X	X		X						X	X	X
Mourning Cloak		X			X	X	X		X	X	X	X	X	X	X		X	X	
American Lady		X			X				X				X						
Painted Lady								X											
Red Admiral		X		X	X	X		X		X	X	X	X	X	X		X		X
Red-spotted Purple		X	X	X		X				X			X				X	X	
Viceroy			X	X					X	X	X		X	X	X			X	X
Monarch	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X
Northern Pearly Eye														X					
Common Wood Nymph						X		X						X					
Eyed Brown						X													
Little Wood Satyr	X	X		X		X		X	X	X	X	X					X		
Silver-spotted Skipper		X	X	X	X	X	X	X		X	X	X					X	X	X
European Skipper	X	X		X		X	X	X			X						X		
Least Skipper		X	X	X			X				X								
Skipper species		X	X					X	X	X		X	X						X
Total Species	**12**	**19**	**12**	**24**	**18**	**22**	**17**	**17**	**17**	**17**	**19**	**16**	**13**	**12**	**11**		**13**	**9**	**17**

Table 10. 2014 Bird Observations-All courses

Common Name	Scientific Name	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Acadian Flycatcher	*Empidonax flaviventris*		X							X								
American Black Duck	*Anas rubripes*					X												
American Coot	*Fulica americana*			X														
American Crow	*Corvus brachyrhynchos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
American Goldfinch	*Carduelis tristis*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
American Kestrel	*Falco sparverius*								X			X	X		X	X	X	
American Redstart	*Setophaga ruticilla*			X	X		X		X	X		X	X					
American Robin	*Turdus migratorius*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
American Tree Sparrow	*Spizella arborea*					X	X									X	X	X
American Wigeon	*Anas americana*																	
American Woodcock	*Scolopax minor*									X	X	X						
Bald Eagle	*Haliaetus leucocephalus*							X										
Baltimore Oriole	*Icterus galbula*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bank Swallow	*Riparia riparia*		X	X	X	X	X	X								X		
Barn Swallow	*Hirundo rustica*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Barred Owl	*Strix varia*														X			
Bay-breasted Warbler	*Dendroica castanea*		X	X			X											
Belted Kingfisher	*Megaceryle alcyon*	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Black-and-white Warbler	*Mniotilla varia*	X			X	X	X	X		X	X	X	X	X	X	X	X	X
Black-billed Cuckoo	*Coccyzus negrobrobus*		X		X		X	X	X		X	X	X					
Blackburnian Warbler	*Dendroica fusca*			X	X	X	X				X	X	X					
Black-capped Chickadee	*Parus atricapillus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Blackpoll Warbler	*Dendroica striata*							X										
Black-thr. Blue Warbler	*Dendroica caerulescens*								X									
Black-thr. Green Warbler	*Dendroica virens*	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
Blue Jay	*Cyanocitta cristata*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Blue-gray Gnatcatcher	*Polioptila caerulea*		X	X	X	X	X	X			X	X	X	X	X		X	X
Blue-headed Vireo	*Vireo solitarius*	X	X	X	X	X	X	X	X			X	X	X				
Blue-winged Teal	*Anas discors*		X		X					X								
Blue-winged Warbler	*Vermivora pinus*	X	X	X	X	X	X	X	X	X	X	X	X	X				X
Bobolink	*Dolichonyx oryzivorus*					X												
Broad-winged Hawk	*Buteo platypterus*									X								
Brown Creeper	*Certhia americana*	X		X								X	X		X	X	X	
Brown-headed Cowbird	*Molothrus ater*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Brown Thrasher	*Toxostoma rufum*	X	X	X		X	X	X	X	X	X	X	X	X	X			
Canada Goose	*Branta canadensis*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 10. 2014 Bird Observations-All courses

