Appendix N – Bird Collision Susceptibility Assessment

Table N-1. Refuge-Monitored Species.

Species	Refuge Breeder? *(USFWS 2006, Appendix K)*	Occurrence on Refuge *(USFWS 2006, Appendix K)*	Recent High Single-Day Counts from Refuge Surveys	Percent of Count in or near Proposal Area	Distribution of Count within or near Proposal Area						Feeding Habits *(NatureServe 2011, except as noted)*	North American 2011 Population Estimate/NAWMP Population Goal *(USFWS 2011i/NAWMP Committee 1998, 2004a, 2004b)*	Mississippi Flyway 2010 Hunting Season Harvest *(USFWS 2011m)*	Other Notes
					5 C	5 O	5A C	5A O	6/ Tr.	7 O				
Swans														
Tundra swan (*Cygnus columbianus*).	No.	Abundant in spring and fall; uncommon in winter.	30,045 11/30/09	5	660	0	5	0	690	0	Feeds on the tubers of aquatic plants like arrowhead, wild celery and sago pondweed (USFWS 2011j).	98,000/80,000 (eastern population only; winter population).	NA	USFWS reports that 20 to 45 percent of the eastern population of tundra swans visits the Refuge on the way to wintering areas “from late October through freeze-up” and that on their return “a small number stop, usually the last two weeks of March” (USFWS 2011j).
			27,985 11/12/09	4	540	0	80	0	420	0				
			11,500 03/30/09	NA	10	1270	0	0	155	0				
Trumpeter swan (*Cygnus buccinator*).	Yes. Nests at water’s edge or in shallow marsh.	Rare in spring, summer and winter; uncommon in fall.	A small number of trumpeter and/or mute swans are likely included in the counts reported as tundra swans. The USFWS generally counts only “swans” in its surveys. However, the following notes were included in the survey reports, for Pools 9 to 11 (well south of the Proposal Area): September 30, 2009, 4 trumpeter swans; October 5, 2009, 8 trumpeter swans; October 13, 2009, 30 “? trumpeter” (USFWS 2009d); October 12, 2010, 5 trumpeter swans (USFWS 2010c). The following were recorded in 2011 on Pools 9 to 11: 7 on September 19; 9 on October 3; and 15 on October 10 (USFWS 2011o).								Feeds on aquatic plants. May graze in fields.	4,647 (2005 survey; survey type not noted; USFWS 2006c)/2,000 (fall population); (interior population only).	NA	All native trumpeter swans were extirpated from the interior region (which includes MN and WI) and all interior region swans are the results of restoration programs that began in 1960 (Trumpeter Swan Society 2009). The interior population of trumpeter swans showed a growth rate of +11.7% from 1960 to 2005 and +13.0% from 2000-2005 (USFWS 2006c).
Mute swan (*Cygnus olor*).	Yes. Nests at water’s edge or in shallow water.	Rare in all seasons.	Not specifically included in survey.								Feeds on aquatic plants.	20,000 (3-year winter mean 2001-2003)/Not yet established.	NA	Introduced from Europe. The mute swan is showing an increasing population trend (NAWMP Committee 2004b, p. 32).
Geese														
Canada goose (*Branta canadensis*).	Yes. The Canada goose breeds in open or forested areas near water and feeds on marsh grasses, sprouts of winter wheat (spring), grain (fall); clover, cattails, bulrushes, algae, and pondweed.	Abundant in spring and fall; common in summer and winter.	20,200 11/08/10	11	875	0	740	0	595	0	Feeds on marsh grasses, sprouts of winter wheat (spring), grain (fall); clover, cattails, bulrushes, algae, pondweed, mollusks and small crustaceans.	1.6 million/1.0 million ((Mississippi Flyway Giants only; total spring population)	940,000	A large proportion of the Canada goose population in the Mississippi Flyway is represented by the Mississippi Flyway Giant Population. The USFWS reports that this is an “over-abundant population, currently managed with the goal of reducing it” (USFWS 2011i, p. 44).
			20,355 10/24/11	3	190	50	0	0	325	0				

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					5 C	5 O	5A C	5A O	6/ Tr.	7 O				
Greater white-fronted goose (*Anser albifrons*).	No.	Rare in spring and fall.	The USFWS counts only “other geese” in addition to Canada geese. Recent maximum single-day counts of “other geese” have not exceeded 25 birds.								Feeds on marsh grasses, grain crops, tundra plants, aquatic plants and fresh plant growth in fields, berries, aquatic insects.	710,000 (2010)/600,000 (mid-continent population only; fall population)	105,000	The migration route of the mid-continent greater white-fronted goose population passes through the Dakotas and the far western edge of Minnesota (USFWS 2011i, p. 53 and Figure 17).
Lesser snow goose (*Chen caerulescens*).	No.	Uncommon in spring and fall.									Feeds on grasses, grains, aquatic plants.	3.2 million/1 – 1.5 million (mid-continent population only; also includes Ross’ goose; winter population)	45,000	Snow goose populations in North America have expanded rapidly, resulting in levels that are damaging to breeding areas. The current USFWS management goal for light geese, which includes the lesser snow goose is a 50 percent population reduction from late 1990s levels (USFWS 2007b, p. ii).
Dabbling Ducks														
Mallard (*Anas platyrhynchos*).	Yes. The distribution of the breeding population on the Refuge was not found. The mallard usually nests on ground in concealing vegetation within 0.8 km of water (NatureServe 2011).	Abundant in spring and fall; common in summer and winter.	42,760 11/12/09	10	2465	20	1065	0	460	245	Feeds on seeds, rootlets and tubers of aquatic plants, tree seeds, insects, fish, mollusks, amphibians and cultivated grain. In winter the mallard may fly up to 48 to 64 km to forage from its roost site.	9.2 million/8.2 million (breeding population).	2.2 million.	The mallard breeding population has fluctuated dramatically since the USFWS began monitoring began in 1955 (USFWS 2011i, Figure 2). USFWS estimates the mid-continent mallard fall 2011 population at 12 million birds (USFWS 2011i, p. 34).
			32,980 11/01/10	10	1150	495	990	25	560	195				
American black duck (*Anas rubripes*).	No.	Reported as abundant in spring and fall; however this is not reflected in the surveys. The maximum count was 405 on November 29, 2010, with nearly all in the closed part of Pool 13. Pools 4-6 were not counted that day. Rare in summer.	95 11/12/09	21	15	0	0	0	5	0	Feeds primarily on aquatic plants and animals in shallow water.	190,000 (midwinter count)/640,000 (breeding population).	27,000 plus 4,500 mallard x black duck hybrids.	The black duck population has declined steadily since monitoring began in 1955; the rate of decline has been higher in the Mississippi Flyway population (USFWS 2011i, Figure 2). The cause of the decline is unknown. It may be habitat loss, hybridization and/or competition with the mallard, over-hunting and/or the effects of acid precipitation and aerial spraying for spruce budworm (NatureServe 2011, NAWMP Committee 1998, p. 20).
			60 11/08/05	25	10	0	0	0	5	0				

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					5 C	5 O	5A C	5A O	6/ Tr.	7 O				
Northern pintail *(Anas acuta)*.	No.	Common in spring and fall; rare in summer and winter.	6,970 11/01/10	0	0	0	0	0	0	0	Feeds on seeds and nutlets of aquatic plants (sedges, grasses, pondweeds, smartweeds) and various aquatic animals. May also feed on waste grain in fields and marine animals on tidal flats.	4.4 million/5.6 million (breeding population).	196,000.	The North American northern pintail population, which was over 10 million in 1955 when monitoring began, has been below its NAWMP goal of 5.6 million since the late 1970s; however, it has shown an increasing trend since 2002 (USFWS 2011i, Figure 2). Low breeding populations relative to historic levels have been attributed to reduced nesting success on agricultural breeding grounds: Pintails frequently nest in crop stubble and are vulnerable to the changes in agricultural practices that have resulted in increased spring tillage (Devries and Guyn 2006; Podruzny et al 2002). Population declines have also been attributed to a disproportionate susceptibility to avian botulism and avian cholera (Friend et al 2001 p. 295-296) Avian botulism is reportedly the most significant disease of waterbirds worldwide, and a number of outbreaks, each with bird losses in the tens of thousands to millions, have occurred in the U.S. (Rocke 2006). Avian cholera is the most important infectious disease affecting wild North American waterfowl (USGS 2001).
			13,220 10/18/11	< 1	0	0	0	0	0	5				
			9,100 10/24/11	< 1	0	0	0	0	5	0				
Gadwall *(Anas strepera).*	No.	Common in spring, abundant in fall, uncommon in summer.	49,020 11/03/09	7	1170	140	890	0	1025	20	Feeds on leaves, stems and tubers of aquatic plants, algae, seeds of sedges and grasses, and small aquatic animals. Occasionally grazes in pastures and grain fields.	3.3 million/1.5 million (breeding population).	1.1 million.	
			29,080 11/12/09	10	1430	0	995	0	370	0				

