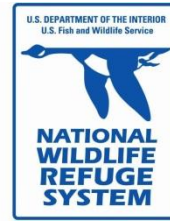


# Detroit River Hawk Watch

## 2012 Season Summary



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## ABSTRACT

The 2012 count represented the 30th consecutive year of monitoring diurnal raptor and turkey vulture migration from the mouth of the Detroit River and the 15th year of consistent coverage at Lake Erie Metropark (LEMP). There were 619 hours of data collection with counts conducted on 88 days between 1 September and 30 November. A total of 93,110 raptors of 16 species were recorded. Only one species, bald eagle (*Haliaeetus leucocephalis*), was detected above its long-term average (LTA) since 1998. One other species, Swainson's hawk (*Buteo swainsoni*), was detected in average numbers. All other species were detected below their LTA (turkey vulture [*Cathartes aura*], sharp-shinned hawk [*Accipiter striatus*], Cooper's hawk [*Accipiter cooperii*], northern goshawk [*Accipiter gentilis*], broad-winged hawk [*Buteo platypterus*], red-shouldered hawk [*Buteo lineatus*], red-tailed hawk [*Buteo jamaicensis*], rough-legged hawk [*Buteo lagopus*], golden eagle [*Aquila chrysaetos*], northern harrier [*Circus cyaneus*], American kestrel [*Falco sparverius*], merlin [*Falco columbarius*] and peregrine falcon [*Falco peregrinus*]). Wind measurements taken from ground-level were compared with measurements from an Automated Weather Observing Station (AWOS IIIP). Measurements taken at a higher altitude using automated equipment might better represent conditions that migrating raptors experience. Further study is necessary to provide a fuller understanding of the best way to assess wind speed and direction at LEMP.

## METHODS

An hourly count of diurnal raptors was conducted each day between 1 September and 30 November 2012. 619 hours of coverage occurred at the Lake Erie Metropark Boat Launch (LEMP; N 42.0792, W 83.1937). Observations began at 07:00 EST and ended at 15:00 EST until 25 October when, due to declining day length, the official sunrise was one hour later than on 1 September. After 25 October, the count began at 08:00 EST and ended at 15:00 EST. All counting was conducted by allowing observers to freely scan the skies with 8 to 10X magnification binoculars. Spotting scopes with 20 to 60X magnification were used only to confirm the identification of raptors previously sighted using 8 to 10X magnification binoculars. Days with excessive rain, exceptionally strong winds, or heavy fog were excluded. Raptors were determined to be migrating if they were observed crossing (and not returning) an imaginary line originating at the observer and running to the northwest and southeast.

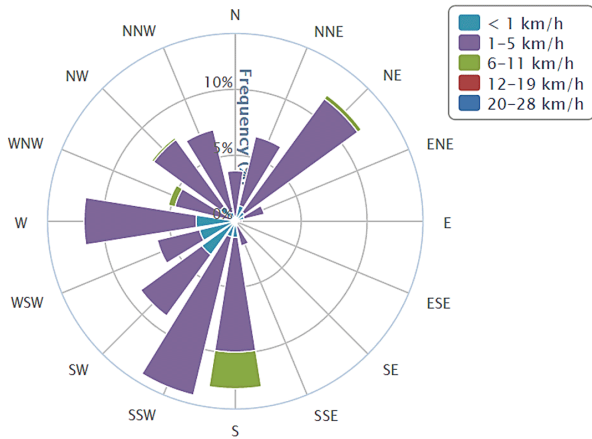
Wind direction and speed, cloud cover, visibility, precipitation, humidity, and temperature were collected at the beginning of each hour with a Kestral 3000®, Nielsen-Kellerman, by the counter standing at the count site. Counts attempted to estimate birds exiting kettles in a stream-like fashion during periods of large migration volume.

Results are reported in relation to LEMP's long-term averages since 1998 when consistent coverage began there.

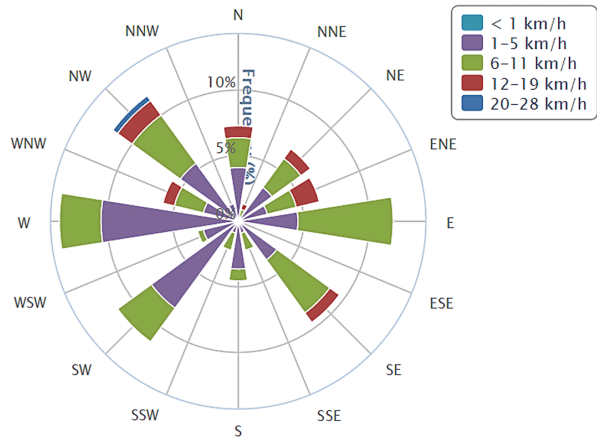
## USE OF WIND MAGNITUDE AND DIRECTION

Wind influences the observed migration of raptors at Detroit River Hawk Watch. However, wind measurements observed at ground level differed from wind measurements taken from nearby Grosse Ile Municipal Airport (KONZ 42° 5' 50.75" N, 83° 10' 0.06" W), which employs a National Weather Service Automated Weather Observing Station (an AWOS IIIP) elevated at 10 m.