Common Name	Scientific Name	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Canada Warbler	*Wilsonia canadensis*																	
Cape May Warbler	*Dendroica tigrina*			X		X	X	X			X	X						
Carolina Wren	*Thryothorus ludovicianus*	X			X		X			X	X							
Cedar Waxwing	*Bombycilla cedrorum*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cerulean Warbler	*Dendroica cerulea*				X			X										
Chestnut-sided Warbler	*Dendroica pensylvanica*	X	X	X	X	X	X			X		X	X		X			
Chimney Swift	*Chaetura pelagica*				X			X	X									
Chipping Sparrow	*Spizella passerina*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Common Grackle	*Quiscalus quiscula*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Common Moorhen	*Gallinula chloropus*																	
Common Nighthawk	*Chordeiles minor*												X					
Common Yellowthroat	*Geothlypis trichas*	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Cooper's Hawk	*Accipiter cooperii*	X		X				X	X	X	X							X
Dark-eyed Junco	*Junco hyemalis*		X	X			X	X				X						
Double-crested Cormorant	*Phalacrocorax ayritus*							X	X		X							
Downy Woodpecker	*Picoides pubescens*	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Eastern Bluebird	*Sialia sialis*	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Eastern Kingbird	*Tyrannus tyrannus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Eastern Meadowlark	*Sturnella magna*	X	X		X	X	X	X	X	X	X	X	X				X	X
Eastern Phoebe	*Sayornis phoebe*		X	X	X		X		X	X	X	X	X	X	X		X	X
Eastern Screech-Owl	*Otus asio*						X											
Eastern Towhee	*Pipilo erythrophthalmus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Eastern Wood-pewee	*Contopus virens*	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
European Starling	*Sturnus vulgaris*	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Field Sparrow	*Spizella pusilla*	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Gadwall	*Anas strepera*						X	X										
Gray Catbird	*Dumetella carolinensis*	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Great Blue Heron	*Areda herodias*	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Great Crested Flycatcher	*Myiarchus crinitus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
Great Horned Owl	*Bubo virginianus*		X			X		X				X						
Green Heron	*Butorides striatus*			X	X	X	X	X	X	X	X	X	X	X	X		X	X
Golden-crowned Kinglet	*Regulus satrapa*										X	X						
Hairy Woodpecker	*Picoides villosus*			X				X	X	X	X	X	X		X		X	X
Hermit Thrush	*Catharus guttatus*		X							X								
Hooded Warbler	*Wilsonia citrina*									X	X							