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					5 C	5 O	5A C	5A O	6/ Tr.	7 O				
American wigeon (Anas americana).	No.	Abundant in spring and fall; uncommon in summer.	12,675 10/11/11	6	155	0	0	0	550	20	Feeds on leaves, stems, buds, pondweeds, widgeon grass, grasses, sedges. Grazes in fields.	2.1 million/3 million (breeding population).	130,000.	The USEPA reports that the steep decline in American wigeon populations in the early 1980s (USFWS 2011i, Figure 2) was a result of drought in primary breeding areas (USEPA 2008). The USEPA also reports that the American wigeon is a "favorite among waterfowl hunters and their local distribution may be determined in part by hunting activity" (USEPA 2008).
			13,730 10/18/11	9	70	200	0	0	1000	25				
			17,405 10/24/11	2	250	0	0	0	0	20				
Northern shoveler *(Anas clypeata).*	No.	Common in spring and fall; uncommon in summer.	1,150 10/11/11	< 1	0	0	0	0	0	10	Feeds on seeds of aquatic plants; aquatic insects, mollusks, crustaceans.	4.6 million/2 million (breeding population).	475,000.	
			940 10/18/10	3	105	25	0	0	175	0				
Blue-winged teal *(Anas discors).*	Yes. Nests on ground among tall grasses near water.	Abundant in spring and fall; common in summer.	1,800 10/11/11	7	70	0	0	0	15	40	Feeds on aquatic plants and invertebrates.	8.9 million/4.7 million ((breeding population; includes blue-winged and cinnamon teal).	633,000 (includes blue-winged and cinnamon teal).	
			Not reported 09/27/07	NA	300	130	0	10	40	170				
Green-winged teal *(Anas crecca).*	No.	Common in spring and fall; rare in summer and winter.	5,205 10/11/11	3	105	5	0	0	0	25	Feeds on aquatic plants and seeds; berries; grapes; aquatic animals; in fall, waste grain.	2.9 million/1.9 million(breeding population).	1.1 million.	
			3,605 11/03/09	3	5	50	40	0	0	5				
Wood duck *(Aix sponsa).*	Yes. Nests in holes in large trees in forested wetlands, usually within 0.5 km of water and near forest canopy openings (NatureServe 2011).	Abundant in spring and fall, common in summer, rare in winter.	725 10/11/11	8	35	0	0	0	25	0	Eats seeds and other parts of aquatic plants; nuts, fruits, and seeds of trees (especially acorns) and shrubs; also aquatic and land insects.	Not reported.	919,000.	Mean North American breeding population 1994 – 2003: 4.6 million; increasing long-term trend 1970-2003 (NAWMP Committee 2004b, Table 2).
			130 10/18/10	58	0	5	0	0	55	15				
Diving Ducks														
Redhead *(Aythya americana).*	No.	Common in spring and fall, rare in summer, uncommon in winter.	1,140 11/01/10	1	0	0	0	0	5	5	Omnivorous – feeds on tubers, rhizomes, seeds, other parts of aquatic plants, and aquatic invertebrates, including insects, crustaceans, and mollusks.	1.4 million/640,000 (breeding population).	109,000.	
			9.560 10/24/2011	< 1	5	0	0	0	0	0				

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					5 C	5 O	5A C	5A O	6/ Tr.	7 O				
Canvasback *(Aythya valisineria).*	No.	Abundant in spring and fall, rare in summer, uncommon in winter.	483,070 11/01/10	1	1895	2155	160	0	415	155	Feeds on aquatic plants; pondweeds, wild celery, water lilies, seeds of grasses, wild rice, rhizomes, tubers, seeds. Also eats some animal food; mollusks, aquatic insects, small fishes, etc.	700,000/540,000 (breeding population).	73,000.	
			430,695 11/12/09	1	4850	0	0	0	120	0				
			96,690 03/30/09	NA	1945	20420	2475	1350	1205	1600				
Ring-necked duck *(Aythya collaris).*	No.	Abundant in spring and fall; rare in summer.	42,110 11/09/09	26	800	0	0	0	10265	0	Plant material important: tubers, leaves, rootstocks, and seeds of aquatic plants (pondweeds, algae, sedges, grasses, smartweeds, etc.), aquatic invertebrates.	Not reported.	268,000.	Mean North American breeding population 1994 – 2003: 2.0 million; increasing trend 1970-2003 (NAWMP Committee 2004b, Table 2).
			19,800 11/01/10	36	3920	1020	0	0	1555	590				
			19,520 10/24/11	7	250	345	0	0	765	0				
			18,255 03/30/09	NA	2800	3150	0	625	375	1180				
Lesser scaup *(Aythya affinis)*	No.	Abundant in spring and fall, rare in summer, uncommon in winter.	169,865 11/12/09	2	2470	0	140	0	445	0	Feeds on seeds of pondweeds, widgeon grass, wild rice, sedges, bulrushes; also crustaceans, mollusks, and aquatic insects.	4.3 million/6.3 million ((breeding population; includes greater and lesser scaup combined).	157,000.	Estimated scaup populations have been increasing since 2006 (USFWS 2011i, Figure 2). Declines appear to be unrelated to adult survival, but rather to reproductive failure, specifically with populations that breed in the western boreal forest of Canada (Furtman 2011). Reported declines may also be based in part on survey bias (Afton and Anderson 2001 pp. 788-800).
			126,610 11/01/10	2	1665	220	15	25	430	90				
			82,185 03/30/09	NA	4850	8900	4100	1580	980	1600				
Common goldeneye *(Bucephala clangula).*	No.	Abundant in spring and fall; common in winter.	9,295 11/12/09	12	500	0	25	0	560	0	Feeds on aquatic insects, crustaceans and aquatic plants.	Not reported.	34,000 (all goldeneye) .	Mean North American breeding population 1994 – 2003: 1.3 million; no trend 1970-2003 (NAWMP Committee 2004b, Table 2).
			20,960 03/30/09	NA	910	2120	110	275	660	450				
Bufflehead *(Bucephala albeola).*	No.	Common in spring, abundant in fall, rare in winter.	18,635 11/01/10	2	95	0	0	0	145	60	Feeds on aquatic insects, snails, amphipods, small fishes, and some aquatic plants.	Not reported.	80,000.	Mean North American breeding population 1994 – 2003: 1.4 million; increasing trend 1970-2003 (NAWMP Committee 2004b, Table 2).
			10,100 11/16/09	3	85	0	90	0	175	0				

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					5 C	5 O	5A C	5A O	6/ Tr.	7 O				
Hooded merganser *(Lophodytes cucullatus).*	Yes.	Common in spring, summer and fall; rare in winter.	2,160 11/26/07	6	0	0	0	0	130	0	Eats mostly small fishes, crayfishes and other crustaceans, and aquatic insects obtained by diving underwater.	Not reported.	46,000.	Mean North American breeding population 1994 – 2003: 350,000; increasing trend 1970-2003 (NAWMP Committee 2004b, Table 2).
			1,320 12/07/09	NA –Pools 4-6 not counted.						0				
Ruddy duck *(Oxyura jamaicensis).*	No.	Common in spring and fall; rare in summer and winter.	9,705 10/24/11	6	25	0	0	0	590	0	Eats pondweeds, algae, wild celery; seeds of sedges, smartweeds, grasses; also eats insects and their larvae, shellfishes, crustaceans.	Not reported.	8,000.	Mean North American breeding population 1994 – 2003: 1.1 million; increasing trend 1970-2003 (NAWMP Committee 2004b, Table 2).
			13,390 10/18/11	3	0	0	0	0	350	0				
Other Monitored Species														
Great blue heron *(Ardea herodias).*	Yes.	Abundant in spring, summer and fall; rare in winter.	47 09/19/11	53	12	1	0	0	5	7	Eats fishes, insects, crustaceans, amphibians and reptiles, mice and shrews, and other animals. Forages mostly while standing in water but also in fields.	Not applicable.	Not applicable.	Populations generally are stable or increasing in most areas (NatureServe 2011).
			14 09/27/10	79	1	3	0	1	2	4				
Great egret *(Casmerodius albus).*	Yes.	Abundant in spring and fall; common in summer.	169 10/11/11	90	1	0	0	1	65	85	Eats mainly fishes, amphibians, snakes, snails, crustaceans, insects, and small mammals; commonly forages in marshes and shallow water of ponds, also in fields.	Not applicable.	Not applicable.	
			130 09/19/11	70	1	0	0	0	55	35				
Bald eagle *(Haliaeetus leucocephalus).*	Yes.	Abundant in fall and common in spring, summer and winter.	615 11/16/09	2	1	1	2	0	3	7	Prefer fish but may take small animals, dead animals and waterfowl.	Not applicable.	Not applicable.	
			404 11/29/10	NA – Pools 4-6 not counted.						13				
American coot *(Fulica americana).*	Yes.	Abundant in spring and fall, rare in summer, uncommon in winter.	171,775 11/12/09	9	11540	2630	50	50	1725	25	Eats seeds, roots, and other plant material, insects, snails, small fishes, tadpoles, and other small organism; feeds on land and in water.	Not reported.	206,000	
			215,450 10/24/11	17	6450	20200	75	0	8580	1005				

