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Waterbird and Wetland Monitoring at The Emiquon Preserve

Preliminary 2009 Annual Report

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Prepared for: The Nature Conservancy

Project Name: Monitoring of Key Attributes and Indicators of Waterfowl at The Nature
Conservancy's Emiquon Preserve
Contract Number: C07-32



INHS Technical Report 2010 (01)
Date of Issue: 14 January 2010

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NATURAL
HISTORY
SURVEY

We monitored production, abundance, and behavior of waterfowl and other waterbirds at The Emiquon Preserve (hereafter, Emiquon) during 2009 in an effort to assist The Nature Conservancy monitor and evaluate success of their restoration work (Table 1). Additionally, we monitored waterfowl food production and mapped wetland vegetation patterns at the site. Herein, we provide preliminary results of our research for 2009. A final report is forthcoming after sample and data processing is complete.

Brood Monitoring

We monitored waterbird production at Emiquon in 2009 through passive brood observations. We conducted 6 brood surveys between 11 June and 25 August using 4 observers located at fixed points spaced along the east and west shores of Thompson Lake and the north levee. This approach maximized coverage and minimized double counting and disturbance associated with a single observer moving between points. We conducted brood surveys every other week for one hour beginning at sunrise. During each survey, observers continually scanned all visible wetland habitat using spotting scopes and binoculars and documented species, number of young and adults, and brood age class of all waterbirds.

Across all surveys, we recorded 114 waterbird broods comprised of 7 species (Table 2). We also incidentally documented Ruddy Duck broods during ground inventories. The most abundant broods recorded were Wood Ducks ($n = 67$), followed by Mallards ($n = 14$) and American Coots ($n = 13$). Incidence of Wood Duck broods increased 26% from 2008 observations, whereas Mallard and American Coot broods declined 26% and 46%, respectively. Late-spring phenology and rising water levels may have influenced these declines by making nesting habitat conditions less favorable. However, brood numbers peaked ($n = 30$) on 21 July, which was one month earlier than the 2008 peak count. This may have been partially due to the

abundance of early-nesting Wood Ducks, which constituted two-thirds of the broods observed during the peak count. As cavity nesters, Wood Ducks may have been less influenced by the late spring conditions.

Similar to 2008, age classes of broods increased throughout the spring-summer observation period. By the last count (25 August), many broods were fully feathered and flighted, making them difficult to distinguish from adults. Our observations indicated that Emiquon again provided quality brood-rearing habitat capable of sustaining young waterbirds to fledging in 2009.

Several key ecological attributes address availability of nesting habitats for waterbirds (e.g., upland, tree cavities). Although we did not specifically monitor nesting habitats, it would be reasonable to speculate that upland nesting cover substantially declined in 2009 due to rising water levels, and our wetland covermap should provide a reasonable estimate of suitable nesting habitats for breeding waterbirds at Emiquon. Few mature trees with suitable nesting cavities exist on the area, but wood ducks that used the surrounding bottomland and upland forests for nesting apparently found Emiquon attractive for raising broods. This was evidenced by the number of wood duck broods, which comprised nearly 60% of all broods observed using the area during spring and summer.

Our brood observations should be considered only as an index of waterbird production. We certainly did not encounter all broods at the site and likely observed individual broods during multiple surveys. Thus, we suggest the greatest use of these counts will be to assess trends among years as habitat conditions change at Emiquon.

Avian Abundance

Waterfowl

Spring

We conducted 8 waterfowl ground inventories between 10 February and 14 April 2009 (Table 3). We estimated waterfowl abundance by species with a spotting scope from 13 primary locations and included birds encountered while moving between locations. Additionally, we conducted aerial waterfowl inventories each week by way of fixed-wing aircraft from 13 March to 3 April (Table 4). Peak abundance reached 50,208 via ground count on 17 February and 46,310 via aerial count on 3 April. The early peak of our ground estimates was largely due to the presence of lesser snow geese, which accounted for 46% of the total. Based on species composition data from ground counts, we observed 20 species of ducks, 3 species of geese, and 3 species of swans during spring 2009. Peak species diversity ($n = 20$) comprised of 16 duck, 3 goose, and 1 swan species occurred on 19 March. Estimated dabbling duck (51.2%) and diving duck (48.9%) abundances were comparable during spring 2009. Northern Shovelers (18.5%) were the most abundant duck species, followed by Lesser Scaup (16.4%) and Ring-necked Ducks (14.8%).

