ESTIMATES OF BIRD MORTALITY ASSOCIATED WITH TRANSMISSION LINES, FALL ADDENDUM

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EXECUTIVE SUMMARY

Ninety hours of daylight observations of birds crossing five electric high voltage transmission line spans within the Niagara Power Project investigation area were conducted during the fall migration period in early to mid September 2004. An interaction between a bird and a transmission line was defined as an event where a bird entered an area bound by the structures supporting a transmission line span, the apparent edges of the right of way parallel to the transmission line, and a vertical area bound by the ground and an estimated altitude twice the height of the structures. During the fall period, two field biologists observed birds within this area for 3 hours per span over a 2-week period. The team also searched for evidence of dead birds within each span, and estimated various sources of bias associated with the dead bird survey. A total of 153 hours of daylight observations of birds occurred during the combined spring and fall migration periods.

A total of 7,134 "interactions" between birds and electric high voltage transmission lines were observed during the fall period. Combined with the spring total of 4,960 interactions, 12,094 bird/powerline interactions were recorded during both seasons. Forty-six bird species were identified during the fall period. No occurrences of dead birds or feather spots were found. One contact between a turkey vulture (*Cathartes aura*) and an electric utility conductor line was observed on September 15, 2004. When all search biases were accounted for, an estimated total of 2.22 dead birds was calculated. Two collision rate estimates, one using the total number of flights observed over the sampling period, and one using an estimated number of flights per day (calculated from our data), were developed. In the fall period, the results were 0.03% and 0.12% respectively. In other words, depending upon the form of the calculation, between 0.03% and 0.12% of the flights that enter the study area would result in bird mortality. The collision rate estimates for the combined spring and fall studies were 0.11% and 0.70% respectively. These collision rate estimates, for both the fall period and the combined spring and fall periods, are below or slightly greater than (in the case of the 0.70% estimate) the mean and median estimates reported from other studies in the US. We conclude that based on data acquired during the fall migration, electric transmission lines in the study area do not appear to be a substantial source of mortality.

1.0 INTRODUCTION

This report is an addendum to Estimates of Bird Mortality Associated with Transmission Lines (URS 2005). It documents the results of a fall migration study conducted in September 2004.

The objectives of this issue are to: 1) describe the ownership of and maintenance responsibilities for transmission facilities within the FERC project boundary; and 2) analyze the relationship between electrical transmission facilities and bird collisions and determine whether bird collisions are occurring along transmission facilities within the Project Boundary.

The first objective was met through studies associated with E/PRO 2005. The E/PRO report describes the ownership and maintenance of property within the project area. Quantitative studies were conducted in order meet the second objective and analyze the relationship between electrical transmission facilities and bird collisions and to determine whether bird collisions are occurring along transmission facilities within the Project boundary.

Sections 1.1 to 1.4 of the original report have been omitted from this addendum in order to avoid redundancy. For information regarding the spring migration study results, or for any other additional information please refer to URS 2005. See Figures 1.1-1 through 1.1-6 of this report for site maps.

Non-Internet Public (NIP) information has been removed from the following page(s).

This material is contained in:
Volume 2
Section: Estimates of Bird Mortality Associated with Transmission Lines, Fall Addendum

FIGURE 1.1-1

SITE LOCATION MAP

[NIP – General Location Maps]

FIGURE 1.1-2

NORTH LEWISTON SITE

[NIP – General Location Maps]

FIGURE 1.1-3

WITMER ROAD SITE

[NIP – General Location Maps]

FIGURE 1.1-4

SOUTH LEWISTON SITE

[NIP – General Location Maps]

FIGURE 1.1-5

INTAKES SITE

[NIP – General Location Maps]

FIGURE 1.1-6

FISHING ACCESS SITE

[NIP – General Location Maps]

2.0 METHODS

The Scope of Services for Issue 14 and 15 indicated that the methods outlined in De La Zerda and Rosselli (1997) or other acceptable methods should be used to estimate the potential for bird interactions with transmission facilities. Methods for the fall period were identical to those used for the spring period, and details are omitted here for the sake of brevity and to avoid redundancy. A full description of the methods used appears in Estimates of Bird Mortality Associated with Transmission Lines (URS 2005).

3.0 RESULTS

3.1 Fall Period Bird Count Results

The five sampled spans, dates, and times at which they were sampled are shown on Table 3.1-1. Sites were sampled from early morning through early evening. Site sampling was scheduled so that each site was sampled during a morning, afternoon, and evening period. As with the spring survey, the fall sampling did not include night sampling. The Buffalo Ornithological Society (2002) reported attempting to complete a night survey from the Rainbow Bridge and indicated that reliably identifying and counting birds, even with night vision equipment, proved quite unproductive.

Forty-six species were observed in the fall. Ten species were counted in the spring but not seen in the fall. These were the black crowned night heron (*Nycticorax nycticorax*), northern harrier (*Circus cyanus*), sharp-shinned hawk (*Accipiter striatus*), lesser yellowlegs (*Tringa flavipes*), American woodcock (*Philohela minor*), common tern (*Sterna hirundo*), barn swallow (*Hirundo rustica*), yellow warbler (*Dendroica petechia*), house sparrow (*Passer domesticus*) and meadowlark (*Sturnella magna*). Of the 46 species counted in the fall, 15 were new species not counted in the spring. These were Cooper's hawk (*Accipiter cooperii*), belted kingfisher (*Ceryle alcyon*), downy woodpecker (*Piciodes pubescens*), Empidonax flycatcher (*Empidonax* spp.), eastern phoebe (*Sayoris phoebe*), black-capped chickadee (*Poecile atrocapilla*), ruby-crowned kinglet (*Regulus calendula*), cedar waxwing (*Bombycilla cedorum*), Tennessee warbler (*Vermivora peregrine*), Nashville warbler (*Vermivora ruficapilla*), magnolia warbler (*Dendroica magnolia*), common yellowthroat (*Geothylpis trichas*), Wilson's warbler (*Wilsonia pusilla*), chipping sparrow (*Spizella passerina*) and purple finch (*Carpodacus purpureus*). In both seasons, small sparrows were noted that could not be identified to species. All these sparrows were observed at some distance and moved or hid effectively and therefore avoided identification.