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					5 C	5 O	5A C	5A O	6/ Tr.	7 O				
American white *pelican (Pelecanus erythrorhynchos)*	No.	Common in spring and fall; uncommon in summer.	2,859 11/01/10	17	0	286	0	0	0	201	Diet includes mainly fishes of little commercial value (e.g., carp, perch, catfish, suckers, sticklebacks, minnows).	Not applicable.	Not applicable.	
			3,505 10/04/10	89	385	120	0	1	2615	0				
Double-crested cormorant *(Phalacrocorax auritus).*	Yes.	Common in spring, summer and fall.	5,066 10/05/09	6	7	115	77	0	128	0	Feeds opportunistically on fishes.	Not applicable.	Not applicable.	Population has increased dramatically from very low numbers in the 1970s; population estimated as at least 256,000 breeding pairs in 1999. Because of adverse impacts on fisheries, USFWS has issued depredation orders to control the cormorants (Federal Register Vol 68, No. 195, October 8, 2008 and Vol. 74, No. 64, April 6, 2009).
			3,093 10/03/11	11	95	0	11	0	231	0				

Notes: 5C = closed portions of Pool 5; 5O = open portions of Pool 5; 5AC = closed portions of Pool 5A; 5AO = open portions of Pool 5A; 6/Tr. = Pool 6 and Trempealeau National Wildlife Refuge; 7O = open portions of Pool 7.
Source for bird count data: USFWS 1996, 1997, 1998, 1999, 2000b, 2001, 2002, 2003, 2004, 2005, 2006d, 2007c, 2008, 2009c, 2009d, 2010c, 2011o.

Table N-2. Potential Impacts to Monitored Species and Additional Resource Classification A and B Species.

Bird	Poor Flyer? *(Bevanger 1998 Fig 1)*	Typically Travel in Large Flocks?	Typically Feed in Ag Fields?	Wingspan, inches/ Weight, lb. *(Sibley 2001)*	Season Common or Abundant on Refuge	Estimated North American Population *(USFWS 2011i or PIF 2007)*/ Notes or Trend	Site-Specific Factors		Literature Studies/Comments	Conclusions
							Related to Crossing	Q1 Alternatives		
Tundra swan	N	Y	N	66/14	Sp Fa	98,000/ Above NAWMP goal.	Small percent of migrants in Proposal area. Nearest closed areas with concentrations in Pools 4 and 5 are 3 to 4 miles away. Fairly large congregation on 5O during spring migration. Crossing is not in a pool area; nearest on 5O is Goose Lake, 3 mi S.	Several hundred may be at 6/Tr during some weeks of fall migration; however, little flock movement away from the river is expected as the swan roosts and feeds at the river.	While multiple events of trumpeter and mute swan collisions are documented (see below), the only documentation of tundra swan fatalities found was from the USFWS utility bird fatality injury program report (USFWS utility report), which summarizes all utility reports of bird fatality/injury from 1997 to 2011, but does not distinguish by bird species between electrocutions and collisions (USFWS 2011q). From the USFWS utility report, the total count is approximately 3,400 birds from 1997 to 2011, with 85% electrocutions and 15% collisions (approximately 510 collisions). Four tundra swans were included; however it is not known if they were injured/killed by electrocution or collision. The USFWS utility report also lists 77 "waterfowl" and some waterfowl by species. The small relative number of tundra swan in the literature compared with trumpeter and mute may be in part because the tundra swan is much lighter and hence probably more maneuverable than the other two. Also, the tundra swan would not be making daily flights to and from ag fields to its roosting site, as the trumpeter swan is likely to do. Flocks of tundra swan at the Refuge have been observed to move downstream when disturbed (Berry 1988 as summarized in Dahlgren and Korschgen 1992).	Based on the literature review, tundra swans do not appear to have a high susceptibility to power line collisions. Tundra swans would not be expected to move off the Refuge during migration to feed in ag fields. No impacts to Refuge populations are expected.
Trumpeter swan	N	N	Y	80/23	--	34,803/ Above NAWMP goal, increasing; MN threatened.	FWS includes trumpeter swans in its monitoring program. All reported occurrences have been in Pools 9-11, 30 miles or more from the Proposal Area.		Five instances of trumpeter swan collisions with power lines were reported from Montana (Banko 1960 as summarized in CEC 2011). Collisions with fences, telephone wires, and power lines reportedly caused the death of 14 swans on public lands in the US during 1958 – 73 (Weaver and St. Ores 1974 as summarized in CEC 2011). Recently, collisions have been reported in WA, WY, and MN (Trumpeter Swan Society 2010). Xcel is working with various agencies and interest groups to mitigate impacts, which appear to be occurring primarily near Monticello, MN. This site is near a 69-kV line at an ice-free part of the Mississippi River in central MN (Rasmussen 2005). Trumpeter swan enthusiasts have been feeding the swans at Monticello every winter for 25 years; there are reportedly 2,000 swans (the majority of the MN population) at the Monticello site in winter (Monticello Chamber of Commerce and Industry 2011). USFWS utility report: 33 trumpeter swans (see discussion under tundra swan above).	While, based on the literature survey, the trumpeter swan is susceptible to collisions with power lines, negligible to no impacts are expected to any Refuge populations, as they are far from the Proposal area. Mitigation measures may be taken if at-risk trumpeter swans are identified in other parts of the Proposal area, especially in MN. Note that while the trumpeter swan is still listed as threatened in MN, the State of MN goal of 500 individuals has been exceeded (the current MN population is estimated at 2,400) (MDNR 2011d). The total interior NAWMP population goal is 2,000.
Mute swan	N	N		75/22	--	Not reported. Non-significant growth trend of +5.8 from 2000 to 2010 (Sauer et al. 2011).	No mute swans identified in Refuge monitoring program.		Many mute swan collisions with transmission lines have been reported in northern Europe (Harrison 1963, Mathiasson 1999, Ogilvie 1967, Owen and Cadbury 1975, Perrins and Sears 1991, Wilmore 1974 – all as summarized in CEC 2011). At least 50 were reported killed in Wisconsin at one site from 1959 to 1974 (Sisson 1975 as summarized in CEC 2011). USFWS utility report: 0 mute swans (see discussion under tundra swan above).	Mute swans, while collision-prone, are an introduced species and are rarely present on the Refuge. No impacts are expected.