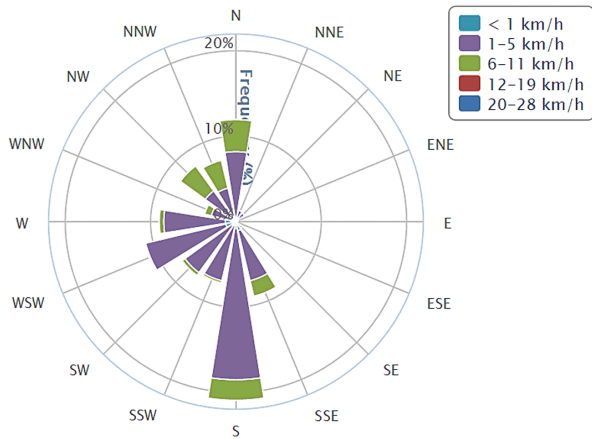
Grosse Ile Muni 0700-1500 – September 2012  
Source: National Climate Data Center



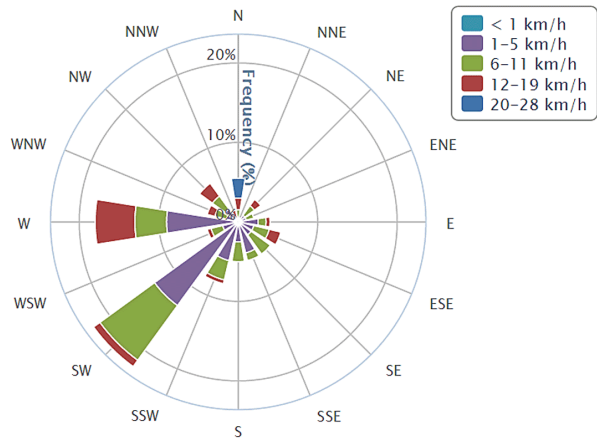
Detroit River Hawk Watch – September 2012  
Source: Detroit River Hawk Watch



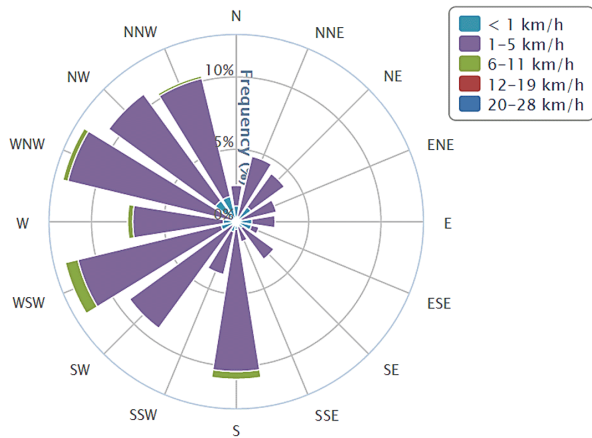
Grosse Ile Muni 0700-1500 – October 2012  
Source: National Climate Data Center



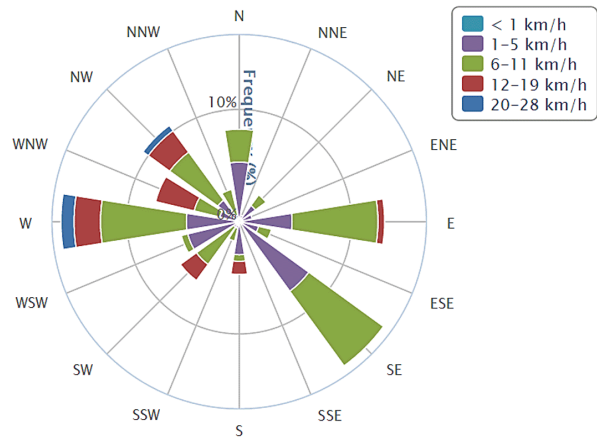
Detroit River Hawk Watch – October 2012  
Source: Detroit River Hawk Watch



Grosse Ile Muni 0700-1500 – November 2012  
Source: National Climate Data Center



Detroit River Hawk Watch – November 2012  
Source: Detroit River Hawk Watch



**Figure 1 Comparison of Wind Magnitude and Direction Between Observation Points**

This reference climate station is 3.5 kilometers northeast of the Lake Erie Metropark Boat Launch and is also located on the lake.

Side-by-side comparisons of the data from both observation points reveal differences in both the magnitude and direction of wind throughout the entirety of the count season. This discrepancy might be explained by the differences in altitude between the human observer and the AWOS IIP, a difference in altitude that might be great enough to explain the measured differences (Lofgren). Because wind speed and direction play such a key role in the observed migration of raptors at LEMP, further study should be undertaken to find the best way to most accurately measure the two.

## **MONTHLY REPORTS**

### **September**

In falls past, south winds prevailed in September, but during the 2012 season, the month featured no consistent wind direction. Expecting a typically slow start to the season, a brief run of northeast wind brought some consistent movement to the first ten days of the month, highlighted by a solid early showing of sharp-shinned hawks (78) and Cooper's hawks (9) on 5 September and of osprey (7), bald eagles (9), northern harriers (10) and American kestrels (41) on 6 September. Broad-winged hawks were on the move as well with three early September days featuring triple digit counts, the highest of which occurred on 10 September when 538 individuals of this species were detected.

Flight conditions deteriorated, however, during the week spanning 11 September to 17 September. Many days featured a poor wind direction or overcast skies and movement was limited as a result. Falcons were the most active species during this period with a seasonal high count of 51 American kestrels seen on 15 September and a seasonal high count of 3 peregrine falcons seen on 13 September. Broad-winged hawk activity began to pick up on 18 September and 19 September when flight conditions improved slightly. Both days featured separate counts of 4,444 and 2,278 individuals, which is low for peak passage window of this species.

Due to a continuing run of poor flight conditions, very limited movement occurred over the next three days, 20 September to 22 September. Finally, on 23 September, despite some light rain and overcast skies, a big flight day materialized and 30,278 broad-winged hawks were counted, the latest peak flight since 2006, when 30,547 broad-winged hawks were recorded on 26 September. Not to be overlooked, the day also featured a monthly high of 21 bald eagles, the season's first real movement of red-tailed hawks (13) and a triple digit showing for sharp-shinned hawks (107).

There was some residual migration on 24 September (particularly a seasonal high count of 189 sharp-shinned hawks), but not until the last four days of the month, 27 September to 30 September, did movement begin to pick up in earnest. Accipiter, Buteo, northern harrier and turkey vulture movement increased considerably. During September's last four days, 3,126 turkey vultures, 51 northern harriers, 448 sharp-shinned hawks, 77 Cooper's hawks, 122 red-tailed hawks and 18 red-shouldered hawks were counted, a significant proportion of the monthly total for each species. Additionally, on 27 September, another 2,020 broad-winged hawks were counted along with the season's first northern goshawk, an uncommonly early first sighting for this species.