We calculated duck use-days (DUDs) for the period of 10 February to 14 April 2009 to assess duck use at Emiquon throughout spring. Total DUDs for this period were 1,849,811, representing a 51.7% increase over the spring 2008 estimate of 1,219,605. Peak duck use during spring occurred between 26 March and 7 April at Emiquon. Continued growth in overall waterfowl abundance and use, coupled with high species diversity, underscores the importance of this wetland complex as a spring staging area.

Fall

We conducted 8 waterfowl ground inventories from 2 September until freeze up on 11 December (Table 5). Since monitoring began in fall 2007, wetland size at Emiquon has

increased by >4,000 acres, which has created challenges in developing census methods that are both effective and efficient. Thus, we continued to adapt our survey strategy with the growth in wetland area in fall 2009. Fall ground inventories were conducted with a spotting scope every other week from 16 fixed points on levees and roads surrounding Thompson and Flag lakes and the Butt tract. Due to the high water levels, nearly all observation points were restricted to the tops of levees, which in many cases placed the observer farther from the birds, and reduced our ability to detect and identify some species.

Peak waterfowl abundance was 70,074 on 23 November via ground count, and 63,123 on 11 November via aerial count (Tables 5 and 6). We observed 20 species of waterfowl during fall ground surveys, comprised of 16 duck, 3 goose, and 1 swan species. Ring-necked Ducks were the most abundant and accounted for 16.9% of all ducks, followed by Gadwalls (16.0%), Ruddy Ducks (14.1%), and Mallards (13.3%). However, estimates of Ring-necked Ducks and Ruddy Ducks may have been biased high due to difficulty in species identification from long-distance observations and mixed flocks of these species with American Coots. Thus, species compositions of flocks that could be accurately identified were applied to rafts of birds observed from long distances. In contrast, Mallard and teal estimates were likely biased low, due to their use of emergent vegetation that made them less visible to the ground observer. Dabbling ducks were most abundant at Emiquon during fall 2009 and accounted for 65.9% of total duck abundance, whereas diving ducks contributed the remaining 34.1%. Despite possible biases of our estimates, results of ground counts nonetheless highlight a growing trend of diving duck abundance at Emiquon during fall. Diving ducks accounted for only 1.2% and 12.4% of fall duck estimates in 2007 and 2008, respectively. Continued increases in diving duck abundance emphasize the importance of Emiquon in providing wetland habitat types, such as submersed

aquatic vegetation and hemi-marsh, which are limited in the Illinois River valley. Finally, we calculated fall DUDs from 1 September to 15 December, which totaled 3,006,678 and 3,422,453 from ground and aerial inventories, respectively. This amounted to a 68.3% increase over the 2008 DUD estimate and a 147.9% increase over the 2007 estimate from ground counts.

Non-Waterfowl

Spring

In addition to waterfowl, we recorded abundances of other wetland birds and raptors at Emiquon. Similar to 2008, we observed 16 non-waterfowl bird species (not including passerines), mostly comprised of American coots (98.7%, Table 7). Peak abundance of non-waterfowl avifauna totaled 58,110 on 26 March. Other commonly observed waterbirds included Ring-billed Gulls, American White Pelicans, Pied-billed Grebes, and Double-crested Cormorants. Commonly observed raptors included Bald Eagles, Red-tailed Hawks and Northern Harriers.

Fall

We documented 17 species of non-waterfowl avifauna during fall ground surveys (Table 8). American Coots were again the most numerous species (97.0%) and peaked at 100,071 on 23 November, overshadowing our peak estimates in 2007 ($n = 28,560$) and 2008 ($n = 57,405$). Other waterbird species commonly encountered were Pied-billed Grebes, American White Pelicans and Double-crested Cormorants. Double-crested cormorants peaked the earliest (2 September; $n = 857$), followed by American White Pelicans (12 October; $n = 1,630$) and Pied-billed Grebes (28 October; $n = 1,211$). Commonly observed raptors included Bald eagles, Northern Harriers, and Red-tailed Hawks. Bald eagle abundance peaked at 167 on 11 December following freeze up.

