

# F

## Bird and Bat Fatality Rates from Post-construction Studies



**Table F-1 Bird Fatality Rates from Post-construction Studies at Wind Energy Facilities**

Wind Project and Location	Habitat	Length of Monitoring	Number of Turbines in Study in Project (Number in Project)	Reported Mortality Rate (Adjusted for Searcher Efficiency)		Reference
				Number of Bird Fatalities/Turbine/Year		
<b>Studies in the United States</b>						
<b>West</b>						
Altamont Pass, California	Grassland/pasture	11 months (1988-1989)	359 (7,340)	-0.13 (42 birds total <sup>c</sup> )		Howell and DiDonato 1991 in Erickson et al. 2001
		11 months (1990-1991)	150 (7,340)	-0.07 (10 birds total <sup>c</sup> )		Howell et al. 1991b in Erickson et al. 2001
		(1989-1991)	1,169 (7,340)	-0.08 (182 birds total <sup>c</sup> )		Orloff and Flannery 1992 in Erickson et al. 2001
		One-time search (1994)	1,169 (7,340)	NA (20 birds total <sup>c</sup> )		Orloff and Flannery 1996 in Erickson et al. 2001
		20 months (1993-1995)	165 (NA)	-0.26 (72 birds total <sup>c</sup> )		Howell 1997 in Erickson et al. 2001
		23 months (1993-1995)	785 (5,400)	-0.17 (256 birds total <sup>c</sup> )		Thelander 2000 in Erickson et al. 2001
		12-30 months (1998-2000)	685-1,110 (NA)	0.19		Thelander 2003
Montezuma Hills, California	Grassland/pasture	25 months (1990-1992)	237 (600)	0.07 <sup>b</sup>		Howell and Noone 1992 in Erickson et al. 2001 and in GAO 2005
		10 months (1994-1995)	76 (NA)	-0.21 (13 birds total <sup>c</sup> )		Howell 1997 in Erickson et al. 2001
San Geronio, California	Grassland/pasture	(1985)	2,900 (2,947)	2.31		McCrary et al. 1986a in Erickson et al. 2001, 2002
		14 months (1997-1998)	~360 (NA)	NA (42 birds total <sup>c</sup> )		Anderson 2000a in Erickson et al. 2001
Tehachapi Pass, California	NA	36 months (1995-1998)	640-760 (NA)	NA (147 birds total <sup>c</sup> )		Anderson 2000b in Erickson et al. 2001
Ponnequin, Colorado	Grassland/agriculture	24 months (1998-2000)	29 (29)	-0.16 (9 birds total <sup>c</sup> )		Kerlinger et al. 2000a, b in Erickson et al. 2001
		60 months	29 (44)	0.11		Kerlinger and Kerns 2003
Klondike (Phase I), Oregon	Grassland/agriculture/CRP	12 months (2002-2003)	16	1.42		Johnson et al. 2003
Combine Hills, Oregon	Grassland/agriculture/CRP	12 months (2004-2005)	41 (41)	2.56		Young et al. 2005
Vansycle/Stateline, Oregon/Washington	Grassland/agriculture/CRP	12 months (1999)	38 (38)	0.63		Erickson et al. 2000
Stateline, Washington/Oregon	Grassland/agriculture/CRP	24 months (2002-2003)	124-153 (454)	1.93		Erickson et al. 2004
Nine Canyon, Washington	Grassland/agriculture/CRP	11 months (2002-2003)	37 (37)	3.59		Erickson et al. 2003
Foote Creek Rim, Wyoming						
Phase I	Short-grass prairie	25 months (1998-2000)	69 (69)	1.50		Young et al. 2001
Phase II		17 months (1999-2000)	36 (36)	1.49		Young et al. 2003
<b>Midwest</b>						
Top of Iowa, Iowa	Agriculture	8 months (2003)	26 (89)	1.29		Koford et al. 2004
Iowa Distributed Wind Generation Project, Algona, Iowa	Grassland/agriculture	9 months <sup>d</sup> (1999-2000)	3 (3)	0.00		Demastes and Trainer 2000 in Erickson et al. 2001
<b>Buffalo Ridge, Minnesota</b>						
Phase I	Grassland/agriculture	8 months (1994-1995)	50 (73)	0.98		Johnson et al. 2002
Phase I		44 months <sup>c</sup> (1996-1999)	21 (73)	0.98		Johnson et al. 2000b in Erickson et al. 2001
Phase II		20 months <sup>c</sup> (1998-1999)	40 (143)	2.27		Johnson et al. 2002
Phase III		8 months <sup>c</sup> (1999)	30 (138)	4.45		Johnson et al. 2002
<b>Summary Buffalo Ridge - Weighted average (all phases)</b>				<b>~35 (~107)</b>		<b>2.83</b>
Lincoln, Wisconsin	Agriculture	(1998-2000; 3 migration seasons fall and spring)	31 (31)	1.30		Howe et al. 2002