Figure 3.1-1 shows the cumulative total of species observed by date and site during the fall period. The greatest total number of species observed in a single day was 35 on September 2, 2004. Ten of these species were observed at only one of the three sites sampled that day. Eight species were seen at

two sites, and only three species appeared at all three sites on September 2. Thirty-four (34) species were observed on September 16. The single sampling period during which the greatest number of different species was observed was the morning period at the South Lewiston Reservoir Site on September 16, when 20 species were counted. Of the 20 species observed during that period, eight species, an Empidonax flycatcher, Tennessee warbler, Nashville warbler, magnolia warbler, Wilson's warbler, common yellowthroat and purple finch, were observed only during that period. Clearly this sampling period coincided with a small migration pulse.

A total of 7,134 bird/powerline interactions were observed during the fall period (Table 3.1-2). *Sturnus vulgaris* (European starlings) accounted for 3,343 observed interactions, or almost 47% of the total. There were 1,023 double crested cormorant (*Phalacrocorax auritus*) interactions observed. Ring-billed gulls (*Larus delawarensis*) accounted for 853 observed interactions. Goldfinches (*Carduelis tristis*) were the next most commonly observed birds, with 674 interactions observed. The number of different types of birds observed crossing the lines during the fall migration was similar to that of the spring migration and included water birds, raptors, scavengers and a variety of passerines (small perching birds).

The Fall migration hourly observation records shown in Table 3.1-3 to Table 3.1-7 indicated a pattern of greater bird activity during mid-day and earlier evening hours, with relatively lower activities, as expressed in terms of bird/transmission line interactions, during early morning hours. This differs from the spring migration hourly observation records, which showed greater bird activity during early morning and early evening hours. The greatest number of observations was made at the Witmer Road site, where 2,942 bird/transmission line interactions were recorded. The team recorded 1,819 interactions at the Fishing Access site, 947 at the South Lewiston Reservoir site and 881 at the North Lewiston Reservoir site. The lowest number of interactions (545) was recorded at the Intakes site. At three of the five sites, starlings made up over 50% of the observations. Starlings accounted for 82% of the observations at the Witmer Road site; 67% at the South Lewiston Reservoir site and 52% at the Intakes site. Of the two remaining sites, goldfinches made up 40% of the observations at the North Lewiston Reservoir site, and double crested cormorant made up 53% at the Fishing Access site.

The tailraces at the Robert Moses and Sir Adam Beck Plants are sites where gulls, in particular sizable groups of ring-billed gulls and *Larus argentatus* (herring gulls) are attracted to the area to feed. The great number of interactions recorded at this site was largely the result of a large number of gulls continually circling and diving, catching fish in the area (Table 3.1-7). Relatively high numbers of gulls were also recorded at the South Lewiston (Table 3.1-5), North Lewiston (Table 3.1-3) and Witmer Road (Table 3.1-4) sites. These sites appear to lie along paths that gulls use during their daily trips between the Niagara River, the reservoir, and other locations near the study area.

Starlings accounted for many of the interactions at the South Goldfinches were commonly observed at the North and South Lewiston and Intakes site, and pigeon (*Columbia livia*) were common at the North Lewiston (Table 3.1-3) and Witmer Road (Table 3.1-4) sites. Double crested cormorant accounted for many of the interactions at the Fishing Access site (Table 3.1-7). Raptors were relatively uncommon. More raptors were observed than are recorded in Tables 3.1-3 through 3.1-7, but these unrecorded raptors were flying so high above the transmission lines that their passage did not constitute an interaction.

3.1.1 Combined Spring and Fall Period Results

Forty-two (42) species were observed interacting within the five powerline spans during the spring period. A combined total of 57 species were observed during both sampling periods (Table 3.1-2). Combined with the spring total of 4,960 interactions, 12,094 bird/powerline interactions were recorded during both seasons. The most frequently observed birds during both survey periods were starlings (3,549), ring-billed gulls (3,504), red wing blackbirds (1,234) and double crested cormorants (1,073).

3.2 Dead Bird Survey Results

Daily surveys for evidence of dead birds were conducted at four of the five sites. The Fishing Access site was not surveyed for dead birds, since the area beneath the lines was largely inaccessible, and carcasses would probably not be found anyway due to the extremely swift current.

No occurrences of dead birds were found at any of the sites surveyed. One wire collision was observed in the early morning of September 15, 2004. One turkey vulture (*Cathartes aura*) was soaring through the wires when the wind velocity or direction changed, causing its wing to come into contact with one of the conductors. No sparks or damage to the bird or the wire was observed and the bird flew off, apparently uninjured.