Waterfowl Behavior

Spring

We conducted 11 behavioral observations from 10 February to 7 April, 2009 using scan sampling techniques on dabbling (e.g., Mallards and Northern Shovelers) and diving ducks (e.g., Lesser Scaup, Ring-necked Duck, and Ruddy Duck) (Table 9). We attempted to sample species that were abundant at Emiquon throughout migration, to promote larger sample sizes while working within the constraints of visibility and our ability to approach flocks undetected. Overall, dabbling ducks spent more than twice as much time feeding (57.4%) than resting (21.4%), and allocated 81.6% more time feeding in spring 2009 than in 2008 (31.6%). Time spent feeding by dabbling ducks increased as spring progressed with a peak in April (87.6%); however, there was only one dabbling duck observation made in April.

Overall estimates of diving duck behavior indicated similar proportions of time spent feeding (36.3%) and resting (40.2%). In contrast, diving ducks spent 14.8% of the time feeding and 66.2% of the time resting in spring 2008. Diving ducks rested more and fed less than dabbling ducks in spring 2009. Total ducks observed in spring 2009 spent substantially more time feeding (45.9%), but less time resting (31.8%), than ducks observed in spring 2008 (feeding: 21.9%, resting: 52.7%) at Emiquon. The apparent increase in the proportion of time spent feeding may have been a result of rising water levels creating additional foraging habitat for ducks. However, we interpret these data cautiously due to small sample sizes.

Fall

We documented fall dabbling duck behavior by conducting 13 scan samples from 2 September to 23 November 2009. Species in our samples included Mallards, Blue-winged Teal, American Green-winged Teal, Northern Pintails, Northern Shovelers, American Wigeon and

Gadwalls. Dabbling ducks devoted most of their time to feeding (58.6%), followed by resting (20.0%), locomotion (16.0%), self-maintenance (4.9%), and social (0.5%) behaviors (Table 10). Our 2009 estimates were similar to those observed in 2008 for feeding (50.5%) and resting (21.4%) activities. Foraging behavior peaked in October (67.1%), whereas the proportion of time spent resting was greatest in November (31.1%). The combination of extensive beds of submersed aquatic vegetation and shallowly flooded areas appeared to have provided attractive foraging habitat for dabbling and diving ducks using Emiquon in 2009.

We did not conduct behavior observations in December due to low abundances of waterfowl as a result of ice up. Also, the continued growth in water area at Emiquon created greater distances between observation points and many diving ducks that used the area. Thus, we did not include diving ducks in our behavior observations during fall 2009 due to difficulties in locating diving duck concentrations close enough to make reliable observations.

Waterfowl Food Abundance

Aquatic Invertebrates – *In progress*

Aquatic invertebrates are important foods for waterbirds during the breeding and brood-rearing periods. We collected 20 sweep-net samples on 5 May, 23 June, and 6 August ($n = 60$ total samples) to estimate availability of nektonic invertebrates for breeding waterfowl. We collected samples from randomly-selected locations using a D-frame sweep net in shallow water (<46 cm) along the margins of Thompson Lake, and preserved them in a 10% buffered formalin solution. We will rinse samples through a series of sieves to remove substrate or vegetation and separate invertebrates from each sieve. Invertebrates will be identified to the lowest practical taxonomic level (e.g., Family), dried to constant mass, and weighed to estimate biomass. We will process samples during winter 2010 and provide updated results when sample processing is

complete. Anecdotally, field observations during collections indicated that an abundance and diversity of invertebrate forage was available during the brood-rearing period.

