

Presence of Birds and Bats at Danish Flats Environmental Services Waste Treatment Facilities in the Cisco Desert, Utah

Final Report

May 2, 2011

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Executive Summary

Field Results

Bird and bat counts were conducted at the Danish Flats Environmental Services (DF) waste water treatment facility during the four seasons of 2009 and 2010. Forty-five visits were made to the facility, with more visits occurring in spring and fall due to greater bird abundance during these migration seasons.

Birds

A total of 2754 birds were observed during field counts. The highest numbers of birds were observed in spring, and the fewest were observed in winter. Peak bird use was in early May. The number of species observed and individuals observed by season and visit are shown below.

	Total Individuals	Average/Visit
2009 Spring	1,126	93.8
2009 Summer	118	19.7
2009 Fall	208	52.0
2009 Winter	107	35.7
2010 Spring	661	82.6
2010 Summer	166	55.3
2010 Fall	361	60.2
2010 Winter	7	2.3

Of the 2754 birds observed, 1391 were in the ponds, at the edge of the pond, or on the berms around the ponds. The other 1363 individuals were either flying over the ponds but not landing or outside the perimeter fence of the facility. Several of the birds observed had traces of oil on legs or plumage, and six were heavily oiled (Ruddy Duck, Western Grebe, Long-billed Dowitcher, Eared Grebe, Spotted Sandpiper, and Ring-billed Gull). The Long-billed Dowitcher was captured and taken to a wildlife rehabilitator in Grand Junction, CO, and released after cleaning the following day. The Eared Grebe was found dead and given to DF staff. The other four were not observed on subsequent visits. The four birds most heavily oiled were at pond 3; the other two (Spotted Sandpiper and Ring-billed Gull) were at pond 8.

Bats

Eight species of bats were detected at DF in 2009 and 2010. The most common species was the Brazilian Free-tailed Bat. One species, the Spotted Bat, is a Utah Species of Concern. Numbers of individuals could not be determined, nor could the extent of bat use of the evaporation ponds.

Recommendations

Oil-like sludge and fluids were observed on all ponds (greatest on pond 3) and tended to collect in the downwind corners of each pond. Thousands of dead insects also collected in these downwind corners. Cleaning the oil-like fluids from the edges of ponds more frequently would be beneficial in reducing impacts to birds. Birds are attracted to the dead insects as a source of food, and more frequent cleaning would reduce the build-up of dead insects and it would also reduce the amount of such fluids getting on bird's feet and legs. Pond 3 has been the most contaminated of all non-netted ponds, and netting over pond 3 would reduce impacts to birds.

Summary

Recent operational changes at the facility should result in less oil-like fluids on the ponds, especially Pond 3. With the installation of a Gen IV receiving system, hydrocarbons should be separated from water more efficiently.

All facilities such as this have the potential for some exposure of hydrocarbons to wildlife. Overall, the Danish Flats facility is reasonably clean and well run. While some impacts to birds were observed, the impacts appear to be relatively low.

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Introduction

Operations at oil and gas production wells involve the use of many fluids that can be detrimental to wildlife species. Waste pits and evaporative ponds are often used to treat and process many of these fluids. Commercial oilfield waste disposal facilities are facilities that receive production water and frac fluid (a fluid used in the fracturing process) for treatment and disposal. Treatment pits, also known as surface impoundments or ponds, are used to hold wastes so that the liquids will evaporate off of the solid waste materials. These waste products include chemicals that can be harmful to birds and other wildlife. Such impoundments or ponds often attract birds because they appear to be wetlands. This is especially true in arid environments where water sources are not common.

Background

The Danish Flats Environmental Services treatment facility (DF) north of Cisco, Utah, is used to dispose of and evaporate produced water and frac fluid from oil and gas production wells throughout the region. Production waste water is trucked to the site for evaporation in the existing ponds. The facility is designed to handle tanker trucks delivering the production or “brine” water on a 24 hour per day basis.

The facility includes pretreatment of the water to remove free oil. The process includes 6 concrete receiving tanks, a sludge pond (netted to prevent bird and animal use), and 13 five-acre evaporation ponds. Light hydrocarbons and heavy sediments and sludge are recovered in the receiving tanks, and lighter sludge and sediments are collected in the sludge pond. After this treatment, the water is passed to the 13 evaporation ponds via pumps and gravity feed. The 13 evaporation ponds are fenced but not netted, thereby allowing bird and bat access to the ponds.

In April 2009, the facility consisted of 8 evaporation ponds, each 183 m (600 feet) by 123 m (400 feet), or about 2 hectares (5 acres) each. Five additional ponds were constructed beginning in late 2009, bringing to 13 the total number of ponds (Figure 1). Ponds 1-8 are approximately 11 feet deep, and ponds 9-13 are approximately 22 feet deep.