3.3 Bias Estimation Results

The intent of the bias estimators is to account for evidence of dead birds (carcasses or feather spots) that might have been overlooked because they 1) were not seen by the search teams (search bias), 2) were removed by scavengers before the search teams arrived at the site (removal bias), 3) landed in areas that were unsearchable (habitat bias), or 4) struck the conductor and landed outside the study area (crippling bias). A complete description of the equations used to quantify the various sources of bias appears in *Estimates Of Bird Mortality Associated With Transmission Lines* (URS 2005). An adjustment had to be made to all the bias equations for the Fall survey. The first source of bias estimated is search bias, which essentially adjusts the total number of fresh dead birds or feather spots found by the proportion of quail carcasses found by the search teams in the Spring surveys (See Equation 2.1.1 in Estimates Of Bird Mortality Associated With Transmission Lines (URS 2005)). No dead birds or feather spots were found during the Fall surveys, therefore the numerator of Equation 2.1.1 is zero. Since zero divided by any other number equals zero, the subsequent estimation of search bias following Equation 2.1.1 totals zero. Subsequently, all the other bias estimating equations (Equations 2.1.2, 2.1.3, 2.1.4 and 2.1.5) result in zero if zero is used as the total number of dead birds found. Finally, the estimated total collisions, and the calculated Collision Rate Estimate (CRE) would then be zero.

Our results from the bias estimation for the Spring survey indicate that searchers did overlook dead quail carcasses, that some birds were removed by scavengers, and that portions of the sampled areas were unsearchable. All of these issues result in bias in the estimation of a collision rate; it is logical to assume that the same biases would occur since the same field crews searched the same sample areas. While it is statistically possible that no bird mortality occurred during the Fall period, using zero in the numerator of equations 2.1.1 through 2.1.5 produces a result that mathematically underestimates the

potential sources of bias. Therefore, in order to correct this mathematical problem and attempt to account for the various bias factors when no dead birds were actually found, we ran equations 2.1.1 through 2.1.5 setting total dead birds found to 1. This allowed us to calculate a CRE for the Fall surveys that takes into account the sources of bias. To calculate a CRE for both survey periods combined, we used 7, the actual number of total dead birds found during both the Spring and Fall surveys combined.

Search bias is a measure of the ability of the field staff to find dead birds. **Of the 15 birds placed during the spring period, the field team found 10. Search bias for this study, as calculated using Equation 2.1.1 with Total Dead Birds Found set to 1, was 0.50**.

Removal bias is an estimate of the bias introduced by removal of bird carcasses by scavengers or predators before the carcasses could be found by the field team. **Removal bias was calculated using Equation 2.1.2 with Total Dead Birds Found set to 1, and was 0.51 for this study.**

Habitat bias is an estimate of the bias introduced because portions of the study area could not be searched by the field team. Approximately 30% of the total surveyed area, that is, the area beneath the Sir Adam Beck/Robert Moses connector at the Fishing Access site, and portions of the North Lewiston, South Lewiston and Intakes sites, could not be surveyed for dead birds. **Habitat bias, as calculated using Equation 2.1.3, was estimated as 0.67 for this study.**

Crippling bias is an estimate of the number of birds that are crippled by striking a transmission line, but that land outside the study areas. **One bird strike on the lines was directly observed but the bird flew on apparently unharmed, so the value of this bias estimate was 0.**

An estimate of total collisions was calculated using Equation 2.1.5. This estimate combines the total observed dead bird evidence with estimates from the various bias factors. Given that 0 collisions were observed, and that all bias estimators equal 0 when using 0 as the total number of dead birds found, then estimated total collisions for the fall period would be 0. **Total estimated collisions for this study using 1 as the number of total dead birds found was 2.22. The investigators believe that this**

estimate accounts for the various sources of bias. That is, given the various biases inherent in the sampling method, it is possible that roughly 2 dead birds could have been found during the sampling period.

3.4 Collision Rate Estimates for the Fall Period

Finally, a collision rate estimate (CRE) was calculated using Equation 2.1.6. CRE is essentially an estimate of the proportion of flights that could result in a collision between birds and transmission lines. **In the fall period, data indicated that if 1 were used as the total number of dead birds found, then approximately 0.03% of the bird flights in the fall would result in a collision.**

Other researchers have used slightly different methods for calculating a CRE. Several studies completed for the Bonneville Power Authority used the average number of flights over 24 hours as an estimate of total flights (Beaulaurier, et al 1982; Meyer 1978; James and Haak 1979; Beaulaurier 1981; James 1980; Willdan Associates 1981). During the fall period the team observed 7,134 bird/transmission line interactions over 90 hours of observations, yielding an estimate of 79.27 birds/hour for all lines studied. Extrapolated over 24 hours this yields an estimate of 1,902.40 birds/day. CRE calculated for the fall using this figure is 0.12%.

3.4.1 Collision Rate Estimate for Both Periods

During the combined fall and spring surveys the teams observed 12,094 bird/transmission line interactions over 153 hours of observations. The CRE calculated on the basis of Equation 2.1.6, and using data from both periods, was 0.11%. The total of 12,094 birds observed over 153 hours of observation in both periods yields an estimate of 79.05 bird interactions/hour for all lines studied over both periods. Directly extrapolated over 24 hours this yields an estimate of 1,897.10 birds/day for both periods. CRE calculated for both periods using this figure is 0.70%. Table 3.4.1-1 summarizes the CRE values for both periods, calculated using both methods.