Moist-Soil Plant Seeds – *In progress*

We estimated above- and below-ground biomass of moist-soil plant seeds by extracting a soil core (10 cm diameter) in standing vegetation at 20 randomly-allocated points. We collected soil cores on 22 September 2009 along the west shore of Thompson Lake. In the laboratory, we will wash samples through a graduated series of 2-3 sieves, separate seed heads and seeds from plant debris, and dry samples to a constant mass. We will then pass samples through a series of sieves to separate large (e.g., *Echinochloa* spp., *Polygonum* spp.) and small (e.g., *Cyperus* spp., *Amaranthus* spp.) seeds. Based on field observations during soil core collections and wetland covermapping operations, we believe moist-soil plant seed production likely declined in fall 2009 due to less favorable growing conditions caused by rising water levels. We will process soil cores during winter and provide seed abundance estimates by spring 2010.

Wetland Covermapping – *In progress*

We mapped all wetted areas of Emiquon during 15–23 September to document changes in wetland area, vegetation, and habitat assemblages. We used boats and ATVs to traverse wetland habitats along 16 evenly-spaced east-west transects. We marked changes in vegetation assemblages using a handheld GPS, drew them on aerial photos, and recorded vegetative composition. Vegetation or physical features that did not fall on transect lines were investigated, marked, and mapped as needed. During winter 2010, we will enter field data into a GIS coverage to be overlaid onto 2009 high-resolution aerial imagery to create a habitat covermap. We intend to complete the covermap prior to the Emiquon Science Symposium in March 2010.

Although the covermap has not been completed, our field operations allowed us to make some general observations of wetland habitat conditions in 2009. Wetland areas of Emiquon remained diverse with a mix of open water and several vegetation assemblages that included submersed aquatic, persistent emergent (e.g., cattail, *Typha* spp.), non-persistent emergent (i.e., moist-soil), and upland vegetation, much of which was flooded. We encountered relatively few invasive or undesirable wetland plant species during 2009; however, we observed areas with curly pondweed (*Potamogeton crispus*), Eurasian milfoil (*Myriophyllum spicatum*), reed canarygrass (*Phalaris arundinacea*), and common reed (*Phragmites australis*). Additionally, we found purple loosestrife (*Lythrum salicaria*) on the preserve for the first time during 2009. The substantial growth in water area appeared to increase the amount of aquatic bed, but reduced the amount of hemi-marsh habitat and inundated most of the upland vegetation surrounding the wetland. Likewise, a reduction in moist-soil area is expected as high water prevented exposure of mudflats for moist-soil plant production. Emiquon continued to provide a diversity of wetland habitats in 2009, but increased water levels have created substantial shifts in the habitat composition of this wetland complex since restoration began in 2007.

Table 1. Avian species observed during monitoring activities at The Emiquon Preserve, 2009.

AOU Code	Common Name	Scientific Name
ABDU	American Black Duck	<i>Anas rubripes</i>
AGWT	American Green-winged Teal	<i>Anas crecca</i>
AMCO	American Coot	<i>Fulica americana</i>
AMWI	American Wigeon	<i>Anas americana</i>
AWPE	American White Pelican	<i>Pelecanus erythrorhynchos</i>
BAEA	Bald Eagle	<i>Haliaeetus leucocephalus</i>
BCNH	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>
BNST	Black-necked Stilt	<i>Himantopus mexicanus</i>
BOGU	Bonaparte's Gull	<i>Chroicocephalus philadelphia</i>
BUFF	Bufflehead	<i>Bucephala albeola</i>
BWTE	Blue-winged Teal	<i>Anas discors</i>
CAEG	Cattle Egret	<i>Bubulcus ibis</i>
CAGO	Canada Goose	<i>Branta canadensis</i>
CANV	Canvasback	<i>Aythya valisineria</i>
COGO	Common Goldeneye	<i>Bucephala clangula</i>
COLO	Common Loon	<i>Gavia immer</i>
COME	Common Merganser	<i>Mergus merganser</i>
DCCO	Double-crested Cormorant	<i>Phalacrocorax auritus</i>
EAGR	Eared Grebe	<i>Podiceps nigricollis</i>
GADW	Gadwall	<i>Anas strepera</i>
GBHE	Great Blue Heron	<i>Ardea herodias</i>
GHOW	Great Horned Owl	<i>Bubo virginianus</i>
GREG	Great Egret	<i>Ardea alba</i>
GRHE	Green Heron	<i>Butorides virescens</i>
GWFG	Greater White-fronted Goose	<i>Anser albifrons</i>
HOGR	Horned Grebe	<i>Podiceps auritus</i>
HOME	Hooded Merganser	<i>Lophodytes cucullatus</i>
LBHE	Little Blue Heron	<i>Egretta caerulea</i>
LESC	Lesser Scaup	<i>Aythya affinis</i>
LSGO	Lesser Snow Goose	<i>Chen caerulescens</i>
MALL	Mallard	<i>Anas platyrhynchos</i>
MUSW	Mute Swan	<i>Cygnus olor</i>
NOHA	Northern Harrier	<i>Circus cyaneus</i>
NOPI	Northern Pintail	<i>Anas acuta</i>
NSHO	Northern Shoveler	<i>Anas clypeata</i>
OSPR	Osprey	<i>Pandion haliaetus</i>
PBGR	Pied-billed Grebe	<i>Podilymbus podiceps</i>
RBGU	Ring-billed Gull	<i>Larus delawarensis</i>
RBME	Red-breasted Merganser	<i>Mergus serrator</i>
REDH	Redhead	<i>Aythya americana</i>