## October

In many past seasons, northerly winds prevailed in October. But for the second fall in a row, the month's dominant wind direction was southerly. Winds had a southerly component for 51% of the count hours and only 30% of the count hours featured winds with a northerly component. The lack of favorable wind likely minimized movement. Several species were seen in below average numbers over the course of the month and the customary late-October peak for golden eagles and red-shouldered, red-tailed and rough-legged hawks never materialized. Instead those species peaked during the early part of November.

Heavy cloud cover and southerly wind conspired to keep movement to a minimum during the first seven days of October. Of note, the season's first golden eagle was observed on 4 October, and the season's first rough-legged hawk was observed on 7 October. These are early first sightings for two species more commonly seen during the latter portion of the season. From 8 October to 12 October, turkey vulture numbers began to build in accordance with the traditional peak of movement for this species. A total of 21,409 turkey vultures were tallied during those five days, culminating with a seasonal high count of 10,671 on 12 October. On 8 October, a seasonal high count of 22 bald eagles and a monthly high count of 36 American kestrels were seen.

After the large vulture flight on 12 October, a lengthy stretch of limited movement occurred until 21 October. During that period, 16 October was the only day that featured significant movement with a monthly high of eight northern harriers and sharp-shinned, Cooper's, red-tailed and red-shouldered hawks seen in good numbers. The season's day of greatest variety came on 21 October when 12 individual species were noted.

From 21 October to 28 October, there were 132 Cooper's hawks, 139 red-shouldered hawks and 543 red-tailed hawks seen, an overwhelming proportion of the monthly total for each species. For Cooper's hawks, there was a much later peak of movement this year than the usual early October peak customarily seen at this site. The last three days of October lacked consistent coverage due to the high winds and rain caused by the lingering effects of Hurricane Sandy.

## November

After the effects of the hurricane moved through the area, flight conditions quickly improved with the start of a new month. Northerly wind and partly cloudy skies prevailed during the first eight days of November, producing the most consistent high volume movement of the season, particularly Buteos and golden eagles.

As might be expected with steady north wind, the first week of November was by far the liveliest of the month. A seasonal high count of red-tailed hawks (501) occurred on 3 November, a seasonal high count of red-shouldered hawks (53) occurred on 4 November and a seasonal high count of golden eagles (9) occurred on 5 November. All told, 4,160 turkey vultures, 1,796 red-tailed hawks, 196 red-shouldered hawks and 38 golden eagles were counted during the eight-day period. Also of note, seasonal high counts for rough-legged hawk (4) and northern goshawk (3) were achieved on 3 November and 7 November, respectively.

After the north wind came to a halt on 8 November, migrating raptors were few and far between. For much of the three week period spanning 9 November to 30 November, conditions were less than ideal and many days featured counts in the single digits. On more than one occasion, excessive fog limited visibility considerably. Other times, the wind was too light to entice any

movement of raptors. On some days, conditions appeared to be favorable for migration, but there was still minimal movement noted.

The most active time of the three-week period occurred during a four-day stretch from 15 November to 18 November when the season's last push of red-tailed hawks and turkey vultures made their way south. During that four-day period, 147 turkey vultures and 114 red-tailed hawks were tallied, the last regular movement for either species. Toward the end of the season, bald eagles began to be seen with greater frequency and 13 individuals of that species were tallied during the season's last week.



# SPECIES ACCOUNTS

## Turkey Vulture

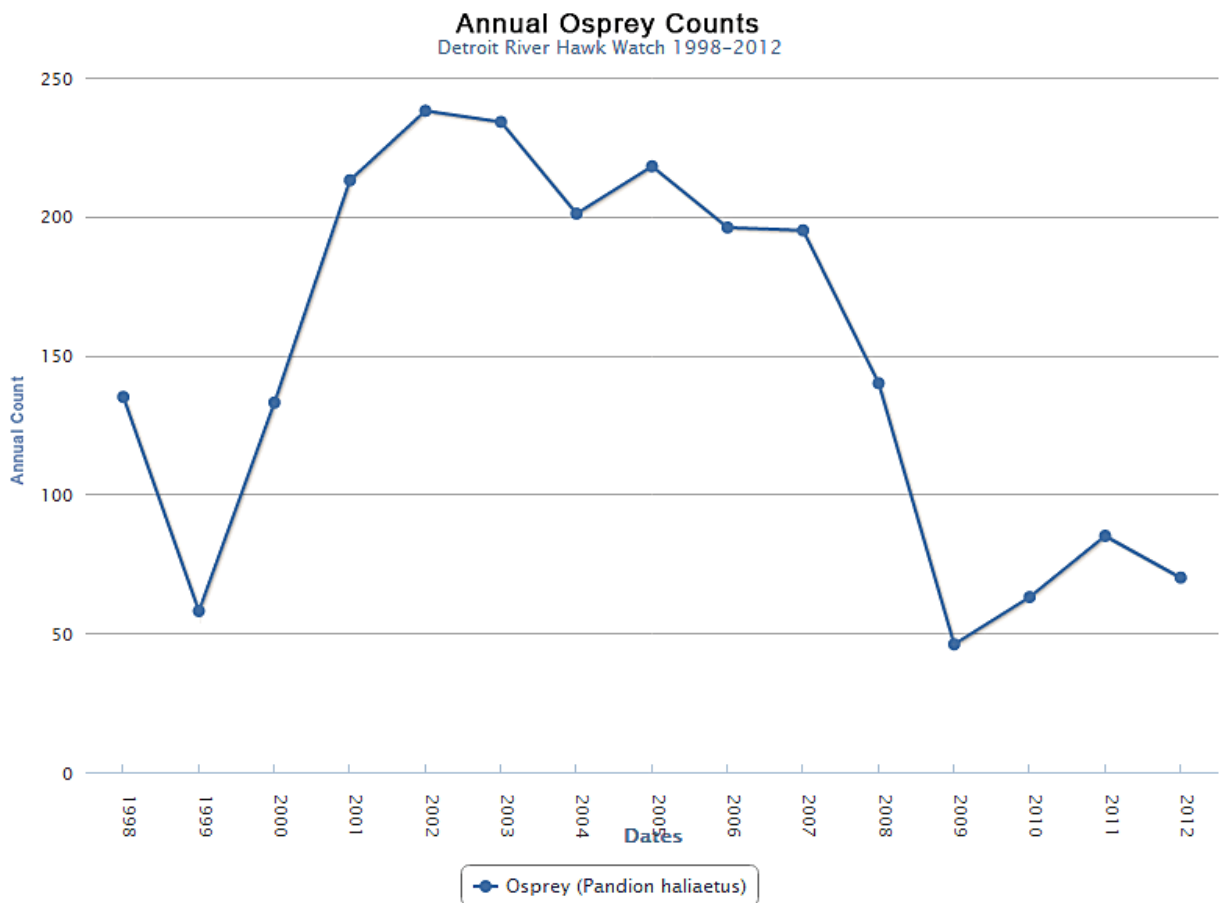
43,285 between 1 September and 18 November was 5.2 percent below the previous 14-year mean for LEMP. Turkey vulture numbers were down slightly from last season's 52,745, but were very much in line with the number of individuals we typically see at this site. This year's high count day was close to our usual peak of 9 October.