**Table F-1 Bird Fatality Rates from Post-construction Studies at Wind Energy Facilities**

Wind Project and Location	Habitat	Length of Monitoring	Number of Turbines in Study in Project (Number in Project)	Reported Mortality Rate (Adjusted for Searcher Efficiency)		Reference
				Number of Bird Fatalities/Turbine/Year		
<b>Northeast</b>						
Madison County, New York	Mixed (agriculture and forest)	12 months	7 (7)	~0.42 (4 birds total <sup>e</sup> )		Kerlinger 2002 in Kelinger and Guarnaccia 2003
Maple Ridge, New York						
daily surveys	Mixed (agriculture and forest)	5 months (2006)	50 (120)	9.59		Jain et al. 2007
3-day surveys	Mixed (agriculture and forest)	5 months (2006)	50 (120)	4.47		Jain et al. 2007
weekly surveys	Mixed (agriculture and forest)	5 months (2006)	50 (120)	3.13		Jain et al. 2007
Maple Ridge, New York	Mixed (agriculture and forest)	7 months (2007)	64 (195)	5.67		Jain et al. 2008
Steel Winds, Lackawanna, New York	Coastal (industrial land)	16 surveys in 7 months (2007)	8 (8)	NA (5 birds total <sup>e</sup> )		Grehan 2008
Wethersfield, Wyoming County, New York	Mixed (agriculture and forest)	5 months <sup>f</sup> (2005)	10 (10)	0.00		E & E 2006
Green Mountains, Searsburg, Vermont	Forested mountain	4 months (1997)	11 (11)	0.00		Kerlinger and Kerns 2003
<b>Mid-Atlantic Highlands</b>						
Meyersdale, Somerset County, Pennsylvania	Grassland/agriculture	7 months (2000)	8 (8)	0.00		Kerlinger 2000 in Erickson et al. 2001
Buffalo Mountain, Tennessee	Mountainous forested ridges and strip mines	11 months (2001-2002)	3 (3)	7.70		Nicholson 2003
Mountaineer, West Virginia	Mixed (agriculture and forest), mountainous	7 months <sup>g</sup> (2003)	44 (44)	4.04 <sup>h</sup>		Kerns and Kerlinger 2004
<b>Canadian Studies</b>						
<b>Ontario</b>						
Erie Shores, Port Burwell, Ontario	mixed; near coast	12 months (2006 - 2007)	66	2 - 2.5 (approx)		James 2008
Huron Wind	Mixed (agriculture and forest)	2003 (April to Oct)	5 (5)	0.00		E & E 2004, Parker 2000
Canadian Exhibition Place Toronto	Urban	Spring and fall 2002	1 (1)	2.00		James and Coady 2003
<b>European Studies</b>						
<b>Belgium</b>						
Zeebrugge	Coastal port	12 months	23	~2.39 (55 birds total <sup>c</sup> )		Everaert et al. 2002 in BirdLife 2003
<b>Netherlands</b>						
Oosterbierum	Coastal agriculture and marshes/water	Fall	18	0.06		Winkelman 1994
		Spring	18	0.09		
Urk	Coastal agriculture and marshes/water	Fall	25	0.04		Winkelman 1994
		Spring	25	0.05		
Kreekrak	Coastal	NA	5 (26)	0.01 <sup>a</sup>		Musters et al. 1995, 1996 in BirdLife 2003
<b>Spain</b>						
Tarifa, Andalusia Region						
Pesur	Mountain ridges generally	~20 years	190 (190)	0.15		SEO/BirdLife 1995 in BirdLife 2002, 2003
E3	without vegetation.	20 years	66 (66)	0.03		
<b>Total Pesur and E3</b>			<b>256</b>	<b>NA</b>		<b>Barrios and Rodriguez 2004</b>
Salajones, Navarra Region	Mountainous forests and agriculture	NA	33 (33)	13.36		Lekouna 2001 in BirdLife 2003
El Perdon, Navarra Region	Mountainous forests and agriculture	NA	40 (40)	63.90		Lekouna 2001 in BirdLife 2003