Table 1. Continued.

AOU Code	Common Name	Scientific Name
RLHA	Rough-legged Hawk	<i>Buteo lagopus</i>
RNDU	Ring-necked Duck	<i>Aythya collaris</i>
RTHA	Red-tailed Hawk	<i>Buteo jamaicensis</i>
RUDU	Ruddy Duck	<i>Oxyura jamaicensis</i>
TRUS	Trumpeter Swan	<i>Cygnus buccinator</i>
TUSW	Tundra Swan	<i>Cygnus columbianus</i>
WODU	Wood Duck	<i>Aix sponsa</i>
WWSC	White-winged Scoter	<i>Melanitta fusca</i>
YHBL	Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>

Table 2. Broods observed at The Emiquon Preserve during June-August, 2009.

Date	WODU	CAGO	MALL	AMCO	PBGR	HOME	BWTE	Total	Avg. Age
11 Jun	7	1	0	0	0	0	0	8	IIA
23 Jun	6	6	5	1	0	1	0	19	IIB
8 Jul	18	0	2	1	2	0	0	23	IIB
21 Jul	20	0	5	1	4	0	0	30	IIB
6 Aug	12	0	2	7	3	0	1	25	IIC
25 Aug	4	0	0	3	2	0	0	9	III
Total (%) ^a	67 (58.8)	7 (6.1)	14 (12.3)	13 (11.4)	11 (9.6)	1 (0.9)	1 (0.9)	114 (100.0)	

^aPercent of grand total.

Table 3. Ground estimates of waterfowl at The Emiquon Preserve during Spring, 2009.

Species	Census Dates								Spring Total (%) ^a
	10 Feb	17 Feb	3 Mar	13 Mar	19 Mar	26 Mar	7 Apr	14 Apr	
ABDU	0	2	0	0	0	0	0	0	2 (0.0)
AGWT	0	208	2	1,537	2,887	2,581	4,704	2,240	14,159 (4.9)
AMWI	254	224	295	101	170	32	0	0	1,076 (0.4)
BUFF	0	0	339	824	1,350	1,688	1,690	956	6,847 (2.4)
BWTE	0	0	0	13	502	2,111	3,684	3,163	9,473 (3.3)
CAGO	2,009	181	369	19	21	25	18	26	2,668 (0.9)
CANV	0	2,005	1,402	303	114	46	25	2	3,897 (1.4)
COGO	280	1,218	695	107	12	2	1	1	2,316 (0.8)
COME	2	0	0	0	0	0	0	0	2 (0.0)
GADW	2	1,587	1,089	3,639	4,482	2,138	1,137	2,376	16,450 (5.7)
GWFG	2,821	2,050	701	166	11	20	0	0	5,769 (2.0)
HOME	0	5	7	132	22	18	0	22	206 (0.1)
LESC	142	2,678	5,300	6,635	6,545	8,983	4,374	1,210	35,867 (12.4)
LSGO	15,801	23,000	0	13,001	7,650	1,500	402	320	61,674 (21.4)
MALL	5,087	12,325	3,837	796	721	179	260	86	23,291 (8.1)
MUSW	0	0	2	0	0	0	0	0	2 (0.0)
NOPI	4,216	1,318	1,170	13	3	1	0	0	6,721 (2.3)
NSHO	0	1	187	4,923	7,739	8,918	11,631	7,157	40,556 (14.0)
RBME	0	0	0	1	0	0	10	65	76 (0.0)
REDH	0	2	739	2,042	416	137	1	2	3,339 (1.2)
RNDU	300	3,374	6,869	6,571	4,601	7,835	2,405	486	32,441 (11.2)
RUDU	0	0	76	2,697	3,907	6,839	5,521	2,670	21,710 (7.5)
TRSW	0	30	0	0	0	0	0	0	30 (0.0)
TUSW	0	0	12	0	3	0	0	0	15 (0.0)
WODU	0	0	0	61	18	112	0	6	197 (0.1)
WWSC	0	0	7	0	0	0	0	0	7 (0.0)
Total	30,914	50,208	23,098	43,581	41,174	43,165	35,863	20,788	288,791 (100.0)