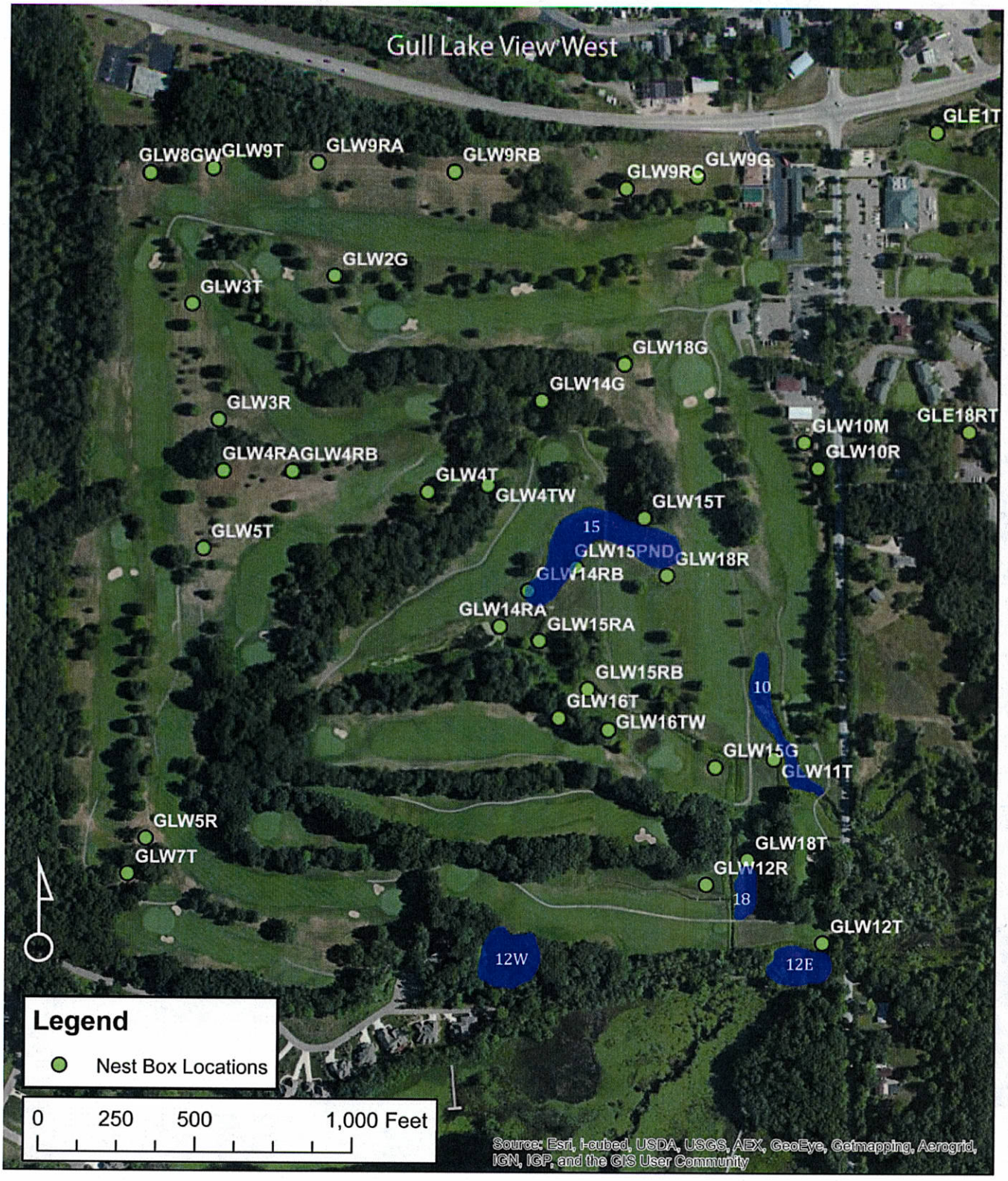
Table 10. 2014 Bird Observations-All courses