**Table F-1 Bird Fatality Rates from Post-construction Studies at Wind Energy Facilities**

Wind Project and Location	Habitat	Length of Monitoring	Number of Turbines in Study in Project (Number in Project)	Reported Mortality Rate (Adjusted for Searcher Efficiency)		Reference
					Number of Bird Fatalities/Turbine/Year	
<b>United Kingdom</b>						
Blyth	Coastal habitats	30 months	9	1.34		Still et al. 1996 in BirdLife 2003

Source: Table based on tables from the National Academy of Sciences (2007) and additional references.

**Key:**

CRP = Conservation Reserve Program.

NA = Not available.

**Notes:**

<sup>a</sup> Predicted values.

<sup>b</sup> Not adjusted for searcher efficiency or scavaging rate.

<sup>c</sup> Surveys not conducted during winter months

<sup>d</sup> Surveys conducted during fall, winter, spring months

<sup>e</sup> Number of birds/turbine/year not provided, only the total number of fatalities; an approximation was calculated based on the values available and scavenger/searcher efficiency was not taken into account.

<sup>f</sup> Survey conducted in spring and fall, during migration.

<sup>g</sup> Spring and fall migration and summer breeding season

<sup>h</sup> Fatalities for 7 month study period

**Table F-2 Bat Fatality Rates from Post-construction Studies at Wind Energy Facilities**

Wind Project and Location	Habitat	Length of Monitoring	Reported Mortality Rate (Adjusted for Searcher Efficiency)	Reported Mortality Rate	Reference
			Number of Bat Fatalities/ Turbine/Year	Number of Bat Fatalities/ MW/Year	
<b>Studies in the United States</b>					
<b>West</b>					
Altamont Pass	Grassland/pasture	NA	NA	0.0	Smallwood and Neher 2004 in GAO 2005
High Winds, California	Grassland/agriculture	NA	NA	2.0	Kerlinger et al. 2006
Vansycle/Stateline, Oregon/ Washington	Grassland/agriculture	12 months (1999)	0.74	1.1	Erickson et al. 2000
Stateline, Washington/Oregon	Shrubland/agriculture	24 months (2002-2003)	1.12	1.7	Erickson et al. 2003
Nine Canyon, Washington	Grassland/agriculture/	11 months (2002-2003)	3.21	2.5	Erickson et al. 2003
Klondike (Phase I), Oregon	Grassland/agriculture/CRP	12 months (2002-2003)	1.16	0.8	Johnson et al. 2003
Foote Creek Rim, Wyoming	Short-grass prairie	NA	1.34	2.0	Yount et al. 2003, Gruver 2002
<b>Midwest</b>					
Top of Iowa, Iowa	Agriculture	8 months (2003)	1.88 <sup>d</sup>	8.6	Jain 2005
Buffalo Ridge, Minnesota (Phase I)	Grassland/agriculture/CRP	8 months (1994-1995)	0.26	0.8	Osborn et al. 2003
(Phase II)		(1996-1999)	1.78	2.5	Johnson et al. 2003
(Phase III)		(2001-2002)	2.04	2.9	Johnson et al. 2004
Lincoln, Wisconsin	Agriculture	(1998-2000; 3 migration seasons fall and spring)	4.26	6.5	Howe et al. 2002
<b>Northeast</b>					
Maple Ridge, New York daily surveys	Mixed (agriculture and forest)	5 months (2006)	24.53	14.87	Jain et al. 2007
3-day surveys	Mixed (agriculture and forest)	5 months (2006)	22.34	13.54	Jain et al. 2007
weekly surveys	Mixed (agriculture and forest)	5 months (2006)	15.20	9.21	Jain et al. 2007
Maple Ridge, New York	Mixed (agriculture and forest)	7 months (2007)	15.54	9.42	Jain et al. 2008
Steel Winds, Lackawanna, New York	Coastal (industrial land)	16 surveys in 7 months (2007)	NA (48 bats total <sup>e</sup> )	NA	Grehan 2008
Wethersfield, Wyoming County, New York	Mixed (agriculture and forest)	5 months <sup>h</sup> (2005)	~0.96 (4 bats total <sup>e</sup> )	NA	E & E 2006
Erie Shores, Port Burwell, Ontario	mixed; near coast	12 months (2006 - 2007)	2 - 2.5 (approx)	NA	James 2008
<b>Mid-Atlantic Highlands</b>					
Meyersdale, Somerset County, Pennsylvania	Deciduous forested ridge	1.5 months (2004)	23.00 <sup>e</sup>	15.3	Kerns et al. 2005
Buffalo Mountain, Tennessee Phase I	Deciduous forested ridge	11 months (2001-2002)	NA	31.5	Fiedler 2004
Phase II		NA	20.80	41.1	TVA, unpublished data