Bird	Poor Flyer? *(Bevanger 1998 Fig 1)*	Typically Travel in Large Flocks?	Typically Feed in Ag Fields?	Wingspan, inches/ Weight, lb. *(Sibley 2001)*	Season Common or Abundant on Refuge	Estimated North American Population *(USFWS 2011i or PIF 2007)*/ Notes or Trend	Site-Specific Factors		Literature Studies/Comments	Conclusions
							Related to Crossing	Q1 Alternatives		
Canada goose	N	Y	Y	60/10	Sp Su Fa Wi	5.3 million/ Above NAWMP goal. Significant growth trend of +15.5 from 2000 to 2010 (Sauer et al. 2011).	Small percent of migrants in Proposal area. Few in 5O.	Several hundred Canada geese may be at 6/Tr during fall migration and may fly across line to access ag fields; however, the line would be more than a mile from the water.	A 5-year study at power plant cooling pond reported 10 Canada goose casualties out of 43,450 use days (0.23 casualties per 1000 use days) (Rusz et al 1986 p. 443). Canada geese were under-represented in 200 casualties at a lake in North Dakota (Faanes 1987 p. 15). From 1963 to 1975 4.3 percent of 553 recovered Canada geese in England were record as dead from power line collision (Thomas 1977 as summarized in CEC 2011). USFWS utility report: 20 Canada geese (see discussion under tundra swan above).	Based on the literature review, Canada geese are not particularly susceptible to collisions. Only a small percent of the Refuge population is found in the Proposal area. While Canada geese may make daily flights between the Refuge and nearby ag fields to feed, no lines paralleling the river would be close to pools. No impacts to Refuge populations are expected.
Greater white-fronted goose	N	Y	Y	53/5	--	Not reported/ Above NAWMP goal.	The USFWS counts only "other geese" in addition to Canada geese. Recent maximum single-day counts of "other geese" have not exceeded 25 birds.		No reports specific to white-fronted geese were found. USFWS utility report: 0 greater white-fronted geese (see discussion under tundra swan above).	Greater white-fronted geese do not appear to be collision-prone and are present in very small numbers on the Refuge. No impacts expected.
Lesser snow goose	N	Y	Y	53/5	--	5.3 million/ Above NAWMP goal.			In North Dakota, 46 snow geese apparently struck a utility line, all in one morning (Schroeder 1977 as summarized in CEC 2011). Snow geese were reported striking utility lines during a storm in Texas (Peterson and Glass 1946 as summarized in CEC 2011). One author mentioned an incident in which 131 lesser snow geese were killed in a power line collision in Missouri (Trauger et al 1971). In Manitoba, a flock of snow geese in an ag field panicked when a small plan approached at an elevation of 100 feet; 25 to 75 were killed when they struck a nearby power line (Blokpoel and Hatch 1976 as summarized in Dahlgren and Korschgen 1992). USFWS utility report: 7 snow geese (see discussion under tundra swan above).	While the lesser snow goose seems to be susceptible to collision, no population impacts are expected because of the low population at the Refuge and the large overall population.
Mallard	N	Y	Y (in winter may fly 30 miles to forage from roost sites)	35/2.4	Sp Su Fa Wi	9.2 million/ Above NAWMP goal. Non-significant growth trend of +0.7 from 2000 to 2010 (Sauer et al. 2011).	Closed concentration areas (including 5C) are not close to proposed line. Several hundred in fall on 5O; however, nearest pool area is Goose Lake, 3 mi S.	Several hundred mallards (of > 40,000 on the Refuge) may be at 6/Tr during fall migration and may fly across line to access ag fields; however, the line would be more than a mile from the water.	Janss (2000) considered the mallard to be collision-prone, although it's not clear why. In a 5-year study at a Michigan cooling pond next to a river, with a transmission line between the pond and river, Rusz et al (1986) found a casualty rate of 0.157 per 1000 use days for mallards (4 mallards, 31,810 use-days). In a three-year study at a power pond in Illinois surrounded by corn fields, Anderson (1978) found a casualty rate of 0.026 per 1000 use days for mallards. Anderson reports that the mallard's trips from the pond to nearby cornfields did not require that they fly over the lines (hence the low casualty rate). Many mallards were reported killed in a storm in South Dakota by colliding with trees, buildings and utility wires (Schorger 1952 as summarized in CEC 2011). USFWS utility report: 2 mallard (see discussion under tundra swan above).	Based on the literature review, mallards are not particularly susceptible to collisions. Only a small percent of the Refuge population is found in the Proposal area. While mallards may make daily flights between the Refuge and nearby ag fields to feed, no lines paralleling the river would be close to pools. No impacts to Refuge populations are expected.
American black duck	N	Y	N	35/2.6	--	190,000/ Below NAWMP goal; but taken off Watch List. Non-significant growth trend of +1.9 from 2000 to 2010 (Sauer e al. 2011).	From surveys beginning in the 1990s very few black ducks have been observed at the Refuge, and almost none (20 or less in a given day) in the Proposal area.		Anderson (1978) reported finding one black duck among 343 waterfowl power line collision causalities at a power plant pond in Illinois where a half-million waterfowl were counted over a 5-year monitoring period. The percent of black ducks in the overall population was not reported (this was reported only for the mallard, blue-winged teal, coot and Canada goose). USFWS utility report: 0 black ducks (see discussion under tundra swan above).	Given that almost no black ducks have been documented near the Proposal area, impacts to black ducks are not expected.

Bird	Poor Flyer? *(Bevanger 1998 Fig 1)*	Typically Travel in Large Flocks?	Typically Feed in Ag Fields?	Wingspan, inches/ Weight, lb. *(Sibley 2001)*	Season Common or Abundant on Refuge	Estimated North American Population *(USFWS 2011i or PIF 2007)*/ Notes or Trend	Site-Specific Factors		Literature Studies/Comments	Conclusions
							Related to Crossing	Q1 Alternatives		
Northern pintail	N	Y	Y	34/1.8	Sp Fa	4.4 million/ **Below NAWMP goal**; increasing. Non-significant growth trend of +4.7 from 2000 to 2010 (Sauer et al. 2011).	Northern pintails are found in large numbers on the Refuge during fall migration; however, almost none have been counted in the Proposal area.		At a Montana wetland that had been the site of 63,000 bird deaths from a botulism outbreak the two previous years, 3,218 birds were reported killed from power line collisions in a 18-month period (the authors believe the incidents were not related) (Malcolm 1982). A total of 264 pintails were documented as killed from power line collisions at the site (Malcolm 1982 Table 1). Malcolm reported the overall breeding/nesting population as 45,000 including 32,000 dabbling ducks, 4,000 eared grebes and 3,000 American coots, with peak populations in August due to the influx of 30,000 blue-winged teal and 15,000 pintails. Malcolm reported that the birds killed represented the populations present at the site. Based on the reported numbers, dabbling ducks, especially blue-winged teal and pintail, appear to be under-represented in collision counts compared to grebes and shorebirds. Anderson (1978) reported pintails as 2.3% of collision casualties (see discussion above under American black duck). One pintail was reported in a study in Manitoba (Siegfried 1972 as summarized in CEC 2011). USFWS utility report: 1 pintail (see discussion under tundra swan above).	Based on the literature review, Northern pintails are not particularly susceptible to collisions. Only a small percent of the Refuge population is found in the Proposal area. No impacts to Refuge populations are expected.
Gadwall	N	Y	Y	33/2	Sp Fa	3.3 million/ Above NAWMP goal. Non-significant growth trend of +2.0 from 2000 to 2010 (Sauer et al. 2011).	Closed concentration areas (including 5C) are not close to proposed crossing.	Approximately 1,000 gadwalls (of 50,000 on the Refuge) may be at 6/Tr during fall migration and may fly across line to access ag fields; however, the line would be more than a mile from the water.	Malcolm (1982) reported 183 gadwalls killed in the power line collision in Montana (described above under northern pintail). Anderson (1978) reported the gadwall as 1.8% of collision casualties (see discussion above under American black duck). USFWS utility report: 0 gadwalls (see discussion under tundra swan above).	Based on the literature review, gadwalls are not particularly susceptible to collisions. Only a small percent of the Refuge population is found in the Proposal area. While gadwalls may make daily flights between the Refuge and nearby ag fields to feed, no lines paralleling the river would be close to pools. No impacts to Refuge populations are expected.
American wigeon	N	Y	Y	32/1.6	Sp Fa Wi	2.1 million/ **Below NAWMP goal**. Non-significant growth trend of -2.1 from 2000 to 2010 (Sauer et al. 2011).	Closed concentration areas (including 5C) are not close to proposed crossing. Up to 200 in fall on 5O; however, nearest pool area is Goose Lake, 3 mi S.	Approximately 1,000 wigeons (of 14,000 on the Refuge) may be at 6/Tr during fall migration and may fly across line to access ag fields; however, the line would be more than a mile from the water.	Malcolm (1982) reported 42 American wigeons killed in the power line collision in Montana (described above under northern pintail). Anderson (1978) reported the American wigeon as 6.3% of collision casualties (see discussion above under American black duck). USFWS utility report: 0 wigeons (see discussion under tundra swan above).	Based on the literature review, wigeons are not particularly susceptible to collisions. Only a small percent of the Refuge population is found in the Proposal area. Although wigeon populations are below their NAWMP goal and may still be declining, over 100,000 are harvested annually in the Mississippi Flyway. Any losses from the Proposal would be expected to be negligible by comparison. No impacts to Refuge populations are expected.
Northern shoveler	N	Y	N	30/1.3	Sp Fa	4.6 million/ Above NAWMP goal. Significant growth trend of +4.2 from 2000 to 2010 (Sauer et al. 2011).	Northern shovelers are found in large numbers on the Refuge during fall migration; however, very few have been counted in the Proposal area.		Malcolm (1982) reported 82 northern shovelers killed in the power line collision in Montana (described above under northern pintail). Anderson (1978) reported Northern shovelers as 1.1% of collision casualties (see discussion above under American black duck). USFWS utility report: 0 shovelers (see discussion under tundra swan above).	Northern shovelers are very abundant, however very few are found in the Proposal area, and they would not be expected to travel between the Refuge and ag fields to feed. No impacts to Refuge populations are expected.