During the treatment process, the waste water is first treated in receiving tanks and the netted sludge pond. The water is then pumped or gravity fed to pond 3, and from pond 3 to the other 12 evaporation ponds.



Figure 1. Danish Flats Environmental Services waste treatment facility north of Cisco, UT, with pond numbers (Google Earth image, 2010).

Objective

The objective of this study was to determine if birds and bats were present at the DF waste treatment ponds and, if so, to what extent they use the waste treatment ponds. The study will be used by Danish Flats Environmental Services to determine appropriate mitigation measures to protect winged wildlife, if necessary, at the facility. This report summarizes bird and bat data collected in spring, summer, fall, and winter of 2009 and 2010.

Study Area

The DF waste treatment facility is located in the Cisco Desert, approximately 3.6 km (3.2 miles) north of I-70, near the Highway 128 Cisco exit. The site is located in an arid region of eastern Utah approximately 43 miles west of the Utah-Colorado state line. The nearest surface body of water is the Colorado River, approximately 11 km (7 miles) to the south.

Methods

Field Counts

Experienced ornithologists visited the facility several times during each of the four seasons in 2009 and 2010, with a higher number of visits during periods of probable high use (spring and fall migration). Standard line transects were made through and around the pond areas, and all bird sightings were entered onto a data sheet developed for this study (Appendix I). Investigators used binoculars and high-power spotting scopes to aid in observation and species identification. Whenever possible, photographs of birds at the ponds were made. After field visits, field data was entered into an Access database developed for this study. Site visits began in April 2009 and continued through January 2011. During site visits, investigators logged all species observed and recorded location, activity, and behavior. We attempted to minimize double counting of the same individual, although this may have occasionally occurred. Observation periods were primarily from sunrise to mid-morning, but occurred during all periods of the day.

Time Lapse Cameras

Time-lapse photographs were collected at several of the ponds during all seasons (Figure 2). Digital cameras were programmed to take one photograph every 5 minutes throughout the day in 2009. This sample scheme was changed to one photograph every 10 minutes in 2010 after initial analysis of 2009 data (less frequent samples were adequate for assessing presence of birds). These photographs were analyzed to determine the presence of birds during periods when investigators were not present and also to compare field count data with photographic data. Each photograph captured approximately 50% of the pond under observation.

Bat Detection Equipment

The presence of bats was studied using a special very high frequency microphone and digital recorder that makes recordings in very high frequencies (up to 96,000 Hz) used by bats (Figure 3). The bat detector/recorder (Binary Acoustics Technology, Tucson, AZ) was programmed to turn on at 2000 hours and turn off at 0600 hours. Recordings were used to determine the presence of bats and were collected in spring, summer, and fall. Sonabat 3 (Software for Bat Call Analysis, Arcata, CA) was used to determine presence and species of bats.



Figure 2. Digital camera programmed to collect a still photograph every 5 or every 10 minutes, throughout the day and throughout the season.



Figure 3. Bat detector high frequency microphone and recorder, programmed to make night recordings.

Results

Birds, Field Counts

Forty-five site visits were made to DF in 2009 and 2010 (Table 1). More visits were made in spring and fall due to expected greater bird abundance during migration periods. A total of 2754 birds were observed at DF during field counts in 2009 and 2010 (Tables 2 and 3). Seventy-six species were observed, plus 6 unidentified species.

Table 1. Dates of site visits at DF, by year and by season.

Spring 2009	Summer 2009	Fall 2009	Winter 2009	Spring 2010	Summer 2010	Fall 2010	Winter 2010
4/18/2009	7/30/2009	9/5/2009	10/20/2009	4/13/2010	7/20/2010	9/13/2010	12/8/2010
4/20/2009	8/2/2009	9/16/2009	10/22/2009	4/19/2010	7/24/2010	9/17/2010	12/17/2010
4/26/2009	8/4/2009	9/21/2009	10/27/2009	4/25/2010	8/12/2010	9/20/2010	1/30/2011
4/30/2009	8/7/2009	9/27/2009		4/27/2010		9/23/2010	
5/2/2009	8/11/2009			5/1/2010		10/5/2010	
5/3/2009	8/27/2009			5/4/2010		10/12/2010	
5/4/2009				5/7/2010			
5/5/2009				5/11/2010			
5/6/2009							
5/11/2009							
5/12/2009							
5/15/2009							
12	6	4	3	8	3	6	3
Total Visits:	45						

Table 2. Species and number of individuals observed at DF, 2009-2010.