3.5 Comparisons to Other Studies

Table 3.6-1 shows the collision rate estimates derived from studies completed for the Bonneville Power Authority. The studies from which data were extracted were summarized by Beaulaurier, et al (1982) and Table 3.6-1 is taken from this paper. Flights per day in these studies completed in the northwestern United States ranged from 12 to over 3,000. CREs calculated from these studies ranged from 0.12 to 1.61. The collision rate of 0.01 from the Willdan Associates (1981) data was based on observed collisions only, and not on an estimate of total collisions that took into account the various sources of bias used in this and other studies.

Mean and median CREs were arrived at using the data on Table 3.4.1-1. The mean and median values were calculated without the Bybee Lake, no-ground-wire study, since ground wires were intact on all of the spans used in our study, and without the Willdan Associates (1981) Columbia River data, since the CRE calculated for that study was based on observed collisions only. We found a mean of 0.61, and a median value of 0.54, based on the studies in Table 3.6-1. Both of the CRE's calculated for the fall period were well below these mean and median values. The CRE calculated for both periods using Equation 2.6.1 was well below both the mean and median value for the other published studies we reviewed. The CRE calculated for both periods using the "Bonneville method" was slightly higher than the mean and median. The CRE calculated using either of the methods, for the individual sampling periods and for both periods combined, indicate that fewer than 1% of the bird/powerline interactions in the study area result in bird mortality.

TABLE 3.1-1

SITES, DATES AND TIMES SAMPLED, FALL MIGRATION PERIOD

Site	Dates & Times Sampled	Total Spring Hours Sampled
North Lewiston	2 Sept., 1130-1430 7 Sept., 0725-1025 8 Sept., 1417-1717 13 Sept., 1440-1740 15 Sept., 0723-1023 16 Sept., 1047-1347	18
Witmer Road	2 Sept., 0730-1030 7 Sept., 1430-1630 9 Sept., 1128-1428 13 Sept., 0740-1040 14 Sept., 1428-1728 15 Sept., 1110-1410	18
South Lewiston	2 Sept., 1500-1800 7 Sept., 1105-1405 9 Sept., 0750-1050 13 Sept., 1110-1410 15 Sept., 1442-1742 16 Sept., 0720-1020	18
Intakes	3 Sept., 1120-1420 8 Sept., 0727-1027 10 Sept., 0730-1030 14 Sept., 1102-1402 16 Sept., 1400-1700 17 Sept., 0701-1001	18
Fishing Access	3 Sept., 0725-1025 8 Sept., 1102-1402 9 Sept., 1445-1745 14 Sept., 0734-1034 17 Sept., 1020-1320 17 Sept.,1320-1620	18

TABLE 3.1-2

SPECIES AND NUMBER OF BIRD/POWERLINE INTERACTIONS OBSERVED DURING SPRING AND FALL SURVEY PERIODS

Common name	Species	Total interactions observed spring	Total interactions observed Fall	Total interactions observed both seasons
Canada goose	*Branta canadensis*	17	21	38
Mallard	*Anas platyrhynchos*	8	8	16
Double-crested cormorant	*Phalacrocorax auritus*	50	1023[1]	1073
Great blue heron	*Ardea herodias*	3	6	9
Black-crowned night heron	*Nycticorax nycticorax*	3	0	3
Turkey vulture	*Cathartes aura*	21	11	32
Northern harrier	*Circus cyanus*	1	0	1
Sharp-shinned hawk	*Accipiter striatus*	2	0	2
Cooper's hawk	*Accipiter cooperii*	0	2	2
Red tailed hawk	*Buteo jamaicensis*	5	14	19
American kestrel	*Falco sparverius*	2	2	4
Peregrine falcon	*Falco peregrinus*	1	1	2
Killdeer	*Charadrius vociferus*	20	0	20
Lesser yellowlegs	*Tringa flavipes*	6	0	6
American woodcock	*Philohela minor*	1	0	1
Bonaparte's gull	*Larus philadelphia*	24	6	30
Ring-bill gull	*Larus delawarensis*	2651	853	3504
Herring gull	*Larus argentatus*	34	260	294
Common tern	*Sterna hirundo*	6	0	6
Pigeon	*Columba livia*	90	448	538
Mourning dove	*Zenaida macroura*	78	142	220
Chimney swift	*Chaetura pelagica*	7	6	13
Belted kingfisher	*Ceryle alcyon*	0	5	5
Downy woodpecker	*Picoides pubescens*	0	3	3
Common yellow-shafted flicker	*Colaptes auratus*	2	2	4
Empidonax flycatcher	*Empidonax* spp.	0	1	1
Eastern phoebe	*Sayoris phoebe*	0	2	2
Blue jay	*Cyanocitta cristata*	7	12	19
Crow	*Corvus brachyrhynchos*	32	12	44
Tree swallow	*Iridioprocne bicolor*	27	5	32
Rough-wing swallow	*Stelgidopteryx ruficollis*	18	1	19

TABLE 3.1-2 (CONT.)