High Count: (10,671) 12 October

## Osprey

70 between 1 September and 27 October was 54.5 percent below the previous 14-year average for LEMP. Osprey numbers remained low for a fourth straight year, again failing to break triple digits, which had been a common occurrence for much of the site's history.

High Count: (7) 6 September

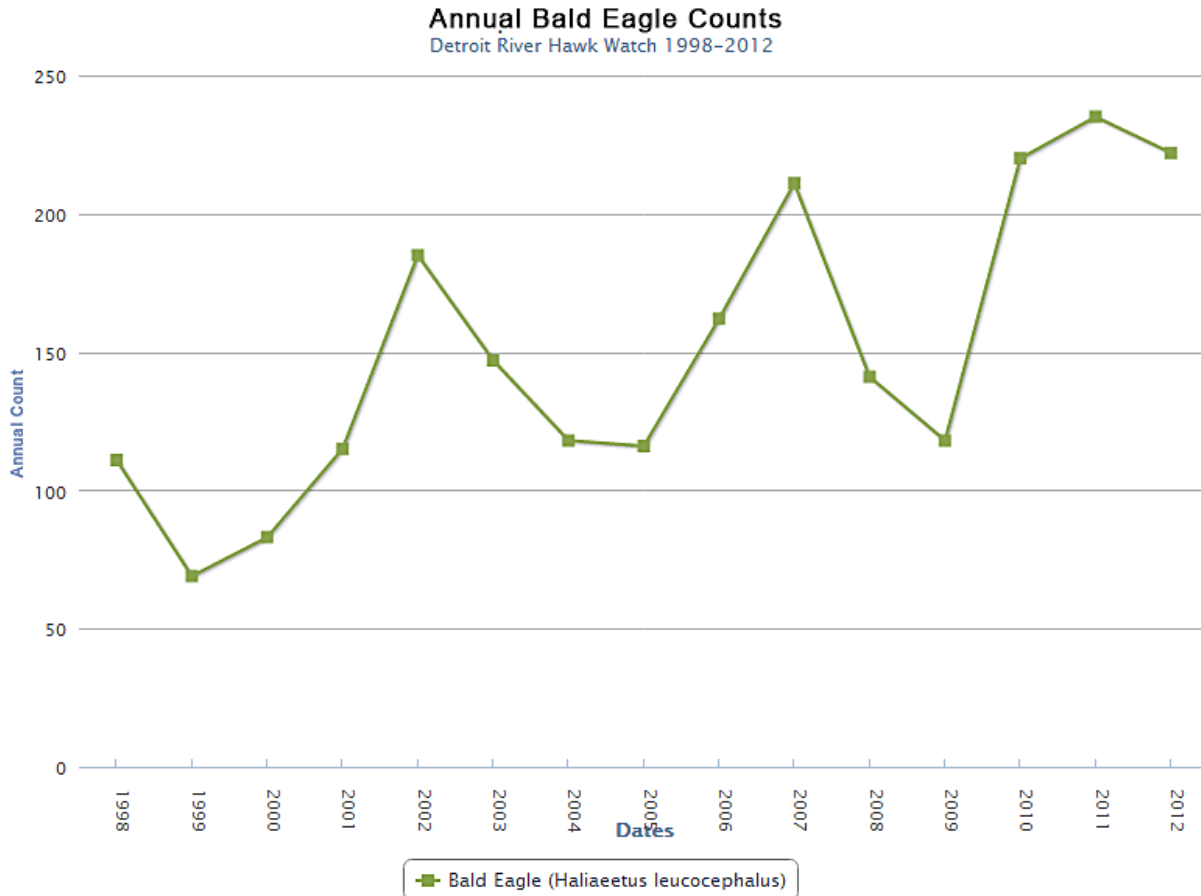


**Figure 2 Osprey Numbers Have Continued to Decline Since 2002**

## Bald Eagle

222 between 1 September and 29 November was 53.0 percent above the previous 14-year average for LEMP. Building on recent strong showings, bald eagle numbers eclipsed 200 individuals observed for a third consecutive season.