**Table F-2 Bat Fatality Rates from Post-construction Studies at Wind Energy Facilities**

Wind Project and Location	Habitat	Length of Monitoring	Reported Mortality Rate (Adjusted for Searcher Efficiency)	Reported Mortality Rate	Reference
			Number of Bat Fatalities/ Turbine/Year	Number of Bat Fatalities/ MW/Year	
Mountaineer, West Virginia	Deciduous forested ridge	7 months (2003; spring and fall migration and summer breeding season)	47.53 <sup>e</sup>	32.0	Kerns et al. 2005
		1.5 months (2004)	38.00 <sup>e</sup>	25.3	Kerns and Kerlinger 2004, Kerns et al. 2005
<b>Southwest</b>					
Oklahoma Wind Energy Center, Oklahoma	Grassland/agriculture/shrubland	NA	NA	0.8	Piorkowski 2006

Source: Table based on tables from the National Academy of Sciences (2007) and additional references.

Key:

CRP = Conservation Reserve Program

NA = Not available

Notes:

<sup>a</sup> Predicted values.

<sup>b</sup> Not adjusted for searcher efficiency or scavenging rate

<sup>c</sup> Represents fatality rate for 6-week study period

<sup>d</sup> Represents fatality rate for 8-month study period

<sup>e</sup> Fatalities for 7 month study period

<sup>f</sup> Fatalities for 5 month study period; a range is provided based on the search schedules (1-day, 3-day, and 7-day)

<sup>g</sup> Number of bats/turbine/year not provided, only the total number of fatalities; an approximation was calculated based on the values available and scavenger/searcher efficiency was not taken into account.

<sup>h</sup> Survey conducted in spring and fall, during migration.