SPECIES AND NUMBER OF BIRD/POWERLINE INTERACTIONS OBSERVED DURING SPRING AND FALL SURVEY PERIODS

Common name	Species	Total interactions observed spring	Total interactions observed Fall	Total interactions observed both seasons
Barn swallow	*Hirundo rustica*	48	0	48
Black-capped chickadee	*Poecile atricapilla*	0	5	5
Ruby-crowned kinglet	*Regulus calendula*	0	1	1
American robin	*Turdus migratorius*	151	9	160
Gray catbird	*Dumetella carolinensis*	2	6	8
Northern mockingbird	*Mimus polyglottos*	1	6	7
European starling	*Sturnus vulgaris*	206	3343	3549
Cedar waxwing	*Bombycilla cedrorum*	0	1	1
Tennessee warbler	*Vermivora peregrina*	0	1	1
Nashville warbler	*Vermivora ruficapilla*	0	2	2
Yellow warbler	*Dendroica petechia*	10	0	10
Magnolia warbler	*Dendroica magnolia*	0	1	1
Common yellowthroat	*Geothlypis trichas*	0	3	3
Wilson's warbler	*Wilsonia pusilla*	0	2	2
Chipping sparrow	*Spizella passerina*	0	23	23
Savannah sparrow	*Passerculus sandwichensis*	30	5	35
Song sparrow	*Melospiza melodia*	40	29	69
House sparrow	*Passer domesticus*	3	0	3
Cardinal	*Cardinalis cardinalis*	7	4	11
Red-wing blackbird	*Agelaius phoeniceus*	1082	152	1234
Eastern meadowlark	*Sturnella magna*	10	0	10
Common grackle	*Quiscalus quiscula*	74	4	78
Brown-headed cowbird	*Molothrus ater*	12	5	17
Purple finch	*Carpodacus purpureus*	0	1	1
American goldfinch	*Carduelis tristis*	167	674	841
Unknown sparrow	*NA*	1	11	12
Total Interactions Observed		**4960**	**7134**	**12094**

Note: A single large flock of double-crested cormorants accounted for an estimated 800 interactions, when approximately 800 of these birds flew through the wires at the Fishing Access Site on September 9.

TABLE 3.1-3

NORTH LEWISTON RESERVOIR, NUMBER OF BIRD/POWERLINE INTERACTIONS OBSERVED BY DATE, TIME AND SPECIES DURING THE FALL SURVEY PERIOD

Common Name	Species	2 September 2004				7 September 2004				8 September 2004				13 September 2004				15 September 2004				16 September 2004			
		1130	1230	1330	total	0725	0825	0925	total	1417	1517	1617	total	1440	1540	1640	total	0723	0823	0923	total	1047	1147	1247	total
Double-crested cormorant	*Phalacrocorax auritus*				0		4		4			1	1				0				0				0
Turkey vulture	*Cathartes aura*	1			1				0				0				0		1	1	2	1	2		3
Cooper's hawk	*Accipiter cooperii*				0	2			2				0				0				0				0
Red tailed hawk	*Buteo jamaicensis*				0				0				0				0			1	1				0
Ring-bill gull	*Larus delawarensis*	3	12	14	29	19	9	4	32	2	5	4	11			3	3	16	3	2	21			1	1
Herring gull	*Larus argentatus*	2		2	4				0		7	1	8				0				0				0
Pigeon	*Columba livia*			1	1	54	49	61	164	6	8	3	17	22	36	9	67	26	6	7	39	8	13		21
Mourning dove	*Zenaida macroura*				0		1		1				0		1		1				0				0
Common yellow-shafted flicker	*Colaptes auratus*				0				0				0				0	1			1				0
Blue jay	*Cyanocitta cristata*	1			1				0				0				0		6		6		3		3
Crow	*Corvus brachyrhynchos*				0				0				0			3	3				0				0
Tree swallow	*Iridioprocne bicolor*				0				0				0				0				0		2		2
American robin	*Turdus migratorius*	1	1		2			4	4				0				0				0				0
Gray catbird	*Dumetella carolinensis*		1	2	3				0				0				0				0				0
European starling	*Sturnus vulgaris*				0		2	1	3				0	4			4	2	1	6	9		11		11
Chipping sparrow	*Spizella passerina*		17		17				0				0				0				0				0
Song sparrow	*Melospiza melodia*		6		6				0	1			1				0	1			1				0
Red-wing blackbird	*Agelaius phoeniceus*	2			2				0				0				0	2	4		6				0
Common grackle	*Quiscalus quiscula*				0				0				0				0				0	2	2		4
American goldfinch	*Carduelis tristis*	33	81	61	175	23	7	63	93	1	5		6	11	7	3	21	21	24	12	57	2			2
Unknown sparrow	*0*		1	3	4				0				0				0				0				0
Total interactions		**43**	**119**	**83**	**245**	**98**	**72**	**133**	**303**	**10**	**25**	**9**	**44**	**37**	**44**	**18**	**99**	**69**	**45**	**29**	**143**	**13**	**33**	**1**	**47**