High Count: (22) 8 October



**Figure 3 Only Bald Eagles Appeared at Above Their Long-Term Average Counts**

## Northern Harrier

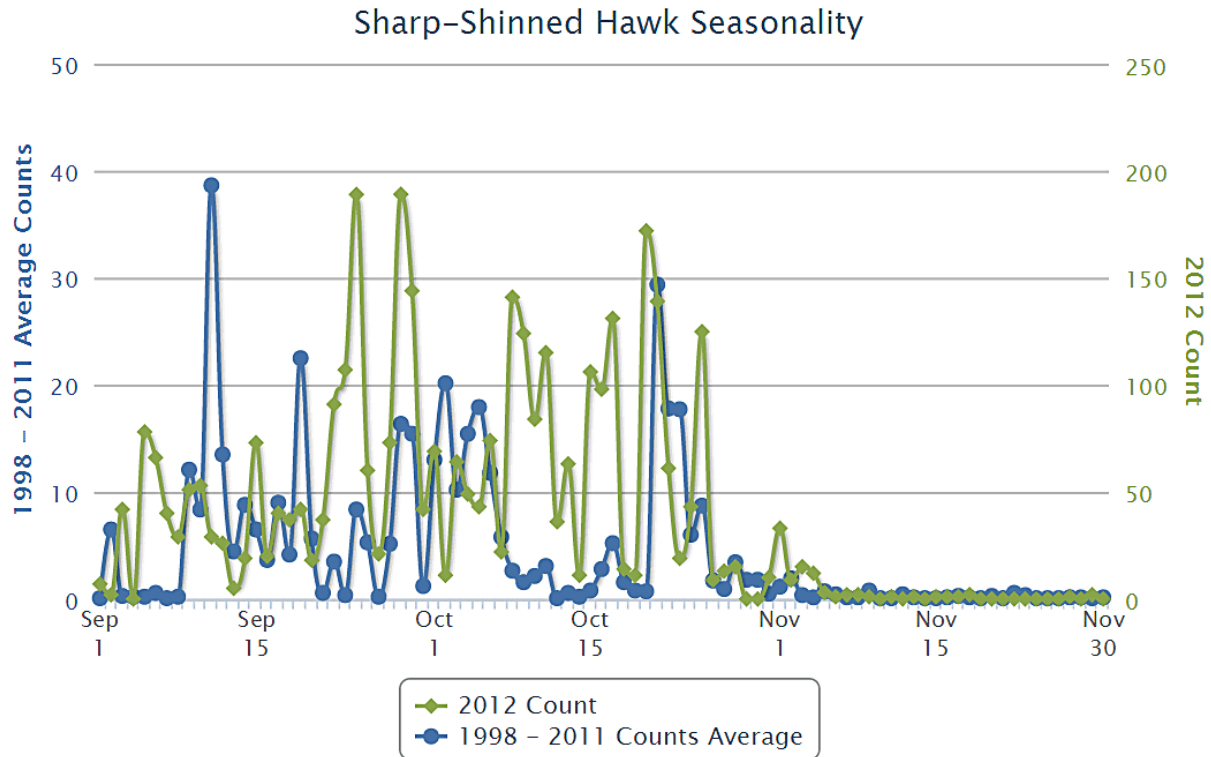
248 between 1 September and 28 November was 50.1 percent below the previous 14-year average for LEMP. Highly cyclical at this watch site, 2012 was another relatively low season for northern harriers.

High Count: (19) 28 September

## Sharp-shinned Hawk

3,590 between 1 September and 29 November was 48.5 percent below the previous 14-year average for LEMP. Sharp-shinned hawk numbers declined for a third straight season. This season's high count days were noticeably later than the usual mid-September peak for this species suggesting low productivity this year since most adults migrate after juveniles.

