

CHRISTENSEN RANCH AND IRIGARAY MINES 2010 WILDLIFE MONITORING

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Contents

	Page
Introduction	1
Survey Area	1
Christensen Ranch	1
Irigaray	2
Methods	2
Greater Sage-grouse	2
Raptors.....	2
Results	3
Greater Sage-grouse	3
Other Upland Game Birds.....	5
Raptors.....	5
References	14

Tables

	Page
Table 1. Peak male counts at greater sage-grouse leks in the Irigaray and Christensen Ranch survey area from 1998 through 2010.....	4
Table 2. Raptor nest locations, status, and productivity in the Irigaray and Christensen Ranch survey area from 2005 through 2010.....	7
Table 3. Annual productivity for nesting raptors in the Irigaray and Christensen Ranch survey area during surveys conducted for those properties from 1991 through 1999 and 2007 through 2010.....	12

Figures

	Page
Figure 1. Cumulative peak male sage-grouse attendance at leks in the Irigaray and Christensen Ranch survey areas during spring surveys from 1989 through 2010.....	5

Maps

Map 1. 2010 Wildlife Monitoring: Sage-grouse Leks and Raptor Nests.

Introduction

Uranium One Americas, Inc. (Uranium One) has developed two in situ uranium recovery operations (Christensen Ranch and Irigaray) in eastern Johnson and western Campbell Counties, Wyoming. ICF International (ICF) conducted annual wildlife monitoring surveys at the Irigaray and Christensen Ranch operations from 1995 through 1999, but discontinued surveys in 2000 when operations at both sites were suspended. In preparation for renewed operations, Uranium One commissioned ICF to renew wildlife monitoring efforts at both properties in 2007, with full reinstatement of the annual wildlife monitoring program beginning in 2008.

Past wildlife surveys completed, including those specified in Uranium One's Permit to Mine (No. 478-A2), consisted of:

- voluntary aerial surveys for wintering big game;
- monitoring of known greater sage-grouse (*Centrocercus urophasianus*) leks and searching for new leks; and
- surveys for known and new nesting raptors.

ICF biologists again conducted surveys for nesting raptors and sage-grouse leks in 2010. However, voluntary big game surveys were discontinued in 2009 and not conducted in 2010. The wildlife survey area, survey methods, and results from the 2010 surveys and previous years are described below.

Survey Area

Christensen Ranch

The Christensen Ranch permit area (including a previous Amendment Area) encompasses approximately 22.1 square miles that includes portions of Sections 24, 26, 34, and 35 T45N:R77W; Sections 19 and 31-33 T45N:R76W; Sections 1-3 and 10-12 T44N:R77W; and Sections 3-10 and 16-21 T44N:R76W (Map 1). Although the Christensen Ranch survey area is quite large, activities associated with uranium recovery have been limited to non-contiguous, narrow bands, totaling less than 3.0 square miles.

Much of the Christensen Ranch survey area is divided by numerous drainages associated with the North Butte plateau, which exists in the extreme east-central portion of the survey perimeter. Beyond the North Butte plateau, trees are limited to cottonwoods (*Populus* spp.) along the Willow Creek corridor, which flows northwest through the center of the permit area. The far southeastern portion of the monitoring area consists of somewhat gentler terrain, a few deep drainages, and several rolling hills.

Irigaray

The Irigaray permit area is limited to approximately 1.0 square mile that spans Sections 5, 8, 9 and 16 T45N:R77W (Map 1).

The terrain in the Irigaray portion of the survey area is rugged and heavily dissected by numerous steep drainages. Willow Creek bisects the area from southeast to northwest and flows to the Powder River, just west of the 1.0-mile survey perimeter. Individuals and small stands of cottonwood trees occur along Willow Creek, but few trees are found elsewhere.

The combined Christensen Ranch and Irigaray wildlife survey area has varied over time, ranging from 53.0 to 64.0 square miles. Beginning in 2009, the boundary for the wildlife monitoring area was modified to include a perimeter that was uniformly 1.0 mile around both of the Christensen Ranch and Irigaray permit boundaries (survey area), totaling 64.2 square miles.

Methods

Greater Sage-grouse

Eight greater sage-grouse leks are known to exist within 1.0 mile of the Irigaray and Christensen Ranch permit areas (Wyoming Game and Fish Department [WGFD] 2010). All eight leks are designated as 'occupied' according to WGFD guidelines. Although none of the leks are located within the Irigaray permit area, three (Christensen Ranch 1, 3, and 7) are located within the Christensen Ranch permit area. The five remaining leks (Irigaray and Irigaray II, and Christensen Ranch 2, 4, and 5) are located within the surrounding survey perimeter (Map 1).