Bird	Poor Flyer? *(Bevanger 1998 Fig 1)*	Typically Travel in Large Flocks?	Typically Feed in Ag Fields?	Wingspan, inches/ Weight, lb. *(Sibley 2001)*	Season Common or Abundant on Refuge	Estimated North American Population *(USFWS 2011i or PIF 2007)*/ Notes or Trend	Site-Specific Factors		Literature Studies/Comments	Conclusions
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Blue-winged teal	N	Y	N	23/0.8	Sp Su Fa	8.9 million/ Above NAWMP goal. Non-significant growth trend of +0.5 from 2000 to 2010 (Sauer et al. 2011).	Up to a few hundred blue winged teals may be present in fall on 5C, with up to 100 to 150 on 5O. Crossing is not close to closed areas and is not in a pool; nearest on 5O is Goose Lake, 3 mi S.	A few hundred may be at 6/Tr and Pool 7 during some weeks of fall migration; however, little flock movement away from the river is expected as the teal roosts and feeds at the river.	Malcolm (1982) reported 437 blue-winged teals killed in the power line collision in Montana (described above under northern pintail; as noted above, blue-winged teals appear to be under-represented in collision counts compared to overall population). Anderson (1978) reported the blue-winged teal as 16.7% of collision casualties, resulting in 0.55 casualties per 1000 use days (104,000 use days) (see discussion above under American black duck). USFWS utility report: 0 teals (see discussion under tundra swan above).	Based on the literature review, blue-winged teals are not particularly susceptible to power line collisions, they are very abundant, only a small percent of the Refuge population is found in the Proposal area, and they would not be expected to fly back and forth to ag fields. No impacts to Refuge populations are expected.
Green-winged teal	N	Y	Y	23/0.8	Sp Fa	2.9 million/ Above NAWMP goal. Non-significant growth trend of +2.0 from 2000 to 2010 (Sauer et al. 2011).	Green-winged teals are found in large numbers on the Refuge during fall migration; however, very few have been counted in the Proposal area.		Malcolm (1982) reported 212 green-winged teals killed in the power line collision in Montana (described above under northern pintail). Anderson (1978) reported green-winged teals as 4% of collision casualties (see discussion above under American black duck). USFWS utility report: 0 teals (see discussion under tundra swan above).	Green-winged teals are very abundant on the Refuge, however very few are found in the Proposal area. No impacts to Refuge populations are expected.
Wood duck	N	Y	N (but eats acorns)	30/1.3	Sp Su Fa	4.6 million/ Increasing. Significant growth trend of +4.0 from 2000 to 2010 (Sauer et al. 2011).	Very few wood ducks have been counted in Pool 5.	A fairly high percent of fall migrants may be on 6/Tr (55 of 130 in Oct 2010) and wood ducks may move away from the river to feed; however, the line would be more than mile from the river.	Anderson (1978) reported wood ducks as 2.3% of collision casualties (see discussion above under American black duck). USFWS utility report: 2 wood ducks (see discussion under tundra swan above).	Based on the literature review, wood ducks are not particularly susceptible to power line collisions. While they are reported as abundant or common, relatively few are found on the Refuge. Very few have been found near the crossing area. Compared to an annual Mississippi Flyway harvest of nearly one million, any impacts would be negligible.
Redhead	N	Y	N	29/2.3	Sp Fa	1.4 million/ Above NAWMP goal. Non-significant growth trend of +3.8 from 2000 to 2010 (Sauer et al. 2011).	Almost no redheads have been counted within or near the Proposal area.		In a 5-year study at a Michigan cooling pond next to a river, with a transmission line between the pond and river, Rusz et al (1986) found no redheads killed in collisions with transmission lines, in spite of more than 25,000 use days for redheads (lesser and greater combined (Rusz et al 1986 p. 443). Malcolm (1982) reported 24 redheads killed in the power line collision in Montana (described above under northern pintail). Many redheads were reported killed in a storm in South Dakota by colliding with trees, buildings and utility wires (Schorger 1952 as summarized in CEC 2011). Woodin and Michot (2002, as summarized in CEC 2011) reported multiple personal observations of redheads striking transmission lines flying between a dairy and a roosting site. USFWS utility report: 0 redheads (see discussion under tundra swan above).	Based on the literature review, redheads are not particularly susceptible to power line collisions, they are very abundant, almost none have been found near the Propsal area, and they would not be expected to fly back and forth to ag fields. No impacts to Refuge populations are expected.
Canvasback	N	Y	N	29/2.7	Sp Fa	700,000/ Above NAWMP goal. Non-significant growth trend of +1.9 from 2000 to 2010 (Sauer et al. 2011).	Up to 2,155 canvasbacks have been counted in 5O; however this is a small percent of the maximum single day counts (480,000). Several thousand may also be in 5C. With this many birds, a few are likely to be near the crossing area even though no pools are near the crossing.	A very low percent of canvasbacks are counted in Pool 6/Tr or 7O.	Mowbray (2002 as summarized in CEC 2011) noted several instances of reported canvasback fatalities from striking power lines. In Malcolm 1982, the canvasback was included in the "other bird species" category of collision casualties (< 10 birds/species) at a Montana site (described above under northern pintail). Anderson (1978) reported observing canvasbacks; however none were included in collision casualties (see discussion above under American black duck). USFWS utility report: 0 canvasbacks (see discussion under tundra swan above).	Because of the large number of birds in the general vicinity of the Proposal, there may be an occasional encounter. While the Refuge is an important stopover for migrating canvasbacks, the current North American population is 160,000 above the NAWMP goal. No impacts to Refuge populations are expected.

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Ring-necked duck	N	Y	N	25/1.5	Sp Fa	2.0 million/ Non-significant growth trend of +5.5 from 2000 to 2010 (Sauer et al. 2011).	A few thousand ring-necked ducks have been counted at 5O and 5C.	Over 10,000 ring-necked ducks have been counted at 6/Tr and nearly 600 at Pool 7 (of a flock of up to 42,000) during some weeks of fall migration; however, little flock movement away from the river is expected as the ring-neck duck roosts and feeds at the river.	In Malcolm 1982, the ring-necked duck was included in the "other bird species" category of collision casualties (< 10 birds/species) at a Montana site (described above under northern pintail). Anderson (1978) reported the ring-necked duck as 0.6% of collision casualties (see discussion above under American black duck). USFWS utility report: 0 ring-necked duck (see discussion under tundra swan above).	Because of the large number of birds in the general vicinity of the Proposal, there may be an occasional encounter. However, compared to the 2010 Mississippi Flyway hunting harvest of 268,000, any effects from the Proposal would be negligible. No impacts to Refuge populations are expected.
Lesser scaup	N	Y	N	25/1.8	Sp Fa	4.3 million/ Below NAWMP goal; increasing. Non-significant growth trend of +3.7 from 2000 to 2010 (Sauer et al. 2011).	Several thousand lesser scaup have been counted at 5O and 5C (compared to overall Refuge counts of up to 170,000).	Nearly 1,000 lesser scaup have been counted at 6/Tr and 1,600 at Pool 7 (of a flock of up to 170,000) during some weeks of fall migration; however, little flock movement away from the river is expected as the ring-neck duck roosts and feeds at the river.	In a 5-year study at a Michigan cooling pond next to a river, with a transmission line between the pond and river, Rusz et al (1986) found no scaup killed in collisions with transmission lines, in spite of more than 25,000 use days for scaup (lesser and greater combined) (Rusz et al 1986 p. 443). Austin et al 1998 (as summarized in CEC 2011) noted lesser scaup collisions in the prairie pothole region of Canada. In Malcolm 1982, the lesser scaup was included in the "other bird species" category of collision casualties (< 10 birds/species) at a Montana site (described above under northern pintail). Anderson (1978) reported the lesser scaup as 1.1% of collision casualties (see discussion above under American black duck). USFWS utility report: 0 scaup (see discussion under tundra swan above).	While lesser scaup have a higher presence in the study area than most other species, based on the literature review they appear to have a relatively low risk for collision. Also, scaup would not be expected to fly off the Refuge to feed in ag fields. Any impacts would be expected to be negligible compared to the annual Mississippi Flyway hunting harvest of 150,000.
Common goldeneye	N	Y	N	26/1.9	Sp Fa	1.3 million/ Non-significant growth trend of +2.8 from 2000 to 2010 (Sauer et al. 2011).	Approximately 900 goldeneyes have been counted in 5C and over 2,000 in 5O.	Several hundred goldeneyes have been counted in Pool 6/Tr and 7.	USFWS utility report: 1 goldeneye (see discussion under tundra swan above).	As with the lesser scaup, goldeneyes have a higher presence in the study area than most other species; however, based on the literature review they appear to have a relatively low risk for collision. Also, goldeneye would not be expected to fly off the Refuge to feed in ag fields. Any impacts would be expected to be negligible compared to the annual Mississippi Flyway hunting harvest of 34,000.
Bufflehead	N	Y	N	21/0.8	Sp Fa	1.4 million/ Significant growth trend of +4.5 from 2000 to 2010 (Sauer et al. 2011).	Up to 850 in 5C. Maximum total 19,000.	Few hundred in 6/Tr.	McDonald (1979, as summarized in CEC 2011) reported a bufflehead striking a utility line in New Mexico and being "stunned." USFWS utility report: 0 buffleheads (see discussion under tundra swan above).	Based on the literature review, buffleheads are not particularly susceptible to power line collisions, only a small percent of the Refuge population has been found near the Proposal area, and they would not be expected to fly back and forth to ag fields. No impacts to Refuge populations are expected.