^aPercent of grand total for Spring.

Table 4. Waterfowl estimates from aerial inventories at The Emiquon Preserve during Spring, 2009.

Species	Census Dates				Spring Total (%) ^a
	13 Mar	17 Mar	26 Mar	3 Apr	
ABDU	0	0	0	0	0 (0.0)
AGWT	0	4,805	3,885	6,060	14,750 (8.6)
AMWI	525	1,005	0	0	1,530 (0.9)
BUFF	2,535	2,460	0	2,220	7,215 (4.2)
BWTE	0	0	100	1,885	1,985 (1.2)
CAGO	145	45	20	60	270 (0.2)
CANV	300	475	0	0	775 (0.5)
COGO	0	0	0	0	0 (0.0)
COME	0	0	0	0	0 (0.0)
GADW	2,625	2,960	3,785	1,885	11,255 (6.5)
GWFG	0	0	0	0	0 (0.0)
HOME	1,015	0	0	0	1,015 (0.6)
LESC	12,555	8,025	5,300	6,835	32,715 (19.0)
LSGO	10,000	8,500	700	800	20,000 (11.6)
MALL	2,550	945	660	2,365	6,520 (3.8)
NOPI	1,460	475	100	0	2,035 (1.2)
NSHO	7,955	8,160	9,855	12,560	38,530 (22.4)
REDH	240	945	0	0	1,185 (0.7)
RNDU	3,360	3,215	9,070	7,025	22,670 (13.2)
RUDU	975	2,360	1,970	4,615	9,920 (5.8)
Total	46,240	44,375	35,445	46,310	172,370 (100.0)

^aPercent of grand total for Spring.

Table 5. Ground estimates of waterfowl at The Emiquon Preserve during Fall, 2009.

Species	Census Dates								Fall Total (%) ^a
	2 Sept	14 Sept	29 Sept	12 Oct	28 Oct	9 Nov	23 Nov	11 Dec	
ABDU	0	0	0	0	0	0	2	0	2 (0.0)
AGWT	0	393	368	1,966	1,564	926	3,376	0	8,593 (4.0)
AMWI	0	15	193	1,912	4,415	4,285	8,434	0	19,254 (9.0)
BUFF	0	0	0	0	0	157	600	0	757(0.4)
BWTE	1,570	1,632	864	281	155	0	6	0	4,508 (2.1)
CAGO	16	10	4	295	0	0	0	0	325 (0.2)
CANV	0	0	0	0	0	34	4,006	0	4,040 (1.9)
GADW	0	0	493	2,475	9,206	13,506	8,333	3	34,016 (15.9)
GWFG	0	0	0	0	100	0	0	0	100 (0.1)
HOME	0	0	0	0	0	25	8	0	33 (0.0)
LESC	0	0	0	0	0	81	709	0	790 (0.4)
LSGO	0	0	0	0	0	0	2	0	2 (0.0)
MALL	500	778	3,447	2,620	1,749	11,620	7,527	2	28,243 (13.2)
MUSW	2	0	0	0	0	3	0	0	5 (0.0)
NOPI	0	667	4,191	2,261	778	333	35	0	8,265 (3.9)
NSHO	60	571	732	4,084	6,023	12,083	2,146	6	25,705 (12.1)
REDH	0	0	0	0	2	21	1,000	0	1,023 (0.5)
RNDU	6	0	4	755	3,178	13,804	18,254	7	36,008 (16.9)
RUDU	2	6	13	401	2,479	11,208	15,636	231	29,976 (14.1)
TEAL ^b	0	2,603	3,816	2,268	0	0	0	0	8,687 (4.1)
WODU	643	1,282	859	231	0	0	0	0	3,015 (1.4)
Total	2,799	7,957	14,984	19,549	29,649	68,086	70,074	249	213,347 (100.0)