Both aerial surveys and ground-based counts for sage-grouse leks were conducted during spring 2010. Aerial surveys were used primarily as a means to search for new leks, while ground surveys were used to confirm activity and obtain accurate counts at the known leks. Aerial surveys were conducted on April 8 and 9. Ground counts were conducted on April 16, 20, 27, and May 5. All aerial surveys were completed between 30 minutes before and 1 hour after sunrise by two ICF biologists and a pilot in a fixed-wing Cessna 172XP, 182, or 205 at a speed and altitude of 80-100 mph and 100-300 feet above ground level, respectively. The surveys were conducted by flying north-south transects spaced at 0.62-mile (1 kilometer [km]) intervals over both permit areas and the surrounding 1.0-mile perimeter. Ground-based counts were conducted between 30 minutes before and 30 minutes after sunrise. During the ground surveys, biologists searched for displaying grouse while slowly driving through the area, concentrating efforts in likely lek habitat (level to rolling sagebrush-grassland). Frequent stops were also made at vantage points to scan and listen for strutting birds. Biologists also watched for and recorded grouse or their sign (droppings, fecal deposits, or feathers) during all other ground surveys.

Raptors

Raptor nest monitoring and searches were conducted from late March through early July 2010. Guidelines recommended by Grier and Fyfe (1987) were followed to prevent nest abandonment and injury to eggs or young. Early in the breeding season, known nests were monitored from a distance

with the aid of binoculars and a spotting scope. Nests were not approached on foot until after May. All nests previously identified within the survey area were checked at least once during the breeding season.

New nests were located by walking or slowly driving throughout the survey area and frequently stopping to examine typical nesting habitat. Rough breaks and tree groves were searched on foot. Personnel continually watched for adult raptors and noted behavior that could indicate a nearby nest. Areas where individuals or pairs were repeatedly seen were thoroughly searched for nests. Six small prairie dog colonies, totaling 0.2 square miles and representing potential burrowing owl (*Athene cunicularia*) habitat, were also carefully searched.

The substrate, condition, status, location, and other site-specific information were recorded for all raptor nests. Universal Transverse Mercator (UTM NAD83, Zone 13N) coordinates (uncorrected, less than 10m accepted error) for new nests were determined using a hand-held global positioning system receiver (Garmin GPS 72). The status (active, inactive, alternate, etc.) and condition of nests and the number of young hatched successfully and raised to fledglings were recorded for each nest.

Results

Greater Sage-grouse

Eight greater sage-grouse leks have been documented in the Irigaray and Christensen Ranch survey area; all are currently designated as occupied according to WGFD guidelines. Four of those leks (Irigaray and Christensen Ranch 1-3) were discovered in 1989. The Christensen Ranch 4 and 5 leks were discovered in 1998 and 1999, respectively, and the Irigaray II and Christensen Ranch 7 leks were discovered in 2005. Though suitable sage-grouse habitat is found throughout the survey area, it is not situated in any of the sage-grouse core population areas or defined connectivity corridors identified by the state of Wyoming (Wyoming EO 2010-4).

ICF biologists documented activity at four (Irigaray II, Christensen Ranch 1, 4, and 7) of the eight known sage-grouse leks in 2010 (Table 1). One additional lek (Christensen Ranch 5) was also reported as active in the WGFD (2010) database. Peak male counts at the active leks in 2010 ranged from 1 to 17 birds with the highest count occurring at Christensen Ranch 4 lek (Table 1). Sage-grouse habitat is fairly abundant within the survey area and observations beyond the known lek sites typically occur in appropriate habitats. A few potential lek sites have been identified in past years, but no additional leks have been officially designated by the WGFD.

Most sage-grouse leks were monitored nearly every year since their respective discoveries, whether by agency (WGFD) or consulting biologists. As a result, long-term data are available for each site. The grouse population in the Irigaray and Christensen Ranch area, as measured by male attendance at the monitored leks, declined from 1989 through 1995 (Figure 1). Cumulative peak attendance dropped from 42 to 7 males during that period. Male grouse counts remained quite low through 1997, with several leks abandoned by the late 1990s (Table 1). However, populations began to increase in 1998, rising to a cumulative high of 69 males in 2006. Since 2006, the peak male counts have been dropping again, with a sharp decline observed between 2008 and 2010. It should be noted that leks were only monitored sporadically in 2000 and 2001, and according to the WGFD database records, only the Irigaray lek was monitored in 2002.