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Hooded merganser	N	Y	N	24/1.4	Sp Su Fa	350,000/ Non-significant growth trend of +8.4 from 2000 to 2010 (Sauer et al. 2011).	None	Few hundred out of 2,000 in 6/Tr.	In Malcolm (1982), the hooded merganser was included in the "other bird species" category of collision casualties (< 10 birds/species) at a Montana site (described above under northern pintail). For the common merganser, a related but much heavier species (3.4 lb), Padding (1993, as summarized in CEC 2011) reported 624 collisions in 1988-1991 near Saginaw Bay, Michigan, resulting in death and 907 in serious injury. USFWS utility report: one hooded merganser (see discussion under tundra swan above).	Based on the literature review, hooded mergansers are not particularly susceptible to power line collisions, none have been found near the proposed crossing, and they would not be expected to fly back and forth to ag fields. No impacts to Refuge populations are expected.
Ruddy duck	N	Y	N	18/1.2	Sp Fa	1.1 million/ Non-significant growth trend of +1.3 from 2000 to 2010 (Sauer et al. 2011).	Almost none of up to 14,000 total one-day count near crossing area.	Few hundred at 6/Tr.	Malcolm (1982) reported 47 ruddy ducks killed in the power line collision in Montana (described above under northern pintail). Anderson (1978) reported observing ruddy ducks; however none were included in collision casualties (see discussion above under American black duck). USFWS utility report: 1 ruddy duck (see discussion under tundra swan above).	Based on the literature review, ruddy ducks are not particularly susceptible to power line collisions, almost none have been found near the proposed crossing, and they would not be expected to fly back and forth to ag fields. No impacts to Refuge populations are expected.
Great blue heron	N	N	May forage in fields for small animals.	72/5	Sp Su	Not reported/ Significant growth trend of +1.1 from 2000 to 2010 (Sauer et al. 2011).	Not close to heron rookeries.	Need to address proximity of rookeries with USFWS.	Spalding and Forrester (1991) reported that "collision with power lines" was "a significant mortality factor" for great blue herons and great egrets in Florida; however, their evidence of power line collision was "singed feathers," which suggests electrocution, not collision, so this report is not reliable for assessing collision risk (Spalding and Forrester 1991 p. 22). This (erroneous) conclusion was repeated in at least one other study (NPS 2010 p. 15). In its reports filed with USFWS and the State, Florida Power & Light (FPL) for the period 1997-2010, reported 6 great blue heron fatalities by collision, all except one with the shield wire (4 additional herons were electrocuted) (FPL 2010). USFWS utility report: 124 great blue heron collision/electrocution (see discussion under tundra swan above). In a 5-year study at a Michigan cooling pond next to a river, with a transmission line between the pond and river, Rusz et al (1986) found a casualty rate of 56.1 per 1000 use days for great blue herons, two orders of magnitude greater than any other bird (6 herons, 107 use-days). The authors report finding 2 great blue herons that had collided with a chain link fence near the pond (Rusz et al 1986 p. 443); it's not clear if these birds were included in the collision counts. The authors noted that great blue herons often fly at dawn or dusk, when visibility is low; they hypothesized that the herons have poor vision (p. 444).The great blue heron was included in the "other bird species" category of collision casualties (< 10 birds/species) at a Montana site (described above under northern pintail). Wiese (1976) reported that breeding herons and egrets, when coming close to power lines, either elevated or lowered their flying altitude or ceased wing-flapping and glided through the cables; under adverse conditions (high headwinds, heavy rains or dense fog), they either flow close to the water surface, or delayed departure from the breeding sites until flying conditions improved. Manville (2005, p. 1051) believes large, less maneuverable birds such as the great blue heron are more susceptible to power line collisions.	Based on the literature review, great blue herons may have a relatively higher susceptibility to power line collisions than most of the other birds addressed. However, they do not travel in large flocks and the proposed crossing is not located near rookeries.

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Great egret	N	N	N	51/2	Sp Su	Not reported/ Threatened in WI; globally stable/ Significant growth trend of +3.8 from 2000 to 2010 (Sauer et al. 2011).	Not close to egret rookeries.	Need to address proximity of rookeries with USFWS.	See notes on Spalding and Forrester (1991) and Wiese (1976) under great blue heron above. FPL (2010) reported no egret fatalities for 1997-2010. USFWS utility report: 2 great egrets (see discussion under tundra swan above). McNeill et al (1985) noted egrets present at a study site and reported 1 among 611 collision casualties.	Based on the literature review great egrets appear to be much less susceptible to collisions than great blue herons. This may be at least in part due to their weight (2 lbs vs 5 lb for the heron). They do not travel in large flocks and would not be expected to travel back and forth from ag fields to feed. No impacts to Refuge populations are expected.
Bald eagle	N	N	Prefers fish but may take small animals, dead animals and waterfowl.	80/9.5	Sp Su Fa Wi	300,000/ Increasing but considered locally rare by USFWS. Significant growth trend of +8.8 from 2000 to 2010 (Sauer et al. 2011).	Two active eagle nests on the Minnesota side: one adjacent to the existing line and one 1,800 ft. from the corridor. Bald eagles fish below dams during winter; nearest dam is approximately 2 mile from proposed crossing.	No information regarding bald eagle use of 6/Tr and Pool 7 was found.	USFWS utility report: 205 bald eagles (see discussion under tundra swan above). All or nearly all are assumed to be from electrocution, not collision. Bevanger (1998) tallied collisions by family, with results from 1 to 2,983. He counted 7 casualties in the *Accipitridae* family (hawks, vultures, eagles); this may be in part due to the smaller number of individuals in the family compared to some others. In a seven-year study monitoring 502 endangered Bonetti's eagles in Spain, Mañosa and Real (2001) found two dead from power line collisions. Mañosa and Real reported that most studies have found high numbers of waterbirds, gamebirds, storks and cranes, dead under transmission lines, but very few birds of prey, with reference to Alonso et al 1994, Bevanger 1998, Savereno et al 1996, Janss and Ferrer 1998, and Bayle 1999. A review of these referenced reports confirmed Mañosa and Real's statement. Mañosa and Real (2001) reported that the decreased susceptibility of raptors to collision has been attributed to acute vision, flight performance and solitary habits and low population density. Janss (2000) supports this conclusion. In a review of 2360 raptors and owls accidentally killed in Norway in a 8-year period, 313 deaths were attributed to utilities (Bevanger and Overskaug 1998). For utility deaths, no distinction was made between electrocution and collision, but the authors concluded the deaths were from mostly electrocution; 465 were hit by vehicles and 465 collided with windows. Faanes (1987) reported that bald eagle diurnal movements during winter are usually from night roosts. "Typical feeding activities consist of short flights from a perch site over the water to capture prey and then a return flight to the perch site. Forest vegetation along the stream bank and along open water channels serve to limit bald eagle movements. Thus, most flights are at low altitudes." Faanes believed the greatest potential for collision is at midspan where the power lines cross the river and recommends placing markers on ground wires in such areas, with bald eagle concentrations. Faanes (1987) reported that Jackson et al 1982 (not available for review) found no negative effects of a 500-kV line on wintering eagles on the Columbia River when the lines studied had a combination of shield wire markers and shield wire removal. Faanes (1987) acknowledged that shield wires removal is not feasible in many cases and considered marking shield wires to increase their visibility to be a feasible alternative to shield wire removal.	Based on the literature review, bald eagles have a low susceptibility to power line collisions, and under most conditions they would be expected to spend much of their time between the tall roost trees bordering the river, and the river where they fish, as fish is their primary food. However, eagles are opportunistic feeders and do travel away from major rivers to feed, if opportunities exist. In any case, no impacts to Refuge populations are expected.