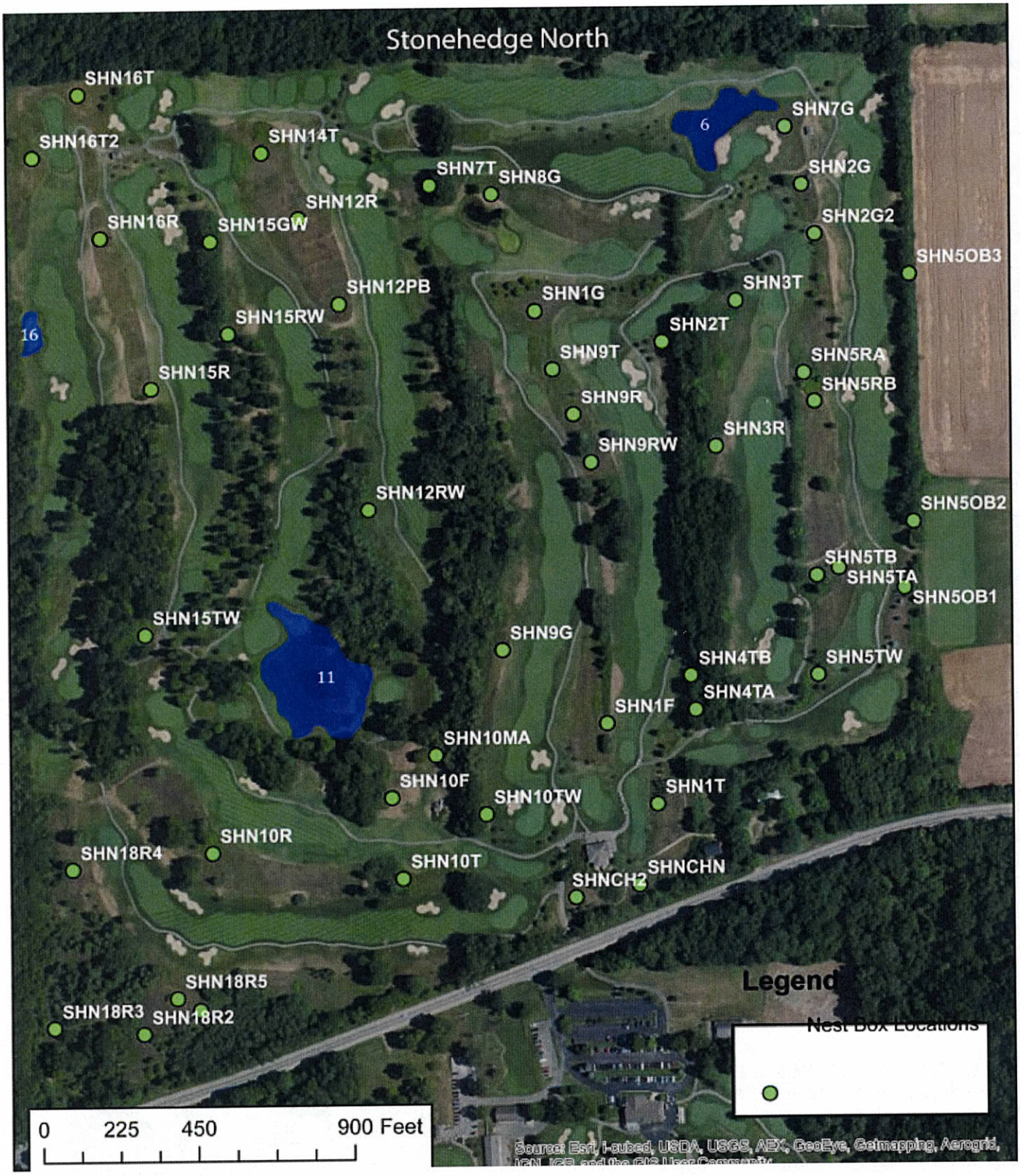
Common Name	Scientific Name	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Horned Grebe	*Podiceps auritus*				X													
Horned Lark	*Eremophila alpestris*	X	X		X	X	X	X	X							X		
House Finch	*Carpodacus mexicanus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
House Sparrow	*Passer domesticus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
House Wren	*Troglodytes aedon*			X	X	X	X	X	X	X	X	X	X	X	X		X	X
Indigo Bunting	*Passerina cyanea*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Killdeer	*Charadrius vociferus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Least Flycatcher	*Empidonax minimus*	X		X	X	X	X	X										
Louisiana Waterthrush	*Seiurus motacilla*							X	X									
Magnolia Warbler	*Dendroica magnolia*			X	X	X	X	X	X			X	X					
Mallard	*Anas platyrhynchos*	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Marsh Wren	*Cistothorus palustris*															X		
Mourning Dove	*Zenaida macroura*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mute Swan	*Cygnus olor*		X		X	X	X	X	X	X	X	X	X	X	X			
Nashville Warbler	*Vermivora ruficapilla*	X	X		X	X	X	X	X			X	X	X	X			X
Northern Bobwhite	*Colinus virginianus*									X								
Northern Cardinal	*Cardinalis cardinalis*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Northern Flicker	*Colaptes auratus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X
Northern Parula	*Parula americana*												X					
N. Rough-winged Swallow	*Stelgidopteryx ruficollis*	X	X	X	X	X	X	X	X							X		
Northern Waterthrush	*Seiurus noveboracensis*					X	X											
Olive-sided Flycatcher	*Contopus borealis*						X											
Osprey	*Pandion haliaetus*										X				X			
Ovenbird	*Seiurus aurocapillus*					X	X	X	X		X	X	X	X	X			
Palm Warbler	*Dendroica palmarum*			X			X	X	X	X			X	X	X			X
Pied-billed Grebe	*Podilymbus podiceps*							X										
Pileated Woodpecker	*Dryocopus pileatus*						X	X		X	X		X	X	X		X	
Pine Siskin	*Carduelis pinus*																	
Pine Warbler	*Dendroica pinus*			X				X	X			X	X	X	X			X
Purple Finch	*Carpodacus purpureus*																	
Purple Martin	*Progne subis*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Red-bellied Woodpecker	*Melanerpes carolinus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Red-breasted Nuthatch	*Sitta canadensis*					X				X			X	X				
Red-eyed Vireo	*Vireo olivaceus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