Species	Number
Horned Lark	485
Franklin's Gull	300
Brown-headed Cowbird	200
Wilson's Phalarope	146
Western Sandpiper	143
Violet-green Swallow	141
Common Raven	121
N. Rough-winged Swallow	80
Northern Shoveler	73
White-faced Ibis	65
Barn Swallow	63
Ring-billed Gull	59
Tree Swallow	51
Brewer's Blackbird	49
Marbled Godwit	47
Yellow-headed Blackbird	42
American Avocet	41
Eared Grebe	38
Red-necked Phalarope	38
Spotted Sandpiper	34
Green-winged Teal	31
California Gull	23
Long-billed Dowitcher	19
Northern Harrier	16
Willet	16
Ruddy Duck	15
Blue-winged Teal	14
Killdeer	14
Lesser Scaup	14
Western Meadowlark	11
Bufflehead	10
Least Sandpiper	10
Canada Goose	9
Cinnamon Teal	9
Lesser Yellowlegs	9
Baird's Sandpiper	8
Cliff Swallow	8
Golden Eagle	8

Species	Number
House Finch	6
American Kestrel	5
Cattle Egret	5
Pied-billed Grebe	5
White-throated Swift	5
Gadwall	4
Northern Pintail	4
Red-winged Blackbird	4
Scaup sp.	4
Mourning Dove	3
Say's Phoebe	3
Snowy Plover	3
Western Grebe	3
Black-Bellied Plover	2
Great Blue Heron	2
Red-tailed Hawk	2
Turkey Vulture	2
Bank Swallow	1
Common Snipe	1
Cooper's Hawk	1
Egret, Sp.	1
Ferruginous Hawk	1
Forster's Tern	1
Greater Yellowlegs	1
Great-tailed Grackle	1
Long-billed Curlew	1
Merlin	1
Osprey	1
Redhead	1
Sanderling	1
Savannah Sparrow	1
Semipalmated Plover	1
Sharp-shinned Hawk	1
Snowy Egret	1
Song Sparrow	1
Vesper Sparrow	1
Whimbrel	1
White-crowned Sparrow	1

Number of Species	76
Number of Individuals	2543

Table 3. Unidentified species and number of each DF, 2009-2010.

Individuals Not Identified	
Blackbird, sp.	91
Shorebird, Sp.	71
Ducks, sp.	22
Swallow, Sp.	20
Gull, sp.	6
Passerine, Sp.	1
Number of Unidentified Ind.	211

Total Individuals	2754
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Most birds were observed in spring, and very few birds were observed in winter (ponds were generally frozen). The number of species observed and individuals observed by season are shown in Table 4. Count data for each visit are presented in Appendix II. Peak bird use was in early May (Figure 4). Some counts were done on successive days; hence some individuals may have been counted twice.

Table 4. Number of birds observed by year and by season, and average number of individuals observed per visit.

	Total Individuals	Average/Visit
2009 Spring	1,126	93.8
2009 Summer	118	19.7
2009 Fall	208	52.00
2009 Winter	107	35.7
2010 Spring	661	82.6
2010 Summer	166	55.3
2010 Fall	361	60.2
2010 Winter	7	2.3

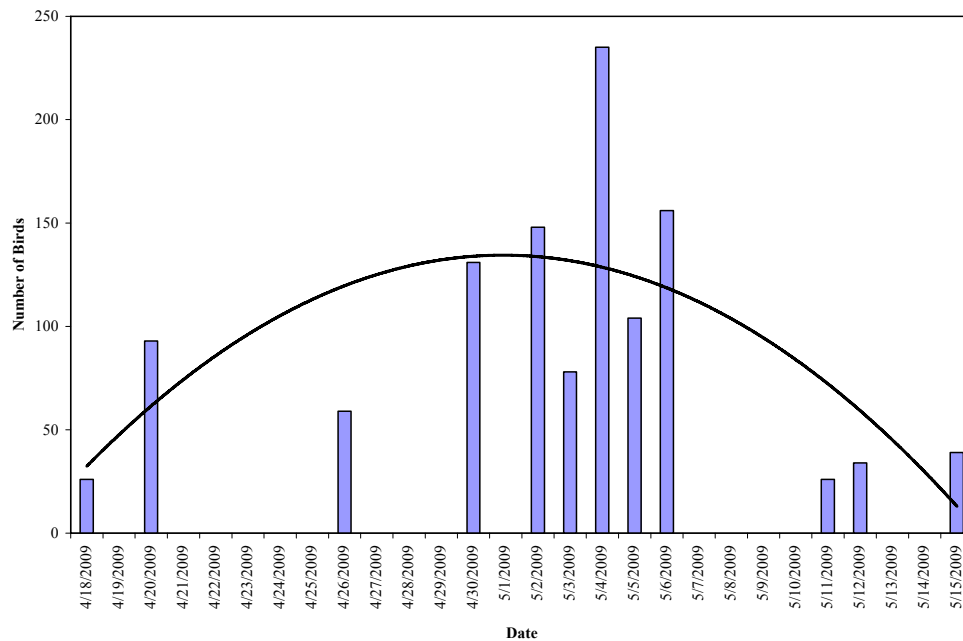


Figure 4. Number of individuals observed at DF facility in spring 2009.