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							Related to Crossing	Q1 Alternatives		
American coot	Y	Y	N	24/1.4	Sp Fa	Not reported/ Globally secure. Non-significant growth trend of +0.5 from 2000 to 2010 (Sauer et al. 2011).	Max over 200,000. 11,500 in 5C and 20,000 in 5O.	8,500 in 6/Tr and 1,000 in 7O.	Malcolm (1982) reported 271 American coots killed in the power line collision in Montana (described above under northern pintail). Coots appeared to be slightly over-represented in collision counts (Malcolm 1982). Anderson (1978) reported American coots as 24.7% of collision casualties, resulting in 0.39 casualties per 1000 use days (217,000 use days) (see discussion above under American black duck). In a 5-year study at a Michigan cooling pond next to a river, with a transmission line between the pond and river, Rusz et al (1986) found 2 American coots killed in collisions with transmission lines, resulting in a very low casualty rate of < 0.005 casualties per 1000 use days (Rusz et al p. 443). USFWS utility report: 2 coots (see discussion under tundra swan above).	The literature review found conflicting results for collision susceptibility for coots, probably due to differing site conditions. Because of the large number of birds in the general vicinity of the Proposal, there may be an occasional encounter. However, compared to the 2010 Mississippi Flyway hunting harvest of 206,000, any effects from the Proposal would be negligible. No impacts to Refuge populations are expected.
American white pelican	N	Y	N	108/16	Sp Fa	Not reported/ Significant growth trend of +9.4 from 2000 to 2010 (Sauer et al. 2011).	Max 3,500. 380 in 5C, 120 at 5O.	2,600 in 6/Tr (most of flock).	FPL reported 5 American white pelican fatalities from transmission line impact from 1997-2010, 4 from striking a pole, and 1 from collision with the shield wire (FPL 2010). USFWS utility report: 5 American white pelicans (see discussion under tundra swan above). In Malcolm 1982, the American white pelican was included in the “other bird species” category of collision casualties (< 10 birds/species) at a Montana site (described above under northern pintail). Manville (2005, p. 1051) believes large, less maneuverable birds such as pelicans are more susceptible to power line collisions. In a summary of 16 power line collision studies Bevanger (1998) tallied collisions by family, with results from 1 to 2,983. He counted 4 casualties in the pelican family; this may be at least in part due to the smaller number of individuals in the family. McNeil et al (1985) found relatively high collision casualties with brown pelicans (which weight about half as much as the white) in a study of a lagoon adjacent to the Caribbean Sea, where a breeding colony of brown pelicans was located. The pelicans roosted in the lagoon and feed at sea; they had to cross a transmission line between the lagoon and sea. The highest casualties by far were found at the span located at the point of the shortest route between the pelican colony and the sea (700 feet). White pelicans were under-represented as collisions casualties in study in North Dakota near a large breeding colony of American white pelicans (Faanes 1987).	The literature review found conflicting results for collision susceptibility for pelicans, probably due to differing site conditions. Many migrating pelicans have been near the Proposal area. However, none of the pools where pelicans may be found are located near the crossing, and pelicans would not be expected to travel back and forth to ag fields. No impacts to Refuge populations are expected.
Double-crested cormorant	Y	Y	N	52/4	Sp Fa	1.6 million/ Significant growth trend of +8.3 from 2000 to 2010 (Sauer et al. 2011).	Not close to rookeries.	Few hundred in 6/Tr.	USFWS utility report: 1 double-crested cormorant (see discussion under tundra swan above). Double-crested cormorants were over-represented in collision casualties in a study in Ontario (Goodrich-Mahoney et al 2008).	Because double-crested cormorants are over-abundant, the crossing is not near rookeries, and the cormorants would not be traveling back and forth to feed in ag fields, no adverse impacts to Refuge populations are expected.

Bird	Poor Flyer? *(Bevanger 1998 Fig 1)*	Typically Travel in Large Flocks?	Typically Feed in Ag Fields?	Wingspan, inches/ Weight, lb. *(Sibley 2001)*	Season Common or Abundant on Refuge	Estimated North American Population *(USFWS 2011i or PIF 2007)*/ Notes or Trend	Site-Specific Factors		Literature Studies/Comments	Conclusions
							Related to Crossing	Q1 Alternatives		
Osprey	N	N	N	63/3	Fa	500,000/ Non-significant growth trend of +4.5 from 2000 to 2010 (Sauer et al. 2011).	The Refuge Comprehensive Conservation Plan (CCP) (USFWS 2006) reports that there are probably fewer than 10 osprey nests on the Refuge. No other Refuge-specific information was found.		FPL reported three osprey fatalities from transmission line impact from 1997-2010, one from the shield wire (FPL 2010). USFWS utility report: 123 osprey (electrocution plus collision) (see discussion under tundra swan above).	Based on the literature review, raptors have a generally low susceptibility to collision. Because of this and the very low Refuge population, impacts to osprey, golden eagles and peregrine falcons are not expected.
Peregrine falcon	N	N	Feeds mainly on birds- may hunt a few miles from nest.	41/1.6	--	1,200,000/ **Locally rare**. Significant growth trend of +8.3 from 2000 to 2010 (Sauer et al. 2011).	Other than the tabulated information on species found on the Refuge (breeds on Refuge, uncommon spring to fall) (USFWS 2006), no Refuge-specific information was found.		USFWS utility report: 2 peregrine falcon (see discussion under tundra swan above).	
Golden eagle	N	N	Feeds mainly on small mammals.	79/10	--	170,000/ Globally secure. Non-significant growth trend of +0.8 from 2000 to 2010 (Sauer et al. 2011).	Other than the tabulated information on species found on the Refuge (migrant, rare in spring and winter, uncommon in fall) (USFWS 2006), no Refuge-specific information was found.		USFWS utility report: 63 golden eagles (see discussion under tundra swan above). As with the bald eagle, these are assumed to be all or nearly all from electrocution. See also discussions under bald eagle above.	
Black tern	N	Y	Y	24/0.14	Sp Su	Not reported/ Globally secure but considered **locally rare by USFWS.** Non-significant growth trend of -3.5 from 2000 to 2010 (Sauer et al. 2011).	The CCP reports that black terns nest in shrubs and bushes throughout the Refuge, "but little is known of their nesting status" (USFWS 2006). No other Refuge-specific information was found.		In Malcolm (1982), the black tern was included in the "other bird species" category of collision casualties (< 10 birds/species) at a Montana site (described above under northern pintail). USFWS utility report: 1 tern (see discussion under tundra swan above).	Based on the literature review, terns have a generally low susceptibility to power line collision (except possibly the Caspian tern). Insufficient information on Refuge populations is available to assess impacts; however, the information available does not suggest a risk.
Forster's tern	N	Y	N	31/0.4	Sp	Not reported/WI **endangered.** Non-significant growth trend of +1.7 from 2000 to 2010 (Sauer et al. 2011).	No Refuge-specific information was found.		In Malcolm (1982), the Forster's tern was included in the "other bird species" category of collision casualties (< 10 birds/species) at a Montana site (described above under northern pintail). USFWS utility report: 1 tern (see discussion under tundra swan above).	
Caspian tern	N	Y	N	50/1.4	--	Not reported/WI **endangered.** Non-significant growth trend of +4.0 from 2000 to 2010 (Sauer et al. 2011).	No Refuge-specific information was found.		USFWS utility report: 1 tern (see discussion under tundra swan above). Based on a study at a lake in Ontario, Goodrich-Mahoney et al (2008) considered Caspian terns to be at risk for power line collisions.	
Common	N	Y	N	30/0.3	--	Not reported/	No Refuge-specific information was found.		In Malcolm (1982), the common tern was included in the "other bird species"	

Bird	Poor Flyer? *(Bevanger 1998 Fig 1)*	Typically Travel in Large Flocks?	Typically Feed in Ag Fields?	Wingspan, inches/ Weight, lb. *(Sibley 2001)*	Season Common or Abundant on Refuge	Estimated North American Population *(USFWS 2011i or PIF 2007)*/ Notes or Trend	Site-Specific Factors		Literature Studies/Comments	Conclusions
							Related to Crossing	Q1 Alternatives		
tern						WI endangered, MN threatened. Non-significant growth trend of +4.2 from 2000 to 2010 (Sauer et al. 2011).			category of collision casualties (< 10 birds/species) at a Montana site (described above under northern pintail). USFWS utility report: 1 tern (see discussion under tundra swan above). In a study of a common tern breeding colony Henderson et al (1996) concluded that "common terns are agile birds and suffered only low rates of direct mortality through collisions with power lines."	
Sandhill crane	N	Y	Y	77/11	--	Not reported/ Significant growth trend of +6.9 from 2000 to 2010 (Sauer et al. 2011).	The CCP reports increased use of certain Pool 8 areas by sandhill cranes. No other Refuge-specific information was found.		Migrating sandhill cranes stage in large groups and roost communally at night in shallow waters of wide river channels or other wetlands and spend the day foraging in flocks on surrounding upland (Sparling and Krapu 1994). In a study of a sandhill crane staging area on the Platte River, Murphy et al (2009) found that most collisions occurred with flocks roosting within approximately 1,800 feet of a power line. When the roosting flocks were disturbed, they flushed upward into the power line. In two events approximately 30 minutes apart, approximately 53 cranes from two flocks of more than 1,000 each collided with a power line this way (Murphy et al 2009). Sandhill cranes made up 19% of collisions casualties at a lake site in North Dakota; at another nearby site they were under-represented: the cranes' daily movement did not take them over the power line, but other species' did (Faanes 1987). Faanes (1987) reported that most sandhill crane casualties resulted from movement between roosting and feeding sites. FPL (2010) reported one sandhill crane collision fatality for 1997-2010. USFWS utility report: 20 sandhill cranes (see discussion under tundra swan above).	Based on the literature review, sandhill cranes are most susceptible to collision when roosting in large flocks in staging areas close to power lines. They are also at risk if their daily flights from roosts to ag fields involve a low-level crossing of a power line. Sandhill cranes do not use the Refuge for staging and the only CCP reports are for areas miles from the Proposal area. In addition, the eastern population has increased in recent years such that the USFWS has proposed allowing hunting for the eastern population (USFWS 2011n). No impacts are expected.
Mourning dove	Y	Y	Y	18/0.3	Sp Su Fa	130,000,000/ Significant growth trend of -0.4 from 2000 to 2010 (Sauer et al. 2011).	No Refuge-specific information was found.		USFWS utility report: one mourning dove (see discussion under tundra swan above).	While doves are reportedly poor flyers and may travel back and forth to ag field, no Refuge-specific information was available to assess impacts. However, the mourning dove is a game bird and is common and widespread in suburban and agricultural settings.