**Table F-1 Bird Fatality Rates from Post-construction Studies at Wind Energy Facilities**

Wind Project and Location	Habitat	Length of Monitoring	Number of Turbines in Study in Project (Number in Project)	Reported Mortality Rate (Adjusted for Searcher Efficiency)	
				Number of Bird Fatalities/Turbine/Year	Reference
<b>Studies in the United States</b>					
<b>West</b>					
Altamont Pass, California	Grassland/pasture	11 months (1988-1989)	359 (7,340)	~0.13 (42 birds total <sup>c</sup> )	Howell and DiDonato 1991 in Erickson et al. 2001
		11 months (1990-1991)	150 (7,340)	~0.07 (10 birds total <sup>c</sup> )	Howell et al. 1991b in Erickson et al. 2001
		(1989-1991)	1,169 (7,340)	~0.08 (182 birds total <sup>c</sup> )	Orloff and Flannery 1992 in Erickson et al. 2001
		One-time search (1994)	1,169 (7,340)	NA (20 birds total <sup>c</sup> )	Orloff and Flannery 1996 in Erickson et al. 2001
		20 months (1993-1995)	165 (NA)	~0.26 (72 birds total <sup>c</sup> )	Howell 1997 in Erickson et al. 2001
		23 months (1993-1995)	785 (5,400)	~0.17 (256 birds total <sup>c</sup> )	Thelander 2000 in Erickson et al. 2001
		12-30 months (1998-2000)	685-1,110 (NA)	0.19	Thelander 2003
Montezuma Hills, California	Grassland/pasture	25 months (1990-1992)	237 (600)	0.07 <sup>b</sup>	Howell and Noone 1992 in Erickson et al. 2001 and in GAO 2005
		10 months (1994-1995)	76 (NA)	~0.21 (13 birds total <sup>c</sup> )	Howell 1997 in Erickson et al. 2001
San Geronio, California	Grassland/pasture	(1985)	2,900 (2,947)	2.31	McCrary et al. 1986a in Erickson et al. 2001, 2002
		14 months (1997-1998)	~360 (NA)	NA (42 birds total <sup>c</sup> )	Anderson 2000a in Erickson et al. 2001
Tehachapi Pass, California	NA	36 months (1995-1998)	640-760 (NA)	NA (147 birds total <sup>c</sup> )	Anderson 2000b in Erickson et al. 2001
Ponnequin, Colorado	Grassland/agriculture	24 months (1998-2000)	29 (29)	~0.16 (9 birds total <sup>c</sup> )	Kerlinger et al. 2000a, b in Erickson et al. 2001
		60 months	29 (44)	0.11	Kerlinger and Kerns 2003
Klondike (Phase I), Oregon	Grassland/agriculture/CRP	12 months (2002-2003)	16	1.42	Johnson et al. 2003
Combine Hills, Oregon	Grassland/agriculture/CRP	12 months (2004-2005)	41 (41)	2.56	Young et al. 2005
Vansycle/Stateline, Oregon/ Washington	Grassland/agriculture/CRP	12 months (1999)	38 (38)	0.63	Erickson et al. 2000
Stateline, Washington/Oregon	Grassland/agriculture/CRP	24 months (2002-2003)	124-153 (454)	1.93	Erickson et al. 2004
Nine Canyon, Washington	Grassland/agriculture/CRP	11 months (2002-2003)	37 (37)	3.59	Erickson et al. 2003
Foote Creek Rim, Wyoming					
Phase I	Short-grass prairie	25 months (1998-2000)	69 (69)	1.50	Young et al. 2001
Phase II		17 months (1999-2000)	36 (36)	1.49	Young et al. 2003
<b>Midwest</b>					
Top of Iowa, Iowa	Agriculture	8 months (2003)	26 (89)	1.29	Koford et al. 2004
Iowa Distributed Wind Generation Project, Algona, Iowa	Grassland/agriculture	9 months <sup>d</sup> (1999-2000)	3 (3)	0.00	Demastes and Trainer 2000 in Erickson et al. 2001

**Table F-1 Bird Fatality Rates from Post-construction Studies at Wind Energy Facilities**

Wind Project and Location	Habitat	Length of Monitoring	Number of Turbines in Study in Project (Number in Project)	Reported Mortality Rate (Adjusted for Searcher Efficiency)		Reference
					Number of Bird Fatalities/Turbine/Year	
<b>Buffalo Ridge, Minnesota</b>						
Phase I	Grassland/agriculture	8 months (1994-1995)	50 (73)	0.98		Johnson et al. 2002
Phase I		44 months <sup>c</sup> (1996-1999)	21 (73)	0.98		Johnson et al. 2000b in Erickson et al. 2001
Phase II		20 months <sup>c</sup> (1998-1999)	40 (143)	2.27		Johnson et al. 2002
Phase III		8 months <sup>c</sup> (1999)	30 (138)	4.45		Johnson et al. 2002
<b>Summary Buffalo Ridge - Weighted average (all phases)</b>			<b>~35 (~107)</b>	<b>2.83</b>		Erickson et al. 2001
Lincoln, Wisconsin	Agriculture	(1998-2000; 3 migration seasons fall and spring)	31 (31)	1.30		Howe et al. 2002
<b>Northeast</b>						
Madison County, New York	Mixed (agriculture and forest)	12 months	7 (7)	~0.42 (4 birds total <sup>e</sup> )		Kerlinger 2002 in Kelinger and Guarnaccia 2003
<b>Maple Ridge, New York</b>						
daily surveys	Mixed (agriculture and forest)	5 months (2006)	50 (120)	9.59		Jain et al. 2007
3-day surveys	Mixed (agriculture and forest)	5 months (2006)	50 (120)	4.47		Jain et al. 2007
weekly surveys	Mixed (agriculture and forest)	5 months (2006)	50 (120)	3.13		Jain et al. 2007
Maple Ridge, New York	Mixed (agriculture and forest)	7 months (2007)	64 (195)	5.67		Jain et al. 2008
Steel Winds, Lackawanna, New York	Coastal (industrial land)	16 surveys in 7 months (2007)	8 (8)	NA (5 birds total <sup>e</sup> )		Grehan 2008
Wethersfield, Wyoming County, New York	Mixed (agriculture and forest)	5 months <sup>f</sup> (2005)	10 (10)	0.00		E & E 2006
Green Mountains, Searsburg, Vermont	Forested mountain	4 months (1997)	11 (11)	0.00		Kerlinger and Kerns 2003
<b>Mid-Atlantic Highlands</b>						
Meyersdale, Somerset County, Pennsylvania	Grassland/agriculture	7 months (2000)	8 (8)	0.00		Kerlinger 2000 in Erickson et al. 2001
Buffalo Mountain, Tennessee	Mountainous forested ridges and strip mines	11 months (2001-2002)	3 (3)	7.70		Nicholson 2003
Mountaineer, West Virginia	Mixed (agriculture and forest), mountainous	7 months <sup>g</sup> (2003)	44 (44)	4.04 <sup>h</sup>		Kerns and Kerlinger 2004
<b>Canadian Studies</b>						
<b>Ontario</b>						
Erie Shores, Port Burwell, Ontario	mixed; near coast	12 months (2006 - 2007)	66	2 - 2.5 (approx)		James 2008
Huron Wind	Mixed (agriculture and forest)	2003 (April to Oct)	5 (5)	0.00		E & E 2004, Parker 2000
Canadian Exhibition Place Toronto	Urban	Spring and fall 2002	1 (1)	2.00		James and Coady 2003
<b>European Studies</b>						
<b>Belgium</b>						
Zeebrugge	Coastal port	12 months	23	~2.39 (55 birds total <sup>e</sup> )		Everaert et al. 2002 in BirdLife 2003
<b>Netherlands</b>						