Locations of Birds Observed

Birds observed were classified according to location, including ponds 1-13, the sludge pond, over ponds, and outside facility perimeter. Bird locations for all site visits in 2009 and 2010 are shown in Table 5.

Table 5. Locations of Birds Observed at DF in 2009 and 2010.

Location	Num. Individuals
Pond 1	215
Pond 2	131
Pond 3	70
Pond 4	278
Pond 5	60
Pond 6	134
Pond 7	144
Pond 8	316
Pond 9	34
Pond 10	45
Pond 11	42
Pond 12	37
Pond 13	67
Pond, Sludge	7
Over Pond	840
Outside Pond Perimeter	334

Behavior of Birds Observed

The behavior(s) of all birds observed is shown in Table 6. The total number of behaviors observed is more than the total number of birds observed because a single individual could be doing several different activities (such as swimming, feeding, and vocalizing) during the observation period.

Table 6. Behavior of birds at DF in 2009 and 2010.

Behavior	Num. Observations
Flying	2259
Vocalizing	921
Perched	640
Hunting / Feeding	396
Dipping Bill in Pond Water	392
Swimming	359
Sleeping / Resting	268
Preening	141
Bill shaking	64
Preening, Excessive	22
Repeated diving	20
Total	5482

Oil or Oil-like Fluids on Birds

Of the 2754 birds observed, several had traces of oil on legs or plumage. It was not possible to determine what percent of the birds observed were oiled due to the difficulty of getting a good observation of all birds (with a high-power scope). Six birds observed were heavily oiled: Ruddy Duck, Western Grebe, Long-billed Dowitcher, Eared Grebe, Spotted Sandpiper, and Ring-billed Gull. The first four were at pond 3, and the last two were at pond 8. The Long-billed Dowitcher was captured and taken to a wildlife rehabilitator in Grand Junction, CO, and released after cleaning the following day. The Eared Grebe was found dead and given to DF staff at the facility. The other four birds could not be captured and were not observed on subsequent visits.

Birds, Time-Lapse Photograph Counts

Over 18,400 photographs were taken during 142 days in 2009 and 2010 with programmable time-lapse cameras. Dates, pond numbers, and number of birds are shown in Table 7. Of these 18,477 photographs, 1107 had birds (6.4%).

Table 7. Time-lapse photographs at DF in 2009 and 2010, with number of birds by year and by season.

Year	Season	Date Start	Date End	Pond	Num. Photo.	With Birds
2009	Spring	20090418	20090515	8SE	4660	365
2009	Summer	20090827	20090831	8NE	750	50
2009	Fall	20090901	20101001	8NE, 4SW, 7SE	10506	655
2009	Winter	NA	NA	NA	NA	NA
2010	Spring	20100501	20100507	8SW	1167	34
2010	Summer	20100720	20100724	9SW	381	0
2010	Fall	20100913	20100923	11NW	742	3
2010	Winter	20101208	20101217	8SW	271	0
Totals:					18477	1107

Time-lapse photographs confirmed general patterns of pond use observed during field counts (pond 8 had the highest percentage of photographs with birds). Time-lapse photographs also confirmed that no periods of very high bird use occurred outside our normal site visits.

Bats

Over 330 hours of high-frequency recordings were collected at DF in spring, summer, and fall in 2009 and 2010. Eight species of bats were detected; the Brazilian Free-tailed Bat was the most common species detected (Table 8). The Spotted Bat is a Utah Species of Concern. Numbers of individuals of each species or the extent of their use of the evaporation ponds could not be evaluated.

Table 8. Species of bats detected at DF, 2009-2010.

Species	Common Name	Comment
<i>Euderma maculatum</i>	Spotted Bat	Species of Concern (Utah)
<i>Lasionycteris noctivagans</i>	Silver-haired Bat	
<i>Lasiurus cinereus</i>	Hoary Bat	
<i>Myotis californicus</i>	California Myotis	
<i>Myotis ciliolabrum</i>	Western Small-footed Myotis	
<i>Myotis yumanensis</i>	Yuma Myotis	
<i>Pipistrellus hesperus</i>	Western Pipestrelle	
<i>Tadarida brasiliensis</i>	Brazilian Free-tailed Bat	Most numerous species

Discussion

Birds were observed in and around all of the evaporation ponds (Figure 5). No birds were observed in the netted sludge pond, but a few were observed perched on top of the netting. Bird abundance varied by season, from zero individuals during some winter visits to over 1,000 individuals in spring.

Oil-like sludge and fluids were observed on all ponds, and tended to collect in the downwind corners of each pond. Dead insects also collected in these downwind corners (Figure 6-8). In late summer, many thousands of dead insects were observed around the edges of the ponds in oil-like material and fluids. Most of the insects were small, white moths (body ~15 mm long, species unknown). Other insect species were observed, including grasshoppers, beetles, and bees, but the small white moth was by far the most common. Many shorebirds were observed feeding on these dead insects (Figures 9 and 10).