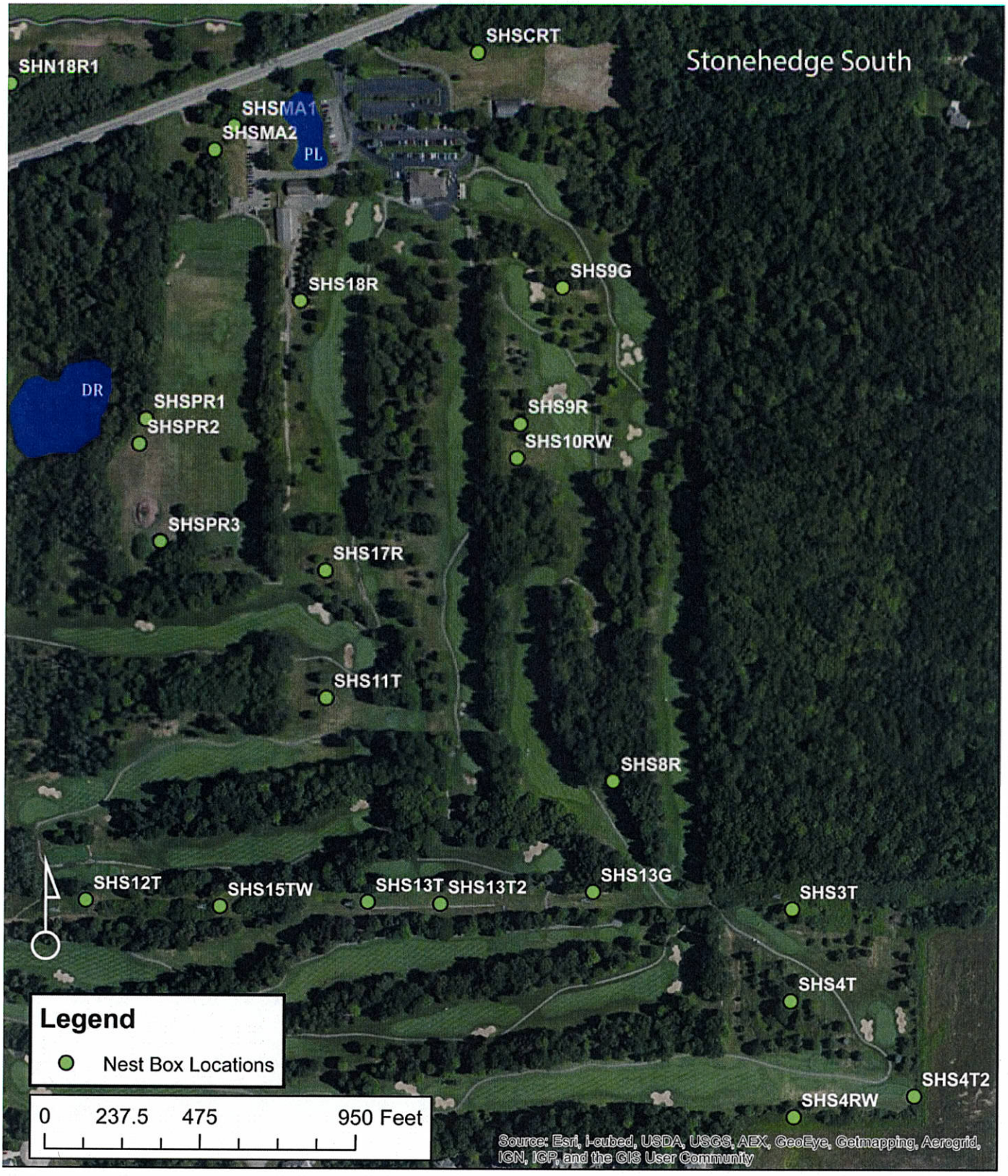
Table 10. 2014 Bird Observations-All courses