**Table F-1 Bird Fatality Rates from Post-construction Studies at Wind Energy Facilities**

Wind Project and Location	Habitat	Length of Monitoring	Number of Turbines in Study in Project (Number in Project)	Reported Mortality Rate (Adjusted for Searcher Efficiency)		Reference
					Number of Bird Fatalities/Turbine/Year	
Oosterbierum	Coastal agriculture and marshes/water	Fall	18	0.06		Winkelman 1994
		Spring	18	0.09		
Urk	Coastal agriculture and marshes/water	Fall	25	0.04		Winkelman 1994
		Spring	25	0.05		
Kreekrak	Coastal	NA	5 (26)	0.01 <sup>a</sup>		Musters et al. 1995, 1996 in BirdLife 2003

**Table F-1 Bird Fatality Rates from Post-construction Studies at Wind Energy Facilities**

Wind Project and Location	Habitat	Length of Monitoring	Number of Turbines in Study in Project (Number in Project)	Reported Mortality Rate (Adjusted for Searcher Efficiency)		Reference
				Number of Bird Fatalities/Turbine/Year		
<b>Spain</b>						
Tarifa, Andalusia Region						
Pesur	Mountain ridges generally	~20 years	190 (190)	0.15		SEO/BirdLife 1995 in BirdLife 2002, 2003
E3	without vegetation.	20 years	66 (66)	0.03		
<b>Total Pesur and E3</b>			<b>256</b>	<b>NA</b>		Barrios and Rodriguez 2004
Salajones, Navarra Region	Mountainous forests and agriculture	NA	33 (33)	13.36		Lekouna 2001 in BirdLife 2003
El Perdon, Navarra Region	Mountainous forests and agriculture	NA	40 (40)	63.90		Lekouna 2001 in BirdLife 2003
<b>United Kingdom</b>						
Blyth	Coastal habitats	30 months	9	1.34		Still et al. 1996 in BirdLife 2003

Source: Table based on tables from the National Academy of Sciences (2007) and additional references.

Key:

CRP = Conservation Reserve Program.

NA = Not available.

Notes:

<sup>a</sup> Predicted values.

<sup>b</sup> Not adjusted for searcher efficiency or scavaging rate.

<sup>c</sup> Surveys not conducted during winter months

<sup>d</sup> Surveys conducted during fall, winter, spring months

<sup>e</sup> Number of birds/turbine/year not provided, only the total number of fatalities; an approximation was calculated based on the values available and scavenger/searcher efficiency was not taken into account.

<sup>f</sup> Survey conducted in spring and fall, during migration.

<sup>g</sup> Spring and fall migration and summer breeding season

<sup>h</sup> Fatalities for 7 month study period