It appears that birds most likely to be impacted by the oil-like sludge and fluids in the ponds were shorebirds and diving ducks. Shorebirds were observed feeding on dead, oiled insects around the edges of the ponds. Diving ducks were most likely to be impacted when they landed on the most contaminated non-netted pond 3. Four heavily oiled birds were observed on or near pond 3, a Ruddy Duck, Western Grebe, Eared Grebe, and a Long-billed Dowitcher. The Eared Grebe was found dead and turned over to the DF staff. The Long-billed Dowitcher was captured, cleaned, and released (by a rehab facility in Grand Junction, CO). The Ruddy Duck and Western Grebe were observed swimming in pond 3 and could not be captured, and were not observed on subsequent visits.

Hazing birds (employees firing fire-cracker type shots) was generally effective in causing birds to fly, but the birds usually flew to a different pond and landed rather than leaving the area of the facilities. The propane-powered “Zon” guns were generally ineffective in preventing bird use of the pond areas as most birds appeared to habituate to the sounds of these guns.



Figure 5. Birds on pond (Franklin Gull, Northern Shoveler, Wilson's Phalarope).



Figure 6. Oil-like sludge and fluid in pond with many dead insects.



Figure 7. Dead insects in oil-like sludge and water.



Figure 8. Dead insects in oil-like sludge and water.



Figure 9. Western Sandpiper feeding at the edge of ponds. Oil is visible on legs and toes.



Figure 10. Western Sandpiper eating insect from oiled section of pond.

Appendix II. Common Names and AOU Bird Codes at Danish Flats 2009.

Common Name	Abbrev.
American Avocet	AMAV
Baird's Sandpiper	BASA
Bank Swallow	BANS
Barn Swallow	BARS
Black-bellied Plover	BBPL
Blackbird, sp.	Blackbird, sp.
Blue-winged Teal	BWTE
Brewer's Blackbird	BRBL
Brown-headed Cowbird	BHCO
Bufflehead	BUFF
California Gull	CAGU
Canada Goose	CAGO
Cattle Egret	CAEQ
Cinnamon Teal	CITE
Cliff Swallow	CLSW
Common Raven	CORA
Common Snipe	COSN
Cooper's Hawk	COHA
Ducks, sp.	Duck, Sp.
Eared Grebe	EAGR
Franklin's Gull	FRGU
Gadwall	GADW
Golden Eagle	GOEA
Greater Yellowlegs	GRYE
Great-tailed Grackle	GTGR
Green-winged Teal	GWTE
House Finch	HOFI
Horned Lark	HOLA
Killdeer	KILL
Least Sandpiper	LESA
Lesser Scaup	LESC
Lesser Yellowlegs	LEYE
Long-billed Dowitcher	LBDO
Marbled Godwit	MAGO

Common Name	Abbrev.
Merlin	MERL
Northern Harrier	NOHA
Northern Shoveler	NSHO
N. Rough-winged Swallow	NRWS
Passerine, Sp.	Passerine, sp.
Redhead	REDH
Red-necked Phalarope	RNPH
Red-tailed Hawk	RTHA
Red-winged Blackbird	RWBL
Ring-billed Gull	RBGU
Ruddy Duck	RUDU
Scaup sp.	Scaup, sp.
Semipalmated Plover	SEPL
Sparrow, Sp.	Sparrow, sp.
Shorebird, Sp.	Shorebird, sp.
Snowy Egret	SNEG
Snowy Plover	SNPL
Spotted Sandpiper	SPSA
Swallow, Sp.	Swallow, sp.
Tree Swallow	TRES
Turkey Vulture	TUVU
Violet-green Swallow	VGSW
Western Grebe	WEGR
Western Meadowlark	WEME
Western Sandpiper	WESA
White-faced Ibis	WFIB
White-throated Swift	WTSW
Willet	WILL
Wilson's Phalarope	WIPH
Yellow-headed Blackbird	YHBL

Appendix III. Species and Individuals at DF by site visit, 2009 and 2010.

Date	Count	Species	Visit Count
4/18/2009	9	Horned Lark	27.00
	5	Franklin's Gull	
	3	Common Raven	
	2	Turkey Vulture	
	2	Violet-green Swallow	
	1	Canada Goose	
	1	Merlin	
	1	Northern Harrier	
	1	Ruddy Duck	
	1	Western Meadowlark	
	1	White-faced Ibis	
4/20/2009	60	Violet-green Swallow	93.00
	15	Yellow-headed Blackbird	
	6	Horned Lark	
	4	Bufflehead	
	2	Common Raven	
	2	N. Rough-winged Swallow	
	1	Golden Eagle	
	1	Great-tailed Grackle	
	1	Marbled Godwit	
	1	Northern Harrier	
4/26/2009	14	Ring-billed Gull	59.00
	12	Blackbird, sp.	
	9	Horned Lark	
	6	Shorebird, Sp.	
	5	White-faced Ibis	
	3	Cliff Swallow	
	3	Western Sandpiper	
	2	Common Raven	
	2	Northern Harrier	
	2	Willet	
	1	Golden Eagle	
4/30/2009	22	American Avocet	133.00
	21	Shorebird, Sp.	
	13	Violet-green Swallow	
	11	Franklin's Gull	
	10	Horned Lark	
	8	Common Raven	
	6	Canada Goose	
	6	Red-necked Phalarope	
	6	Western Sandpiper	
	5	Long-billed Dowitcher	
	5	N. Rough-winged Swallow	