^aPercent of grand total for Fall.

^bSpecies could not be determined.

Table 6. Waterfowl estimates from aerial inventories at The Emiquon Preserve during Fall, 2009.

Species	Census Dates											Fall Total (%) ^a
	2 Sept	9 Sept	14 Sept	13 Oct	20 Oct	2 Nov	11 Nov	23 Nov	1 Dec	7 Dec	15 Dec	
ABDU	0	0	0	0	0	0	0	0	50	0	0	50 (0.0)
AGWT	225	870	1,070	9,510	8,515	14,250	3,185	4,290	1,190	955	0	44,060 (12.9)
AMWI	0	0	0	0	2,105	1,380	4,875	1,480	0	0	0	9,840 (2.9)
BUFF	0	0	0	0	0	0	0	1,430	620	0	0	2,050 (0.6)
BWTE	11,160	5,540	2,320	1,145	2,105	0	0	0	0	0	0	22,270 (6.5)
CAGO	10	40	20	265	160	10	5	0	10	125	0	645 (0.2)
CANV	0	0	0	0	0	1,380	300	50	1,200	0	0	2,930 (0.9)
COGO	0	0	0	0	0	0	0	0	595	0	0	595 (0.2)
COME	0	0	0	0	0	0	0	0	0	200	10	210 (0.1)
GADW	0	225	40	1,570	7,415	7,200	13,035	14,900	6,335	2,790	0	53,510 (15.7)
GWFG	0	0	0	0	0	0	0	200	650	0	0	850 (0.3)
HOME	0	0	0	0	0	0	30	0	0	0	0	30 (0.0)
LESC	0	0	0	0	0	0	0	1,430	1,790	475	0	3,695 (1.1)
LSGO	0	0	0	0	0	0	0	0	400	0	0	400 (0.1)
MALL	235	1,420	1,045	2,625	5,310	5,670	16,020	14,350	11,955	4,780	0	63,410 (18.6)
NOPI	0	0	110	5,230	5,270	1,410	1,590	1,430	595	0	0	15,635 (4.6)
NSHO	100	225	90	5,250	10,570	9,810	7,960	2,860	2,980	1,435	0	41,280 (12.1)
REDH	0	0	0	0	0	0	0	0	0	0	0	0 (0.0)
RNDU	0	0	0	525	2,105	4,140	8,160	7,250	11,925	3,345	0	37,450 (11.0)
RUDU	0	0	0	525	3,155	6,900	7,960	7,150	9,045	7,170	0	41,905 (12.3)
SWN	0	0	0	0	0	0	3	0	0	4	0	7 (0.0)
Total	11,730	8,320	4,695	26,645	46,710	52,150	63,123	56,820	49,340	21,279	10	340,822 (100.0)

^aPercent of grand total for Fall.

Table 7. Estimates of non-waterfowl avifauna from ground counts at The Emiquon Preserve during Spring, 2009.