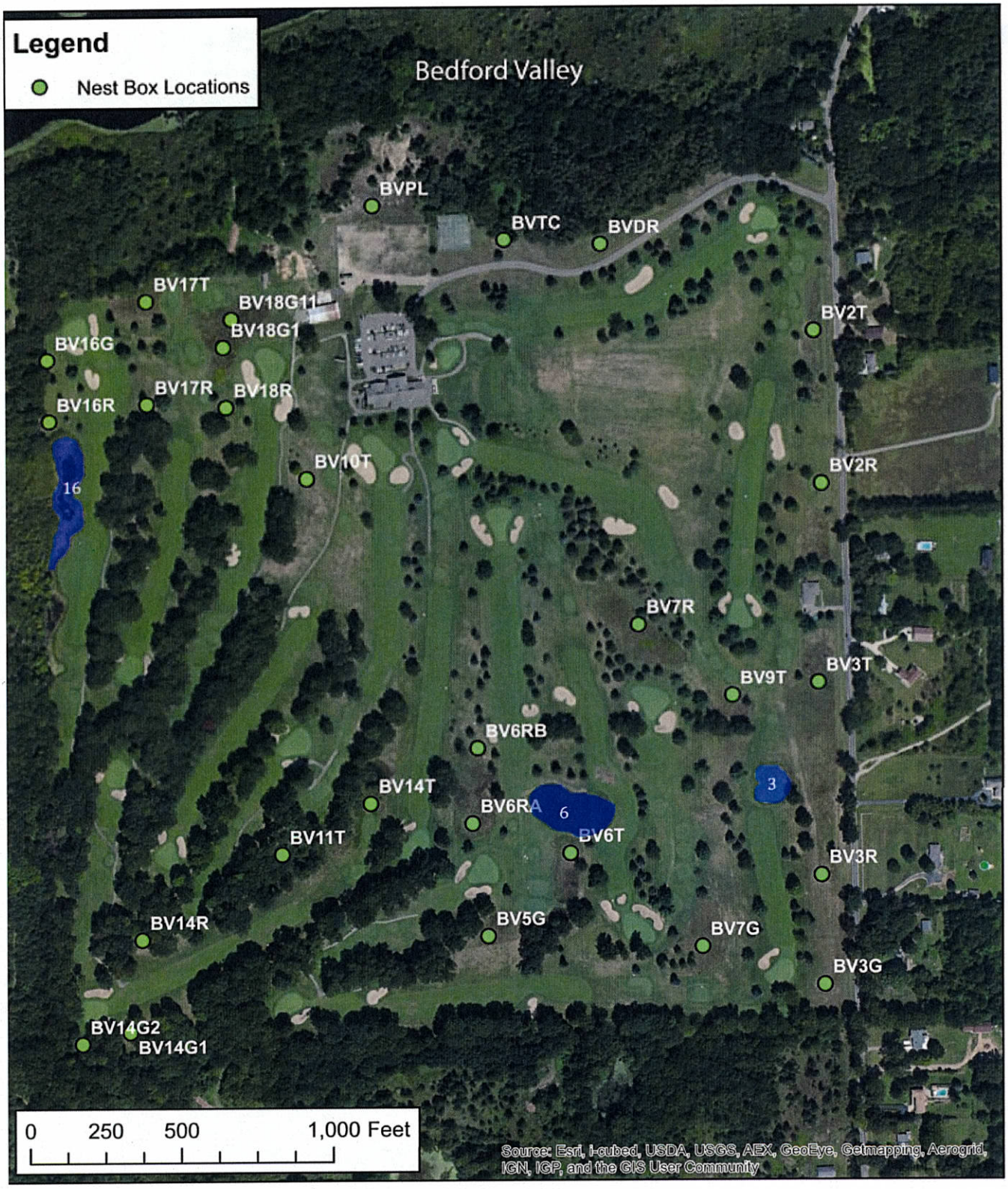
Common Name	Scientific Name	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Red-headed Woodpecker	*Melanerpes erythrocephalus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Red-tailed Hawk	*Buteo jamaicensis*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Red-shouldered Hawk	*Buteo lineatus*											X						
Red-winged Blackbird	*Agelaius phoeniceus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ring-billed Gull	*Larus delawarensis*	X	X		X		X	X	X	X			X	X	X	X	X	X
Ring-necked Pheasant	*Phasianus colchicus*						X	X	X									
Rock Dove	*Columba livia*							X	X									
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ruby-crowned Kinglet	*Regulus calendula*		X	X			X	X	X				X	X	X			X
Ruby-throated Hummingbird	*Archilochus colubris*	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X
Sandhill Crane	*Grus canadensis*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Savannah Sparrow	*Passerculus sandwichensis*		X	X	X								X	X	X			
Scarlet Tanager	*Piranga olivacea*	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Sharp-shinned Hawk	*Accipiter striatus*									X	X	X				X	X	
Solitary Sandpiper	*Tringa solitaria*	X						X	X	X	X	X						
Song Sparrow	*Melospiza melodia*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sora	*Porzana carolina*	X					X						X					
Spotted Sandpiper	*Actitis macularia*			X					X							X		
Swainson's Thrush	*Catharus ustulatus*	X		X	X		X	X	X									
Swamp Sparrow	*Melospiza georgiana*		X	X			X	X	X									
Tennessee Warbler	*Vermivora peregrina*				X	X	X	X			X	X	X	X	X			
Tree Swallow	*Tachycineta bicolor*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Trumpeter Swan	*Cygnus buccinator*			X	X	X		X		X			X	X	X	X	X	X