High Count: (189) 24 September and 28 September

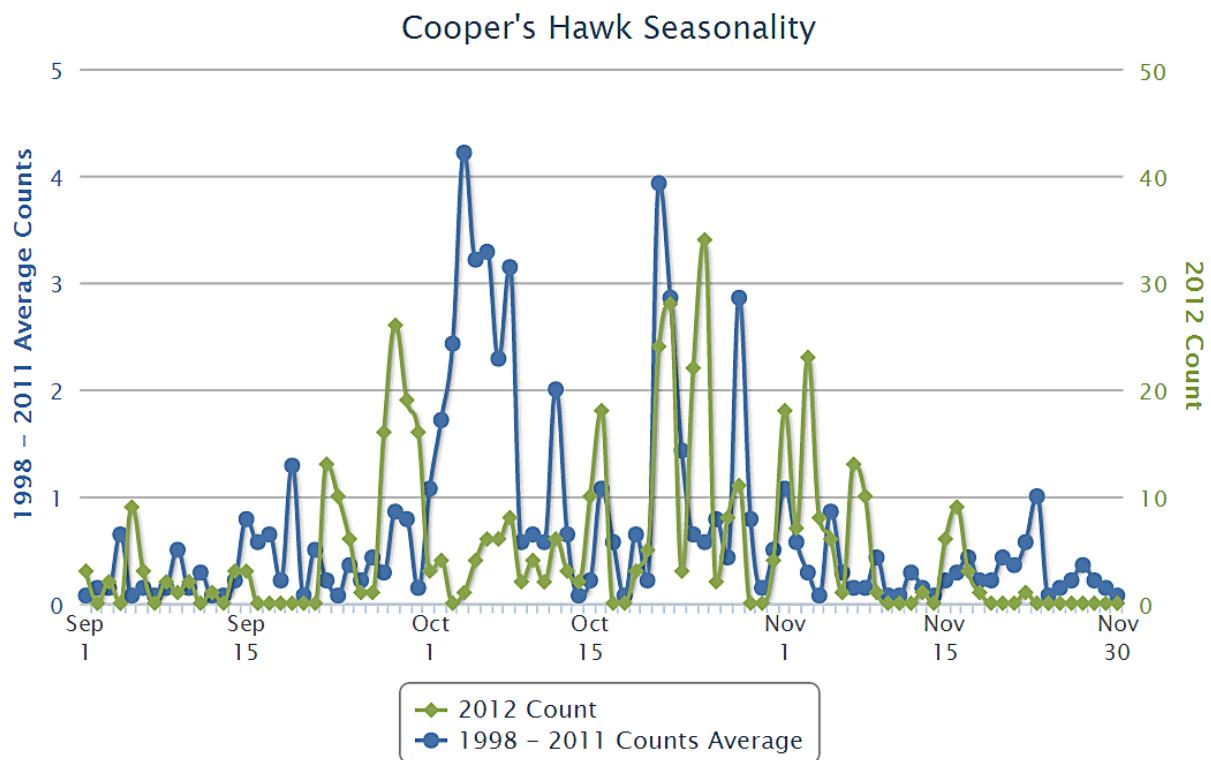


**Figure 4 Notably Later Sharp-shinned Hawk Movement in 2012 Suggests Low Productivity**

## Cooper's Hawk

468 between 1 September and 22 November was 13.0 percent below the previous 14-year average for LEMP. After a robust 2011 season, Cooper's hawk numbers declined precipitously, finishing the fall with their lowest total since 2009. Like sharp-shinned hawks, peak Cooper's hawk activity occurred much later than usual, with high counts recorded during late October rather than the more common early October peak, suggesting low productivity this year since most adults migrate after juveniles.

High Count: (34) 25 October



**Figure 5 Overall lower Cooper's Hawk Numbers Combined with Later Movement Suggest Low Productivity**

## Northern Goshawk

18 between 27 September and 15 November was 27.2 percent below the previous 14-year average for LEMP. All northern goshawks seen well enough to be aged were juvenile. No adults of this species were detected.

High Count: (3) 7 November

## Red-shouldered Hawk

450 between 27 September and 29 November was 32.2 percent below the previous 14-year average for LEMP. While Red-shouldered hawks were down again this season when compared to our historical average, the number of individuals seen remained close to the totals for the

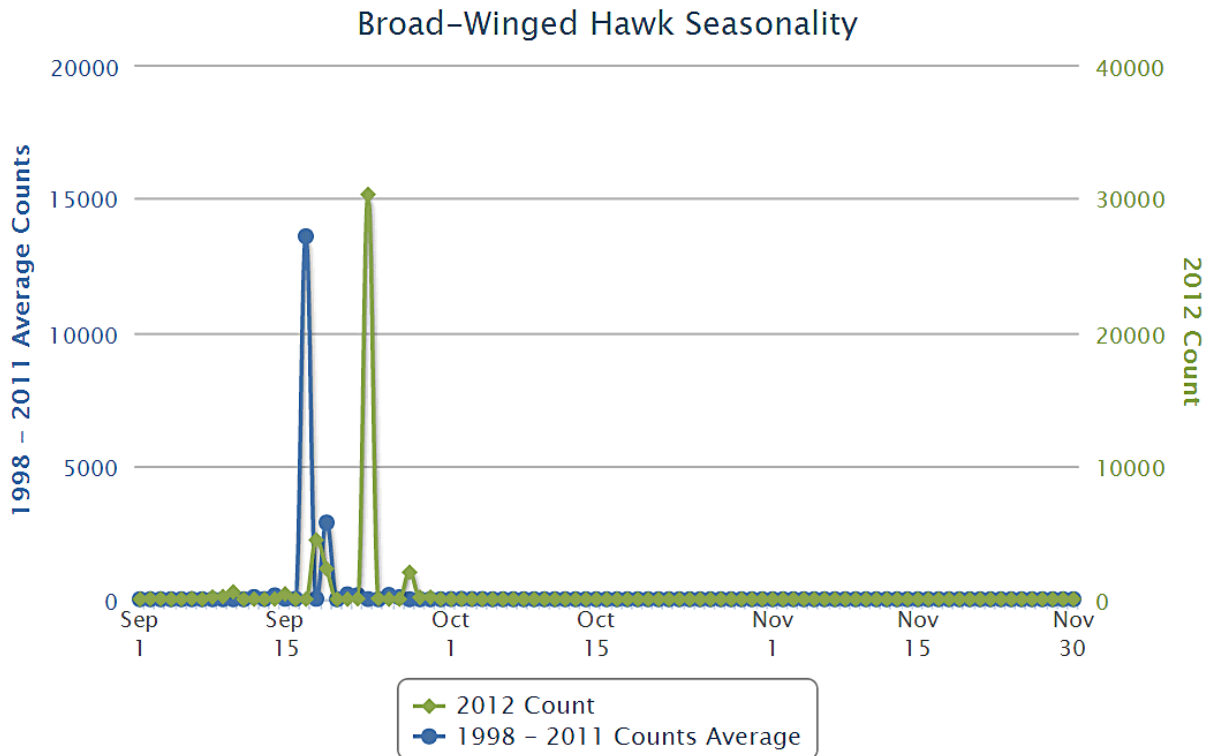
previous two seasons. Also, compared to 2011, this season saw an increase in the number of juvenile birds detected.

High Count: (53) 4 November

### Broad-winged Hawk

40,923 between 1 September and 13 October was 36.2 percent below the previous 14-year average for LEMP. After last season's record high, 2012 represented the fifth lowest broad-winged hawk total in the history of LEMP. Interestingly, this season's high count day was the latest peak flight since 2006, when 30,547 broad-winged hawks were recorded on 26 September.

High Count: (30,278) 23 September



**Figure 6 2012 was the latest peak of Broad-winged Hawks Since 2006.**

### Swainson's Hawk

4 between 19 September and 28 October was 13.8 percent below the previous 14-year average for LEMP. The Swainson's hawk observed on 28 October was the first October record for this species since 2009.

High Count: (2) 23 September

### **Red-tailed Hawk**

2,986 between 1 September and 29 November was 40.3 percent below the previous 14-year average for LEMP. Red-tailed hawk numbers dropped to below 3,000 for the first time since 2009.

High Count: (501) 3 November.