Table N-3. Summary of Birds from Breeding Bird Surveys.

Species	Group	99-09 North American Trend	USFWS utility bird fatality/injury report, avg annual
Common loon	Wetland	1.5	< 0.2
pied-billed grebe			0.4
green heron	Wetland	-1.2	< 0.2
American bittern	Wetland	no signif trend	< 0.2
turkey vulture		3	44
northern harrier	Grassland	no signif trend	0.6
sharp-shinned hawk		2.3	0.8
Cooper's hawk	Woodland	5.1	2.2
red-shouldered hawk	Woodland	4.1	1.8
broad-winged hawk	Woodland	no signif trend	< 0.2
Red-tailed hawk		2.3	60
American kestrel		-1.3	1.4
gray partridge		-1.1	< 0.2
ring-necked pheasant	Grassland	1.8	< 0.2
ruffed grouse	Woodland	no signif trend	< 0.2
wild turkey	Woodland	12.2	0.4
northern bobwhite	Successional/Scrub	-3.3	< 0.2
Virginia rail	Wetland	no signif trend	0.8
sora	Wetland	no signif trend	< 0.2
killdeer		no signif trend	< 0.2
spotted sandpiper	Wetland	no signif trend	< 0.2
upland sandpiper	Grassland	1.7	< 0.2
common snipe	Wetland	no signif trend	< 0.2
American woodcock	Successional/Scrub	no signif trend	< 0.2
ring-billed gull	Wetland	no signif trend	< 0.2
herring gull	Wetland	no signif trend	< 0.2
rock dove	Urban	no signif trend	18.4
mourning dove	Urban	no signif trend	4.4
black-billed cuckoo	Woodland	no signif trend	< 0.2
yellow-billed cuckoo	Woodland	-2.1	< 0.2
eastern screech owl	Woodland	no signif trend	1.8
great horned owl		no signif trend	43
barred owl		2.7	3.8
common nighthawk		-0.9	0.4
whip-poor-will	Woodland	no signif trend	< 0.2
chimney swift	Urban	-2	< 0.2
ruby-throated hummingbird	Woodland	2.2	< 0.2
belted kingfisher	Wetland	-1.2	< 0.2
red-headed woodpecker		-1.2	3
red-bellied woodpecker	Wetland	1.5	2.6
sapsucker (3 species)	Woodland	3	< 0.2
yellow-bellied sapsucker	Woodland	2.9	< 0.2
downy woodpecker	Woodland	no signif trend	< 0.2
hairy woodpecker	Woodland	1.1	0.4
northern flicker		-1.6	2.4
pileated woodpecker	Woodland	1.8	3.2
olive-sided flycatcher	Woodland	-1.3	< 0.2
eastern wood-pewee	Woodland	-0.8	< 0.2
Acadian flycatcher	Woodland	no signif trend	< 0.2
alder flycatcher		0.8	< 0.2
willow flycatcher		0.8	< 0.2
least flycatcher	Woodland	-1.4	< 0.2
eastern phoebe		1	< 0.2
great crested flycatcher	Woodland	0.5	< 0.2
western kingbird		2.1	< 0.2
eastern kingbird		-0.8	< 0.2
loggerhead shrike		-2.4	< 0.2

Bell's vireo	Successional/Scrub	2.3	< 0.2
yellow-throated vireo	Woodland	1.9	< 0.2
warbling vireo	Woodland	1.4	< 0.2
red-eyed vireo	Woodland	0.9	< 0.2
blue jay	Urban	-1.2	14.2
American crow		-0.6	38.8
common raven		3.2	34.2
horned lark	Grassland	-1	< 0.2
purple martin	Urban	no signif trend	< 0.2
tree swallow		1.7	< 0.2
rough-winged swallow		1.1	< 0.2
bank swallow		no signif trend	< 0.2
cliff swallow		4.5	< 0.2
barn swallow		no signif trend	0.4
black-capped chickadee	Woodland	no signif trend	< 0.2
tufted titmouse	Woodland	1.4	< 0.2
red-breasted nuthatch	Woodland	2.3	< 0.2
white-breasted nuthatch	Woodland	2.1	< 0.2
brown creeper	Woodland	no signif trend	< 0.2
house wren	Successional/Scrub	no signif trend	< 0.2
winter wren		-3.1	< 0.2
sedge wren	Grassland	no signif trend	< 0.2
blue-gray gnatcatcher	Woodland	1.7	< 0.2
golden-crowned kinglet	Woodland	-1.5	< 0.2
ruby-crowned kinglet	Woodland	2.8	< 0.2
eastern bluebird		2	< 0.2
veery	Woodland	-1.4	< 0.2
hermit thrush	Woodland	1	< 0.2
wood thrush	Woodland	-1.8	< 0.2
American robin	Urban	0.4	0.4
gray catbird	Successional/Scrub	0.6	0.4
brown thrasher	Successional/Scrub	-0.6	0
European starling	Urban	-0.7	15.2
cedar waxwing		1.7	0.2
blue-winged warbler	Successional/Scrub	no signif trend	0.6
golden-winged warbler	Successional/Scrub	no signif trend	< 0.2
Tennessee warbler	Woodland	no signif trend	< 0.2
Nashville warbler	Successional/Scrub	no signif trend	< 0.2
northern parula	Woodland	1.3	< 0.2
yellow warbler	Successional/Scrub	no signif trend	< 0.2
chestnut-sided warbler	Successional/Scrub	no signif trend	< 0.2
cerulean warbler	Woodland	no signif trend	< 0.2
magnolia warbler	Woodland	no signif trend	< 0.2
yellow-rumped warbler	Woodland	no signif trend	< 0.2
black-throated green warbler	Woodland	no signif trend	< 0.2
blackburnian warbler	Woodland	no signif trend	< 0.2
pine warbler	Woodland	no signif trend	< 0.2
black-and-white warbler	Woodland	no signif trend	< 0.2
American redstart	Woodland	no signif trend	< 0.2
ovenbird	Woodland	0.4	< 0.2
northern waterthrush	Wood	no signif trend	< 0.2
mourning warbler	Successional/Scrub	no signif trend	< 0.2
common yellowthroat	Successional/Scrub	-1	0.4
Canada warbler	Woodland	-1.6	< 0.2
Scarlet tanager	Woodland	no signif trend	< 0.2

easern towhee	Successional/Scrub	-0.7	< 0.2
chipping sparrow	Urban	1	0.2
clay-colored sparrow	Successional/Scrub	no signif trend	< 0.2
field sparrow	Successional/Scrub	-1.6	< 0.2
vesper sparrow	Grassland	no signif trend	< 0.2
savannah sparrow	Grassland	-1.8	< 0.2
grasshopper sparrow	Grassland	-4	< 0.2
Henslow's sparrow	Grassland	5.5	< 0.2
Le Conte's sparrow	Grassland	no signif trend	< 0.2
song sparrow	Successional/Scrub	-0.6	< 0.2
swamp sparrow	Wetland	no signif trend	< 0.2
white-throated sparrow	Successional/Scrub	-1	< 0.2
northern cardinal	Successional/Scrub	0.7	0.8
rose-breasted grosbeak	Woodland	no signif trend	< 0.2
indigo bunting	Successional/Scrub	-0.5	< 0.2
dickcissel	Grassland	no signif trend	< 0.2
bobolink	Grassland	no signif trend	< 0.2
red-winged blackbird	Wetland	-1	< 0.2
eastern meadowlark	Grassland	-2.2	< 0.2
western meadowlark	Grassland	-1.1	< 0.2
yellow-headed blackbird	Wetland	no signif trend	< 0.2
Brewer's blackbird		-1.3	< 0.2
comon grackle	Urban	-1.3	8.8
brown-headed cowbird		no signif trend	0.6
orchard oriole		1.1	< 0.2
Baltimore oriole		no signif trend	< 0.2
purple finch	Woodland	no signif trend	< 0.2
house finch	Urban	no signif trend	0.4
red crossbill	Woodland	no signif trend	< 0.2
pine siskin	Woodland	no signif trend	< 0.2
American goldfinch	Successional/Scrub	no signif trend	< 0.2
evening grosbeak	Woodland	-3.2	< 0.2
house sparrow	Urban	-3.5	0.4

Sources: Sauer et al 2011, USFWS

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