Tufted Titmouse	*Parus bicolor*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Turkey Vulture	*Cathartes aura*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Veery	*Catharus fuscescens*						X											
Vesper Sparrow	*Pooecetes gramineus*							X										
Warbling Vireo	*Vireo gilvus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
White-breasted Nuthatch	*Sitta carolinensis*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
White-crowned Sparrow	*Zonotrichia leucophrys*			X	X	X	X	X	X		X		X	X	X	X	X	X
White-throated Sparrow	*Zonotrichia albicollis*	X		X			X	X	X		X	X	X	X	X	X	X	X
Wild Turkey	*Meleagris gallopavo*		X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Willow Flycatcher	*Empidonax traillii*			X				X	X									
Wilson's Warbler	*Wilsonia pusilla*																	
Winter Wren	*Troglodytes troglodytes*																	
Wood Duck	*Aix sponsa*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Wood Thrush	*Hylocichla mustelina*			X		X			X	X	X	X	X	X	X			X
Yellow Warbler	*Dendroica petechia*	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X
Yellow-bellied Flycatcher	*Empidonax flaviventris*	X				X												
Yellow-bellied Sapsucker	*Sphyrapicus varius*									X								
Yellow-billed Cuckoo	*Coccyzus americanus*		X	X	X		X	X	X	X	X	X	X	X	X	X	X	
Yellow-rumped Warbler	*Dendroica coronata*	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
Yellow-throated Vireo	*Vireo flavifrons*	X	X	X	X	X	X	X	X		X	X	X	X	X			
Total Species		**74**	**85**	**84**	**85**	**95**	**103**	**95**	**80**	**82**	**81**	**92**	**84**	**79**	**74**	**54**	**68**	**71**