### **Rough-legged Hawk**

14 between 7 October and 17 November was 65.2 percent below the previous 14-year average for LEMP. Rough-legged hawk numbers remained low for a seventh straight season. Not since 101 were recorded in 2004 have rough-legged hawk sightings reached 30 individuals.

High Count: (4) 28 October and 3 November

### **Golden Eagle**

51 between 4 October and 28 November was 52.7 percent below the previous 14-year average for LEMP. After a strong 2011 season, golden eagles were seen in their lowest numbers since 2005, when only 45 were recorded.

High Count: (9) 5 November

### **American Kestrel**

531 between 14 September and 9 November was 47.6 percent below the previous 14-year average for LEMP. American kestrel numbers were down a bit from the previous two seasons, but were very much in line with the numbers we've seen of this species over the last five years.

High Count: (51) 15 September

### **Merlin**

38 between 1 September and 3 November was 18.2 percent below the previous 14-year average for LEMP. Highly variable from season to season, merlins were seen in numbers closer to our historical average this season.

High Count: (3) 18 September, 19 September, 20 October and 21 October

### **Peregrine Falcon**

30 between 13 September and 27 October was 28.6 percent below the previous 14-year average for LEMP. Another highly cyclical species, peregrine falcons were seen in below average numbers for a second consecutive fall. Of those peregrines seen well enough to be aged, eight were aged to juvenile and ten were aged to adult.

High Count: (3) 13 September

Table 1 1998–2012 data from Lake Erie Metropark with the 2012 percent deviation from the previous 14-year mean. Seasonal records in bold. See Table 2 List of Species for a reference to the species codes.

	<b>Hours</b>	<b>TV</b>	<b>OS</b>	<b>BE</b>	<b>NH</b>	<b>SS</b>	<b>CH</b>	<b>NG</b>	<b>RS</b>	<b>BW</b>
<b>1998</b>	451.3	19,743	135	111	807	4,968	378	17	517	63,689
<b>1999</b>	481	17,559	58	69	556	6,534	299	23	556	45,711
<b>2000</b>	510.2	29,421	133	83	138	7,132	408	<b>49</b>	875	57,585
<b>2001</b>	526	28,237	213	115	757	<b>14,715</b>	693	46	858	19,386
<b>2002</b>	561.5	42,644	<b>238</b>	185	696	7,307	572	22	962	91,499
<b>2003</b>	545.3	54,975	234	147	<b>1,005</b>	10,643	709	28	533	84,085
<b>2004</b>	478.8	36,893	201	118	214	5,027	461	<b>49</b>	869	27,381
<b>2005</b>	456.3	29,699	218	116	291	5,623	432	18	299	56,229
<b>2006</b>	475.8	51,722	196	162	616	7,013	628	7	1,019	50,718
<b>2007</b>	598.5	62,882	195	211	818	9,909	724	6	<b>1,026</b>	69,574
<b>2008</b>	464.9	35,173	140	141	149	3,593	294	10	185	36,216
<b>2009</b>	519.4	54,989	46	118	169	3,259	335	24	615	20,016
<b>2010</b>	564.5	<b>122,325</b>	63	220	465	6,504	<b>834</b>	21	488	79,572
<b>2011</b>	591.5	52,745	85	<b>235</b>	278	5,331	763	26	487	<b>195,858</b>
<b>2012</b>	619	43,285	70	222	248	3,590	468	18	450	40,923
<b>Average</b>	522.9	45,486.10	148.3	150.2	480.5	6,743.20	533.2	24.3	649.3	62,562.80
<b>2012 Mean Dev.</b>	19.9	-5.2	-54.5	53	-50.1	-48.5	-13	-27.2	-32.2	-36.2

	<b>SW</b>	<b>RT</b>	<b>RL</b>	<b>GE</b>	<b>AK</b>	<b>ML</b>	<b>PG</b>	<b>UNK</b>	<b>TOTAL</b>
<b>1998</b>	5	3,782	17	33	1,046	<b>95</b>	52	86	95,481
<b>1999</b>	8	3,504	76	<b>208</b>	664	30	49	47	75,951
<b>2000</b>	5	5,754	55	188	790	34	24	37	102,711
<b>2001</b>	3	8,153	55	120	1,026	50	48	45	74,520
<b>2002</b>	0	6,565	63	79	<b>2,277</b>	64	52	15	153,240
<b>2003</b>	<b>12</b>	5,789	31	60	2,128	72	<b>82</b>	0	160,533
<b>2004</b>	0	6,155	<b>101</b>	79	470	38	20	0	78,076
<b>2005</b>	8	2,619	30	45	1,018	55	37	0	96,737
<b>2006</b>	8	6,025	27	124	1,314	40	38	0	119,657
<b>2007</b>	2	<b>9,406</b>	29	124	1,275	41	67	8	156,297
<b>2008</b>	0	2,507	18	89	404	19	23	0	78,961
<b>2009</b>	4	2,474	13	117	441	39	35	14	82,708
<b>2010</b>	5	3,207	29	76	675	52	40	18	214,594
<b>2011</b>	5	4,100	19	167	664	21	21	169	<b>260,974</b>
<b>2012</b>	4	2,986	14	51	531	38	30	182	93,110
<b>Average</b>	4.6	4,868.40	38.5	104	981.5	45.9	41.2	41.4	122,903.30
<b>2012 Mean Dev.</b>	-13.8	-40.3	-65.2	-52.7	-47.6	-18.2	-28.6		-25.5



## **NON-RAPTOR HIGHLIGHTS**

There were multiple sightings of red and white-winged crossbills, evening grosbeaks and common redpolls during the month of November. Additionally, unusually large numbers of pine siskins were noted daily from mid-October until the conclusion of the count at the end of November.