21 species observed

TABLE 3.1-4

WITMER ROAD, NUMBER OF BIRD/POWERLINE INTERACTIONS OBSERVED BY DATE, TIME AND SPECIES DURING THE FALL SURVEY PERIOD

Common Name	Species	2 September 2004				7 September 2004				9 September 2004				13 September 2004				14 September 2004				15 September 2004			
		0725	0825	0925	Total	1430	1530	1630	Total	1128	1228	1328	Total	0740	0840	0940	Total	1428	1528	1628	Total	1110	1210	1310	Total
Canada goose	*Branta canadensis*				0				0				0	3			3				0				0
Double-crested cormorant	*Phalacrocorax auritus*	2			2	1		27	28			1	1			1	1				0				0
Great blue heron	*Ardea herodias*	3			3				0				0				0				0				0
Red-tailed hawk	*Buteo jamaicensis*	1			1				0				0	1			1	3			3				0
Ring-bill gull	*Larus delawarensis*	10	2		12	1		8	9	4		34	38				0		1	3	4				0
Pigeon	*Columba livia*	17	6	9	32		3	34	37	2	1		3	15	2	5	22	5	6	22	33	1			1
Mourning dove	*Zenaida macroura*	16		2	18	13	16	15	44	4	1	2	7	10	2	2	14	3	3	19	25				0
Downy woodpecker	*Picoides pubescens*				0		1	1	2				0				0				0				0
Common yellow-shafted flicker	*Colaptes auratus*				0				0				0				0				0		1		1
Tree swallow	*Iridioprocne bicolor*				0				0				0				0				0		1	1	2
Starling	*Sturnus vulgaris*				0	2		76	78	4	1	14	19				0	98	6	156	260	1472	570	1	2043
Savannah sparrow	*Passerculus sandwichensis*				0				0				0	3			3	2			2				0
Song sparrow	*Melospiza melodia*		2	1	3				0	1	1		2		2		2				0				0
Red-wing blackbird	*Agelaius phoeniceus*	16	4	9	29				0		2	4	6	43	24	4	71	4	5	7	16	5	6		11
Brown-headed cowbird	*Molothrus ater*	3		1	4				0				0				0				0				0
American goldfinch	*Carduelis tristis*	10	8	18	36	1		1	2			5	5	1		1	2				0	1			1
Total interactions		**78**	**22**	**40**	**140**	**18**	**20**	**162**	**200**	**15**	**6**	**60**	**81**	**76**	**30**	**13**	**119**	**115**	**21**	**207**	**343**	**1479**	**578**	**2**	**2059**

16 species observed

TABLE 3.1-5

SOUTH LEWISTON RESERVOIR, NUMBER OF BIRD/POWERLINE INTERACTIONS OBSERVED BY DATE, TIME AND SPECIES DURING THE FALL SURVEY PERIOD

Common Name	Species	2 September 2004				7 September 2004				9 September 2004				13 September 2004				15 September 2004				16 September 2004			
		1500	1600	1700	Total	1105	1205	1305	Total	0750	0850	0950	Total	1110	1210	1310	Total	1442	1542	1642	Total	0720	0820	0920	Total
Mallard	*Anas platyrhynchos*				0				0			2	2				0				0				0
Great blue heron	*Ardea herodias*				0			1	1				0				0				0				0
Turkey vulture	*Cathartes aura*		2		2				0				0		1		1				0			1	1
Red-tailed hawk	*Buteo jamaicensis*	2			2				0				0				0				0				0
Ring-bill gull	*Larus delawarensis*	2	6	9	17	1		10	11		3	2	5	13	24	3	40	2	2	7	11	7	8	2	17
Pigeon	*Columba livia*				0				0				0	5			5				0				0
Mourning dove	*Zenaida macroura*	4	1		5		1	1	2	1	3		4				0				0		2		2
Chimney swift	*Chaetura pelagica*				0				0				0				0	1	1	1	3	2	1		3
Belted kingfisher	*Ceryle alcyon*	1			1				0			2	2				0			2	2				0
Downy woodpecker	*Picoides pubescens*				0				0				0				0				0	1			1
Empidonax flycatcher	*Empidonax* spp.				0				0				0				0				0	1			1
Eastern phoebe	*Sayoris phoebe*				0				0				0				0				0			1	1
Crow	*Corvus brachyrhynchos*		5		5				0				0				0				0				0
Rough-wing swallow	*Stelgidopteryx ruficollis*				0	1			1				0				0				0				0
Black-capped chickadee	*Poecile atricapilla*				0				0				0				0				0	5			5
Ruby-crowned kinglet	*Regulus calendula*				0				0				0				0				0	1			1
American robin	*Turdus migratorius*			2	2				0				0				0				0	1			1
Gray catbird	*Dumetella carolinensis*				0			3	3				0				0				0				0
Mockingbird	*Mimus polyglottos*				0				0				0				0	2	1	1	4				0
Starling	*Sturnus vulgaris*				0				0	4	2	1	7	40	47	60	147	159	130	125	414	15	7	40	62
Cedar waxwing	*Bombycilla cedrorum*	1			1				0				0				0				0				0
Tennessee warbler	*Vermivora peregrina*				0				0				0				0				0	1			1
Nashville warbler	*Vermivora ruficapilla*				0				0				0				0				0	2			2
Magnolia warbler	*Dendroica magnolia*				0				0				0				0				0	1			1
Common yellowthroat	*Geothlypis trichas*				0				0				0				0				0	3			3
Wilson's warbler	*Wilsonia pusilla*				0				0				0				0				0	2			2
Chipping sparrow	*Spizella passerina*	2			2			2	2				0				0				0				0
Song sparrow	*Melospiza melodia*				0			2	2				0				0				0	7			7
Cardinal	*Cardinalis cardinalis*	3			3				0				0				0				0	1			1
Red-wing blackbird	*Agelaius phoeniceus*	1			1				0				0	10			10				0				0
Brown-headed cowbird	*Molothrus ater*				0	1			1				0				0				0				0
Purple finch	*Carpodacus purpureus*				0				0				0				0				0	1			1
American goldfinch	*Carduelis tristis*	24	12	31	67	8			8				0	2	2	17	21			4	4		9	3	12
Unknown sparrow			1		1				0				0				0				0				0
Total interactions		**40**	**27**	**42**	**109**	**11**	**1**	**19**	**31**	**5**	**8**	**7**	**20**	**70**	**74**	**80**	**224**	**164**	**134**	**140**	**438**	**51**	**27**	**47**	125