Date	Count	Species	Visit Count
	4	Least Sandpiper	
	2	Blue-winged Teal	
	2	Spotted Sandpiper	
	2	Willet	
	2	Yellow-headed Blackbird	
	1	Cliff Swallow	
	1	Common Snipe	
	1	Golden Eagle	
	1	Lesser Scaup	
	1	Red-tailed Hawk	
	1	Ring-billed Gull	
	1	Snowy Egret	
	1	White-faced Ibis	
5/2/2009	45	Violet-green Swallow	142.00
	39	N. Rough-winged Swallow	
	10	Barn Swallow	
	6	Horned Lark	
	5	Common Raven	
	5	Spotted Sandpiper	
	5	Swallow, Sp.	
	5	Tree Swallow	
	5	White-faced Ibis	
	3	Shorebird, Sp.	
	2	Blue-winged Teal	
	2	Cliff Swallow	
	2	Franklin's Gull	
	2	Snowy Plover	
	2	Wilson's Phalarope	
	1	Canada Goose	
	1	Least Sandpiper	
	1	Northern Harrier	
	1	Ring-billed Gull	
5/3/2009	17	Marbled Godwit	78.00
	16	Franklin's Gull	
	10	Horned Lark	
	9	Common Raven	
	9	Eared Grebe	
	5	N. Rough-winged Swallow	
	5	White-throated Swift	
	3	White-faced Ibis	
	2	Lesser Scaup	
	1	Northern Harrier	
	1	Wilson's Phalarope	
5/4/2009	65	Franklin's Gull	235.00
	25	Wilson's Phalarope	
	23	Eared Grebe	

Date	Count	Species	Visit Count
	22	Western Sandpiper	
	15	Ring-billed Gull	
	11	Lesser Scaup	
	11	Shorebird, Sp.	
	9	White-faced Ibis	
	8	Swallow, Sp.	
	8	Violet-green Swallow	
	7	Long-billed Dowitcher	
	6	Common Raven	
	6	Horned Lark	
	6	Marbled Godwit	
	4	N. Rough-winged Swallow	
	2	Killdeer	
	2	Lesser Yellowlegs	
	2	Spotted Sandpiper	
	1	Black-Bellied Plover	
	1	Red-necked Phalarope	
	1	Willet	
5/5/2009	62	Franklin's Gull	104.00
	10	Marbled Godwit	
	8	Horned Lark	
	7	Ruddy Duck	
	6	Common Raven	
	4	Wilson's Phalarope	
	3	Long-billed Dowitcher	
	2	Golden Eagle	
	1	American Avocet	
	1	Gadwall	
5/6/2009	45	Franklin's Gull	156.00
	25	Blackbird, sp.	
	20	Wilson's Phalarope	
	13	White-faced Ibis	
	10	Horned Lark	
	8	Red-necked Phalarope	
	7	Spotted Sandpiper	
	6	Northern Shoveler	
	3	Least Sandpiper	
	3	Marbled Godwit	
	3	Red-winged Blackbird	
	3	Ring-billed Gull	
	2	Brewer's Blackbird	
	2	Eared Grebe	
	2	N. Rough-winged Swallow	
	1	Common Raven	
	1	Killdeer	
	1	Long-billed Dowitcher	

Date	Count	Species	Visit Count
	1	Willet	
5/11/2009	10	Wilson's Phalarope	26.00
	8	Horned Lark	
	3	American Avocet	
	2	Common Raven	
	1	Northern Harrier	
	1	Redhead	
	1	Ring-billed Gull	
5/12/2009	10	Horned Lark	34.00
	8	Common Raven	
	6	Franklin's Gull	
	6	Wilson's Phalarope	
	2	Yellow-headed Blackbird	
	1	Ring-billed Gull	
	1	Violet-green Swallow	
5/15/2009	8	Horned Lark	39.00
	6	Spotted Sandpiper	
	5	Ring-billed Gull	
	2	Barn Swallow	
	2	Common Raven	
	2	Franklin's Gull	
	2	N. Rough-winged Swallow	
	2	Wilson's Phalarope	
	1	Bank Swallow	
	1	Black-Bellied Plover	
	1	Canada Goose	
	1	Cliff Swallow	
	1	Northern Harrier	
	1	Red-winged Blackbird	
	1	Shorebird, Sp.	
	1	Snowy Plover	
	1	Violet-green Swallow	
	1	Western Sandpiper	
7/30/2009	9	Tree Swallow	29.00
	5	House Finch	
	5	Western Sandpiper	
	4	Spotted Sandpiper	
	3	Horned Lark	
	2	Brown-headed Cowbird	
	1	Wilson's Phalarope	
8/2/2009	20	Tree Swallow	29.00
	4	Wilson's Phalarope	
	1	Common Raven	
	1	Golden Eagle	
	1	Horned Lark	