### **Waterfowl**

Small flocks of wood ducks were consistently seen flying past during the month of September. Small rafts of pied-billed grebes were frequently seen throughout the month as well. Five horned grebes were seen floating in the channel on 14 September and 15 September. A flock of approximately 25 blue-winged teals flew past on 18 September. A green-winged teal was observed on 29 September and 6 October. A small flock of northern shovelers flew by on 30 September and 10 October. American black ducks were seen on 8 November and 15 November. Canada geese were on the move on 7 October with more than 200 seen from the count site. A single snow goose was spotted high overhead on 13 November. The first tundra swans of the season were seen on 27 October. Another 13 tundra swans were noted on 10 November. Many more tundra swans were seen over the rest of November with a peak of more than 650 seen on 25 November.

The location of the count site does not effectively capture migration of divers (canvasback, redhead, scaup) through the region, which number in the tens of thousands offshore from lakes St Clair to Erie during the fall and winter. However, the first lesser scaup were noted on 9 October and this species continued to be seen foraging in the channel frequently through the end of November. Common loons were noted on 13 October, 27 October and 2 November. Common mergansers were seen on 2 November and 26 November. Hooded mergansers were spotted on 5 November and 26 November. Small rafts of ruddy ducks and bufflehead could be found in the channel at several points throughout the month of November. A female long-tailed duck flew by on 7 November.

### **Shorebirds**

Killdeer were heard overhead at various points throughout the season. Small numbers of lesser yellowlegs were detected several times during the months of September and October. A greater yellowlegs was heard on 16 September. Two solitary sandpipers were spotted on 28 September. Black-bellied plovers were observed on 2 October. A spotted sandpiper flew by on 3 September. A flock of sandpipers, likely dunlin, zipped around the channel on 6 October. Four American golden-plovers were spotted on 8 October. A flock of dunlin whizzed by on 15 October. Nine short-billed dowitchers were seen on 20 October.

### **Gulls and Terns**

The season's first Bonaparte's gulls were seen on 2 October. Thereafter, small numbers of this species were present into November with peak activity occurring in early November. A great black-backed gull was seen foraging in the channel on 6 November. Herring gulls were much more abundant this season than last and were seen particularly often during the month of November. Caspian and Forster's terns were seen frequently during the month of September. A single common tern was observed on 5 November.

## **Wading Birds**

Black-crowned night herons were noted several times throughout the month of September. In October and much of November, there were very few sightings of this species. In late November, though, herons began to be seen more frequently, moving through the viewing area in flocks of more than five birds. Great blue herons could be seen flying past in greater abundance during the month of November, often during the morning hours.

## **Corvids**

The first migrant blue jays were detected on 17 September. Consistent with previous seasons, peak movement of this species occurred during late September and early October. The single largest flight of blue jays occurred on 27 September when more than 40,000 were noted. The first migrant American crows were detected on 12 October. Peak movement occurred during late October and early November with the single largest flight on 2 November when more than 150,000 were noted. Throughout their migratory period, there were several days when the number of American crows exceeded 50,000.

## **Icterids**

The first red-winged blackbirds of the season were seen moving through in early September and continued to be seen throughout the fall with many flocks flying past even into late November. Peak migration for this species occurred during the latter part of October when there were multiple days with more than 10,000 blackbirds sighted. Small numbers of rusty blackbirds were detected in the red-winged blackbird flocks starting on 10 October. Flocks of rusty blackbirds continued to be seen in varying numbers up until mid-November with a peak of movement occurring in late October when more than 400 were seen on 21 October. Common grackles were seen mixed in among the flocks of blackbirds, most frequently in late October, particularly 25 October, when more than 300 were detected.

## **Swifts and Swallows**

Purple martins and swallows peak just before the count starts in September. There were abnormally large numbers of tree and northern rough-winged continuing to be seen into October. Small numbers of bank swallows were noted on 2 September and 11 September. Purple martin migration slowed to a trickle by mid-September. Barn swallows were noted in small numbers through the end of September. Three late tree swallows and one late northern rough-winged swallow were seen on 11 November. The peak movement of chimney swifts occurred in late September when more than 250 were seen on 24 September. Two late chimney swifts were detected on 19 October.

## **Sparrows and Finches**

Common redpolls, red crossbills, white-winged crossbills, evening grosbeaks, snow buntings and lapland longspurs were heard overhead on several days during the month of November. American goldfinches were noted throughout the entirety of the count period with a peak of movement during the month of October. The first pine siskins of the season passed overhead on 1 October. An unusually large number of this species continued to be seen for the rest of the count period with peak movement occurring in late October and early November. Dark-eyed

juncos were first noted in late October and were frequently seen in November. The first white-throated sparrows of the season were detected on 20 September and seen often thereafter. A fox sparrow was heard singing on 22 November. The first American Tree Sparrow was found on 4 November.

## Warblers

Wood-warblers were far less abundant this season than last. A total of 13 species were detected during the months of September and October including pine, blackpoll, Tennessee, Cape May, palm, black-throated Blue, black-throated green, magnolia, Nashville, black-and-white, chestnut-sided, yellow-rumped and American redstart.

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## Table 2 List of Species

**TV:** turkey vulture (*Cathartes aura*)

**OS:** osprey (*Pandion haliaetus*)

**BE:** bald eagle (*Haliaeetus leucocephalis*)

**NH:** northern harrier (*Circus cyaneus*)

**SS:** sharp-shinned hawk (*Accipiter striatus*)

**CH:** Cooper's hawk (*Accipiter cooperii*)

**NG:** northern goshawk (*Accipiter gentilis*)

**RS:** red-shouldered hawk (*Buteo lineatus*)

**BW:** broad-winged hawk (*Buteo platypterus*)

**SW:** Swainson's hawk (*Buteo swainsoni*)

**RT:** red-tailed hawk (*Buteo jamaicensis*)

**RL:** rough-legged hawk (*Buteo lagopus*)

**GE:** golden eagle (*Aquila chrysaetos*)

**AK:** American kestrel (*Falco sparverius*)

**ML:** merlin (*Falco columbarius*)

**PG:** peregrine falcon (*Falco peregrinus*)

**UNK:** unknown raptor species

## REFERENCED

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