34 species observed

TABLE 3.1-6

INTAKES, NUMBER OF BIRD/POWERLINE INTERACTIONS OBSERVED BY DATE, TIME AND SPECIES DURING THE FALL SURVEY PERIOD

Common Name	Species	3 September 2004				8 September 2004				10 September 2004				14 September 2004				16 September 2004				17 September 2004			
		1120	1220	1320	Total	0727	0827	0927	Total	0730	0830	0930	Total	1102	1202	1302	Total	1400	1500	1600	Total	0701	0801	0901	Total
Double-crested cormorant	*Phalacrocorax auritus*	1	2	1	4	3	4	1	8		3	1	4				0				0	7			7
Red-tailed hawk	*Buteo jamaicensis*				0	2			2				0				0				0				0
American kestrel	*Falco sparverius*				0				0				0				0			1	1			1	1
Ring-bill gull	*Larus delawarensis*	2			2	1	2	2	5				0				0	1		2	3	8	3	1	12
Herring gull	*Larus argentatus*				0				0				0		1		1	1		2	3				0
Pigeon	*Columba livia*	1			1		3		3				0				0				0				0
Mourning dove	*Zenaida macroura*	1			1	1	1	1	3	1			1				0	1			1	3	7	3	13
Eastern phoebe	*Sayornis phoebe*	1			1				0				0				0				0				0
Blue jay	*Cyanocitta cristata*				0				0				0				0	2			2				0
Crow	*Corvus brachyrhynchos*				0				0				0	1	3		4				0				0
Tree swallow	*Iridioprocne bicolor*				0				0				0				0			1	1				0
Mocking bird	*Mimus polyglottos*				0				0			2	2				0				0				0
Starling	*Sturnus vulgaris*				0	7			7	3		2	5				0				0	144	130		274
Chipping sparrow	*Spizella passerina*		2		2				0				0				0				0				0
Song sparrow	*Melospiza melodia*	1			1			1	1			3	3				0				0				0
American goldfinch	*Carduelis tristis*	23	83	39	145	2	1		3	2	2	2	6	5	1		6				0				0
Unknown sparrow	*NA*		6		6				0				0				0				0				0
Total Interactions		**30**	**93**	**40**	**163**	**16**	**11**	**5**	**32**	**6**	**5**	**10**	**21**	**6**	**5**	**0**	**11**	**5**	**0**	**6**	**11**	**162**	**140**	**5**	307

17 species observed

TABLE 3.1-7

FISHING ACCESS, NUMBER OF BIRD/POWERLINE INTERACTIONS OBSERVED BY DATE, TIME AND SPECIES DURING THE FALL SURVEY PERIOD

Common Name	Species	3 September 2004				8 September 2004				9 September 2004				14 September 2004				17 September 2004				17 September 2004			
		0725	0825	0925	total	1102	1202	1302	total	1445	1545	1645	total	0734	0834	0934	total	1020	1120	1220	total	1320	1420	1520	total
Canada goose	*Branta canadensis*			18	18				0				0				0				0				0
Mallard	*Anas platyrhynchos*				0		6		6				0				0				0				0
Double-crested cormorant	*Phalacrocorax auritus*	58	11	21	90		10		10	813	19	8	840	2	3	4	9	8			8	1	1	4	6
Great blue heron	*Ardea herodias*		1		1	1			1				0				0				0				0
Turkey vulture	*Cathartes aura*				0				0				0		1		1				0				0
Red-tailed hawk	*Buteo jamaicensis*		1	2	3				0				0		1		1				0				0
Peregrine falcon	*Falco peregrinus*				0	1			1				0				0				0				0
Bonaparte's gull	*Larus philadelphia*				0				0				0	3			3				0			3	3
Ring-bill gull	*Larus delawarensis*	238	77	60	375	37	24	25	86	16	28		44	24	14	3	41	2	5	1	8	8	5	3	16
Herring gull	*Larus argentatus*	4	1		5	21	29	26	76	13	19	11	43	1	8	22	31	20	10	15	45	11	12	21	44
Pigeon	*Columba livia*				0				0				0			2	2				0				0
American goldfinch	*Carduelis tristis*				0			2	2				0				0				0				0
Total Interactions		**300**	**91**	**101**	**492**	**60**	**69**	**53**	**182**	**842**	**66**	**19**	**927**	**30**	**27**	**31**	**88**	**30**	**15**	**16**	**61**	**20**	**18**	**31**	**69**

12 species observed

TABLE 3.4.1-1

SUMMARY OF COLLISION RATE ESTIMATES FOR BOTH PERIODS

Site	CRE Following Equation 2.1.6	CRE Following Bonneville Method
Spring Period	0.27	0.72*
Fall Period	0.03	0.12
Both Periods	0.11	0.70

* This value represents a correction of the value reported in the original report on the spring survey. An error was discovered in the original calculation after the spring report was published.