Date	Count	Species	Visit Count
	1	Ring-billed Gull	
	1	Spotted Sandpiper	
8/4/2009	5	Swallow, Sp.	9.00
	2	Western Sandpiper	
	1	Horned Lark	
	1	Wilson's Phalarope	
8/7/2009	6	Wilson's Phalarope	15.00
	4	Western Sandpiper	
	1	Common Raven	
	1	Greater Yellowlegs	
	1	Passerine, Sp.	
	1	Semipalmated Plover	
	1	Spotted Sandpiper	
8/11/2009	2	Horned Lark	5.00
	2	N. Rough-winged Swallow	
	1	Common Raven	
8/27/2009	9	Ducks, sp.	31.00
	8	Western Sandpiper	
	7	Horned Lark	
	3	Cinnamon Teal	
	1	Common Raven	
	1	House Finch	
	1	Killdeer	
	1	Spotted Sandpiper	
9/5/2009	11	Western Sandpiper	40.00
	10	Barn Swallow	
	8	Baird's Sandpiper	
	4	Horned Lark	
	3	Yellow-headed Blackbird	
	2	Common Raven	
	1	California Gull	
	1	N. Rough-winged Swallow	
9/16/2009	16	Western Sandpiper	52.00
	12	Horned Lark	
	8	Northern Shoveler	
	6	Yellow-headed Blackbird	
	3	Common Raven	
	3	Violet-green Swallow	
	1	American Avocet	
	1	Eared Grebe	
	1	Green-winged Teal	
	1	Northern Harrier	
9/21/2009	12	Horned Lark	41.00
	9	Blackbird, sp.	
	5	Cinnamon Teal	

Date	Count	Species	Visit Count
	4	Common Raven	
	3	Western Sandpiper	
	2	Barn Swallow	
	2	Eared Grebe	
	1	Scaup sp.	
	1	Shorebird, Sp.	
	1	Vesper Sparrow	
	1	Yellow-headed Blackbird	
9/27/2009	42	Horned Lark	75.00
	8	Barn Swallow	
	7	Blackbird, sp.	
	6	Western Meadowlark	
	5	Common Raven	
	3	Scaup sp.	
	1	American Avocet	
	1	Cinnamon Teal	
	1	Cooper's Hawk	
	1	Western Sandpiper	
10/20/2009	7	Common Raven	19.00
	5	Cattle Egret	
	2	Bufflehead	
	2	Western Grebe	
	1	Franklin's Gull	
	1	Ring-billed Gull	
	1	Ruddy Duck	
10/22/2009	52	Horned Lark	60.00
	3	Common Raven	
	3	Killdeer	
	1	Northern Harrier	
	1	Western Grebe	
10/27/2009	23	Horned Lark	28.00
	4	Bufflehead	
	1	Common Raven	
4/13/2010	6	Brewer's Blackbird	26.00
	6	Gull, sp.	
	3	California Gull	
	2	Horned Lark	
	2	White-faced Ibis	
	1	Cliff Swallow	
	1	Common Raven	
	1	Franklin's Gull	
	1	Lesser Yellowlegs	
	1	Northern Harrier	
	1	Osprey	
	1	Savannah Sparrow	

Date	Count	Species	Visit Count
4/19/2010	35	Northern Shoveler	79.00
	16	California Gull	
	10	Green-winged Teal	
	5	Horned Lark	
	4	Violet-green Swallow	
	2	Common Raven	
	2	Lesser Yellowlegs	
	1	Franklin's Gull	
	1	Marbled Godwit	
	1	Say's Phoebe	
	1	Western Meadowlark	
	1	White-faced Ibis	
4/25/2010	76	Franklin's Gull	108.00
	6	Horned Lark	
	5	Northern Shoveler	
	4	Northern Pintail	
	4	Ring-billed Gull	
	3	Gadwall	
	2	Blue-winged Teal	
	2	Common Raven	
	2	Lesser Yellowlegs	
	2	Violet-green Swallow	
	1	Marbled Godwit	
	1	Western Meadowlark	
4/27/2010	42	Wilson's Phalarope	78.00
	8	Northern Shoveler	
	7	Green-winged Teal	
	7	Willet	
	2	Blue-winged Teal	
	2	Common Raven	
	2	Northern Harrier	
	1	Barn Swallow	
	1	Golden Eagle	
	1	Horned Lark	
	1	Red-tailed Hawk	
	1	Violet-green Swallow	
	1	Western Sandpiper	
	1	Whimbrel	
	1	White-crowned Sparrow	
5/1/2010	27	Brewer's Blackbird	53.00
	12	Horned Lark	
	7	Marbled Godwit	
	3	Common Raven	
	1	American Kestrel	
	1	Egret, Sp.	