Appendix I- Maps for Nestbox Locations and Ponds


Gull Lake View West
GLE1T
GLW8GW
GLW9T
GLW9RA
GLW9RB
GLW9RC
GLW9G
GLW2G
GLW3T
GLW18G
GLW14G
GLW3R
GLW10M
GLE18RT
GLW10R
GLW4RA
GLW4RB
GLW4T
GLW4TW
GLW15T
GLW5T
15
GLW15PND
GLW18R
GLW14RB
GLW14RA
GLW15RA
GLW15RB
10
GLW16T
GLW16TW
GLW15G
GLW11T
GLW5R
GLW7T
GLW18T
GLW12R
18
GLW12T
12W
12E
Legend
Nest Box Locations
0
250
500
1,000 Feet
Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community


Stonehedge North
SHN16T
SHN16T2
SHN14T
SHN7T
SHN8G
SHN12R
SHN16R
SHN15GW
6
SHN7G
SHN2G
SHN2G2
SHN5OB3
SHN12PB
SHN1G
SHN3T
SHN15RW
16
SHN2T
SHN9T
SHN5RA
SHN15R
SHN5RB
SHN9R
SHN3R
SHN9RW
SHN12RW
SHN5OB2
SHN5TB
SHN5TA
SHN5OB1
SHN15TW
SHN9G
11
SHN4TB
SHN5TW
SHN4TA
SHN1F
SHN10MA
SHN10F
SHN10TW
SHN1T
SHN10R
SHN18R4
SHN10T
SHNCHN
SHNCH2
SHN18R5
SHN18R3
SHN18R2
Legend
Nest Box Locations
0
225
450
900 Feet
Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid,


Stonehedge South
SHSCRT
SHN18R1
SHSMA1
SHSMA2
PL
SHS18R
SHS9G
DR
SHSPR1
SHSPR2
SHS9R
SHS10RW
SHSPR3
SHS17R
SHS11T
SHS8R
SHS12T
SHS15TW
SHS13T
SHS13T2
SHS13G
SHS3T
SHS4T
SHS4T2
SHS4RW
Legend
Nest Box Locations
0 237.5 475 950 Feet
Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community


Legend
Nest Box Locations
Bedford Valley
BVPL
BVTC
BVDR
BV17T
BV18G11
BV18G1
BV16G
BV2T
BV16R
BV17R
BV18R
16
BV10T
BV2R
BV7R
BV9T
BV3T
BV6RB
3
BV14T
BV6RA
6
BV6T
BV11T
BV3R
BV14R
BV5G
BV7G
BV3G
BV14G2
BV14G1
0
250
500
1,000 Feet
Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Appendix II- Nestbox Recommendations

Nestbox	Recommendation
GLVE 15G	Box is dilapidated, remove or upgrade
GLVE 3T	Move, overgrown by mid-summer
STOS 4RW	Relocate or remove- poison ivy
STON18 R3, R2	Relocated- hard to access
STOS PR 1,2,&3	Dominated by house sparrows. Consider moving
GLVE 18V	Box could be considered down range of driving range. Could be relocated

References

"Basic Information about Nitrate in Drinking Water." *Basic Information about Nitrate in Drinking Water*. Environmental Protection Agency, 5 Feb. 2014.

Pinkowski, B. C. (1977). Breeding adaptations in the Eastern Bluebird. *Condor*, 289-302.