Species	Census Dates								Spring Total (%) ^a
	10 Feb	17 Feb	3 Mar	13 Mar	19 Mar	26 Mar	7 Apr	14 Apr	
AMCO	0	50	1,020	16,965	29,255	57,825	29,525	30,750	165,390 (98.7)
AWPE	0	0	0	0	40	126	380	64	610 (0.4)
BAEA	2	19	5	2	0	0	0	0	28 (0.0)
BCNH	0	0	0	0	0	0	0	3	3 (0.0)
BOGU	0	0	0	0	0	0	0	11	11 (0.0)
COLO	0	0	0	0	0	0	0	1	1 (0.0)
DCCO	0	0	0	3	39	3	17	292	354 (0.2)
EAGR	0	0	0	0	0	1	1	6	8 (0.0)
GBHE	0	0	0	0	2	0	10	6	18 (0.0)
GHOW	0	0	0	1	0	0	0	0	1 (0.0)
GREG	0	0	0	0	0	2	2	26	30 (0.0)
NOHA	3	2	0	6	2	1	2	2	18 (0.0)
PBGR	0	0	0	27	22	121	121	146	437 (0.3)
RBGU	0	132	167	250	106	26	2	10	693 (0.4)
RLHA	1	0	0	0	0	0	0	0	1 (0.0)
RTHA	1	1	1	4	2	5	4	1	19 (0.0)
Total	7	204	1,193	17,258	29,468	58,110	30,064	31,318	167,622 (100.0)

^aPercent of grand total for Spring.

Table 8. Estimates of non-waterfowl avifauna from ground counts at The Emiquon Preserve during Fall, 2009.

Species	Census Dates								Fall Total (%) ^a
	2 Sept	14 Sept	29 Sept	12 Oct	28 Oct	9 Nov	23 Nov	11 Dec	
AMCO	662	2,790	28,300	42,595	69,001	90,235	100,071	351	334,005 (97.0)
AWPE	1,005	500	195	1,630	113	68	4	0	3,515 (1.0)
BAEA	0	0	0	1	0	1	0	167	169 (0.1)
BCNH	3	2	0	0	0	0	0	0	5 (0.0)
BNST	11	13	5	0	0	0	0	0	29 (0.0)
CAEG	0	0	0	0	3	0	0	0	3 (0.0)
DCCO	857	286	330	215	140	35	0	1	1,864 (0.5)
GBHE	7	5	4	0	6	4	18	4	48 (0.0)
GREG	59	64	41	0	13	2	2	0	181 (0.1)
GRHE	1	1	0	0	0	0	0	0	2 (0.0)
HOGR	0	0	0	2	0	0	0	0	2 (0.0)
LBHE	10	27	4	0	0	0	0	0	41 (0.0)
NOHA	0	1	1	2	6	2	0	5	17 (0.0)
OSPR	0	1	0	0	0	0	0	0	1 (0.0)
PBGR	154	231	577	448	1,211	811	851	18	4,301 (1.3)
RTHA	0	0	0	0	1	0	2	2	5 (0.0)
YHBL	1	0	0	0	0	0	0	0	1 (0.0)
Total	2,770	3,921	29,457	44,893	70,494	91,158	100,948	548	344,189 (100.0)

^aPercent of grand total for Fall.

Table 9. Behavior observations (%) of ducks at The Emiquon Preserve during Spring, 2009.

Group	Month	Activity				
		Feed	Rest	Social	Locomotion	Other
Dabbling Ducks	February	35.7	33.3	3.9	12.6	14.5
Dabbling Ducks	March	54.6	24.4	0.7	11.9	8.4
Dabbling Ducks	April	87.6	1.6	4.0	4.8	2.0
Total		57.4	21.6	2.0	10.6	8.4
Diving Ducks	February	41.5	31.5	0.4	18.3	8.3
Diving Ducks	March	30.9	44.6	0.2	15.6	8.7
Diving Ducks	April	34.6	42.3	0.0	2.0	13.7
Total		36.3	40.2	0.2	13.8	9.5
Total Ducks		45.9	31.8	1.0	12.4	9.0

Table 10. Behavior observations (%) of dabbling ducks at The Emiquon Preserve during Fall, 2009.

Month	Activity				
	Feed	Rest	Social	Locomotion	Other
September	62.9	20.5	0.0	12.1	4.5
October	67.1	8.3	0.9	16.5	7.2
November	44.5	31.1	0.6	20.5	3.2
Total	58.6	20.0	0.5	16.0	4.9