Date	Count	Species	Visit Count
	1	Franklin's Gull	
	1	Long-billed Dowitcher	
5/4/2010	12	Brewer's Blackbird	54.00
	11	White-faced Ibis	
	5	Western Sandpiper	
	4	Horned Lark	
	3	California Gull	
	3	Ring-billed Gull	
	3	Ruddy Duck	
	3	Wilson's Phalarope	
	2	Brown-headed Cowbird	
	2	Say's Phoebe	
	2	Western Meadowlark	
	2	Yellow-headed Blackbird	
	1	Franklin's Gull	
	1	Mourning Dove	
5/7/2010	180	Brown-headed Cowbird	234.00
	14	N. Rough-winged Swallow	
	10	Yellow-headed Blackbird	
	8	Wilson's Phalarope	
	4	Horned Lark	
	3	Red-necked Phalarope	
	2	Great Blue Heron	
	2	Long-billed Dowitcher	
	2	Spotted Sandpiper	
	2	Swallow, Sp.	
	1	Common Raven	
	1	Lesser Yellowlegs	
	1	Long-billed Curlew	
	1	Marbled Godwit	
	1	Violet-green Swallow	
	1	Western Sandpiper	
	1	Willet	
5/11/2010	12	American Avocet	29.00
	6	Ring-billed Gull	
	5	Franklin's Gull	
	2	Horned Lark	
	1	American Kestrel	
	1	Common Raven	
	1	Ferruginous Hawk	
	1	Western Sandpiper	
7/20/2010	45	Horned Lark	88.00
	16	Barn Swallow	
	15	Brown-headed Cowbird	
	4	Common Raven	

Date	Count	Species	Visit Count
	3	Killdeer	
	2	Blackbird, sp.	
	1	American Avocet	
	1	Shorebird, Sp.	
	1	Willet	
7/24/2010	17	Tree Swallow	40.00
	11	Wilson's Phalarope	
	8	Horned Lark	
	2	Mourning Dove	
	1	Least Sandpiper	
	1	Western Sandpiper	
8/12/2010	18	Red-necked Phalarope	38.00
	12	Shorebird, Sp.	
	3	Spotted Sandpiper	
	2	Common Raven	
	1	Horned Lark	
	1	N. Rough-winged Swallow	
	1	Willet	
9/13/2010	18	Horned Lark	59.00
	13	White-faced Ibis	
	9	Northern Shoveler	
	5	Ducks, sp.	
	5	Western Sandpiper	
	2	Barn Swallow	
	1	Blackbird, sp.	
	1	Brown-headed Cowbird	
	1	Common Raven	
	1	Northern Harrier	
	1	Red-necked Phalarope	
	1	Sanderling	
	1	Song Sparrow	
9/17/2010	18	Horned Lark	34.00
	8	Western Sandpiper	
	6	Green-winged Teal	
	2	Common Raven	
9/20/2010	36	Horned Lark	76.00
	18	Western Sandpiper	
	7	Green-winged Teal	
	3	N. Rough-winged Swallow	
	2	Blue-winged Teal	
	2	Northern Shoveler	
	1	Common Raven	
	1	Forster's Tern	
	1	Killdeer	
	1	Least Sandpiper	

Date	Count	Species	Visit Count
	1	Lesser Yellowlegs	
	1	Red-necked Phalarope	
	1	White-faced Ibis	
	1	Yellow-headed Blackbird	
9/23/2010	17	Western Sandpiper	69.00
	15	Shorebird, Sp.	
	12	Common Raven	
	11	Barn Swallow	
	10	Horned Lark	
	2	Killdeer	
	2	Ruddy Duck	
10/5/2010	12	Horned Lark	19.00
	4	Western Sandpiper	
	2	Common Raven	
	1	Barn Swallow	
10/12/2010	42	Horned Lark	104.00
	35	Blackbird, sp.	
	8	Ducks, sp.	
	5	Pied-billed Grebe	
	4	Blue-winged Teal	
	3	Ring-billed Gull	
	2	Brewer's Blackbird	
	1	Common Raven	
	1	Golden Eagle	
	1	Killdeer	
	1	Ruddy Duck	
	1	Sharp-shinned Hawk	
12/8/2010	2	American Kestrel	4.00
	1	Common Raven	
	1	Northern Harrier	
12/17/2010	1	American Kestrel	3.00
	1	Eared Grebe	
	1	Northern Harrier	
1/30/2011	0	None	0