TABLE 3.6-1

COMPARISON OF COLLISION RATES FROM OTHER STUDIES

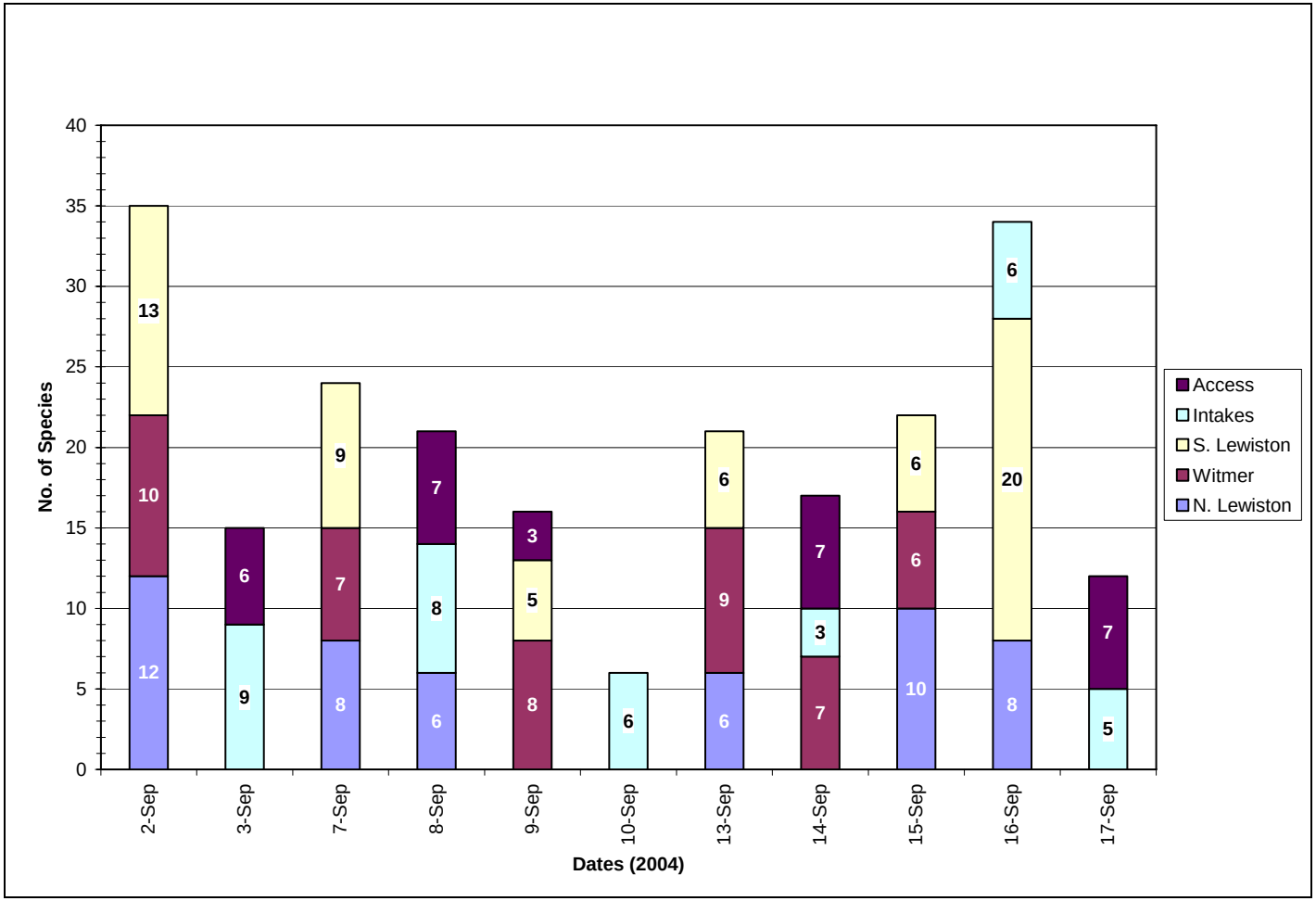
Site	Number of flights/day	CRE
Lower Crab Creek[1]	248	0.34
Bybee Lake[1]	54	1.61
Lower Crab Creek[2]	150	0.65
Bybee Lake[2]	190	0.68
Saddle Mountain Lake[2]	250	0.51
Lower Crab Creek[3]	67	0.28
Bybee Lake no ground wire[3]	64	0.58
Bybee Lake ground wire intact[3]	12	1.03
Crowe Butte Slough[4]	2070	0.12
Columbia River[4]	3730	0.57
Crowe Butte Slough[5]	102	0.31
Columbia River[5]	368	0.01

Table Source: Beaulaurier, et al 1982

Data sources: 1: Meyer 1978; 2: James and Haak 1979; 3: Beaulaurier 1981; 4: James 1980; 5: Willdan Associates 1981

FIGURE 3.1-1

TOTAL SPECIES OBSERVED BY SITE AND DATE



4.0 CONCLUSIONS

Many human structures and activities, including electric transmission lines, are known to cause mortality among birds. The overall estimated mortality due strictly to high voltage electric transmission lines may be lower than that associated with other structures and activities (see Table 1.4-1 in URS 2005). In this fall period, the field team observed a total of 7,134 bird/transmission line interactions. A total of 12,094 bird/transmission line interactions were observed for the combined spring and fall periods. Forty-six species of birds were identified during the fall period. Of the 46 species of birds identified during the fall period, only 15 were new species not identified during the spring study. A total of 57 species of birds were identified during the combined spring and fall periods.

One direct collision between a turkey vulture and a transmission line was observed on 15 September 2004. No sparks or damage to the bird or the wire was observed and the bird flew off. No evidence of dead birds was found among the 5 sample areas during the fall period. Using techniques commonly employed in such studies to estimate a total number of dead birds, and accounting for various sources of bias, we estimated as many as 2 birds may have been killed during the study. CRE's of 0.03% and 0.12% were calculated for the fall period. CRE's of 0.11% and 0.70% were calculated for the combined spring and fall periods. Differences in the two CRE's were due to differences in how the total number of flights was calculated. All the CRE's are below 1%, and are generally low compared to other published studies. High voltage transmission lines within the Niagara Power Project relicensing study area do not seem to be substantial sources of bird mortality.

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