Table 1. Peak male counts at greater sage-grouse leks in the Irigaray and Christensen Ranch survey area from 1989 through 2010.

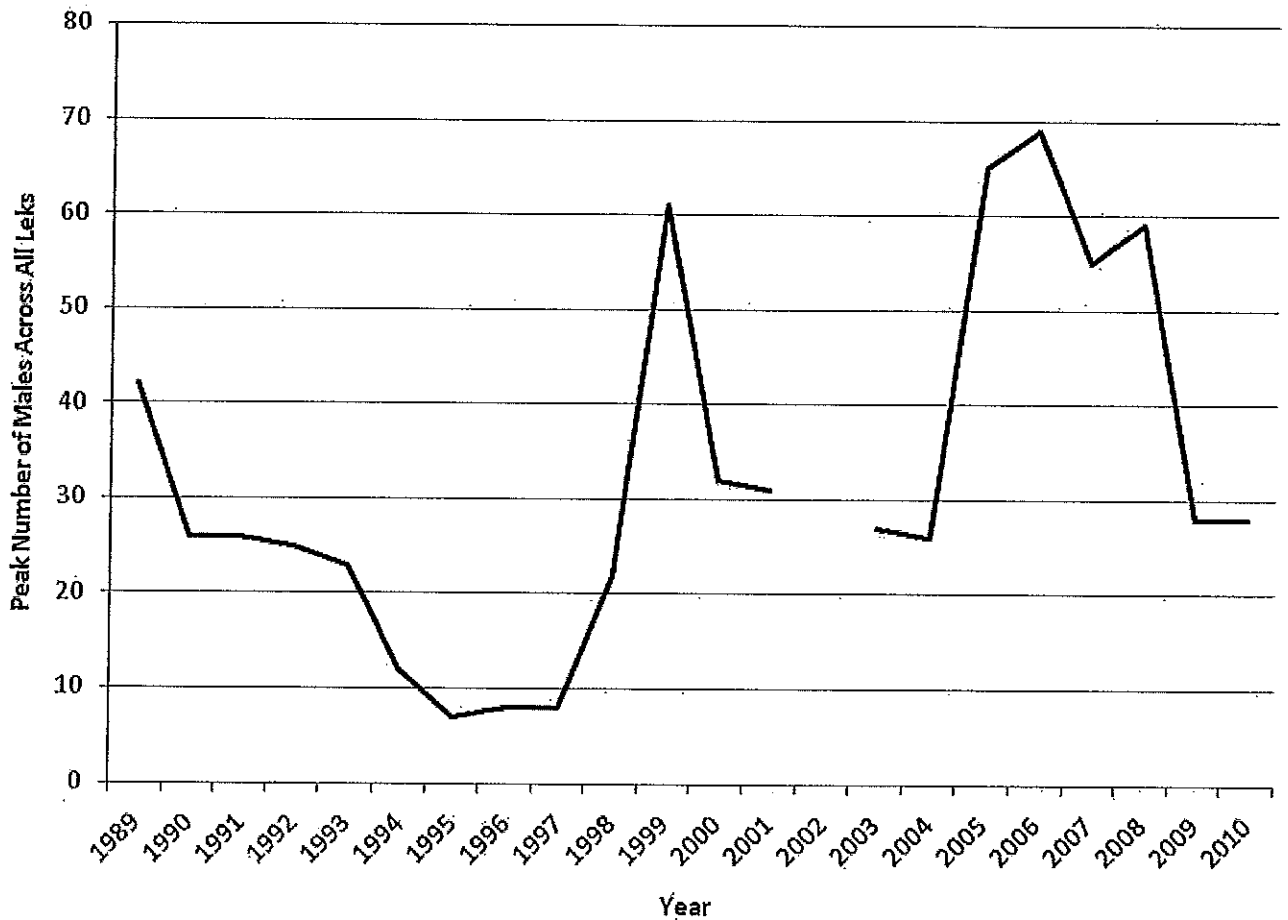
Year	CR 1	CR 2	CR 3	CR 4	CR 5	CR 7	Irigaray	Irigaray II
1989	23	--	9	--	--	---	10	---
1990	16	--	4	--	--	---	6	---
1991	21	3	0	--	--	---	2	---
1992	13	6	0	--	--	---	6	---
1993	8	10	0	--	--	---	5	---
1994	4	3	0	--	--	---	5	---
1995	3	1	1	--	--	---	2	---
1996	7	0	0	--	--	---	1	---
1997	7	0	0	--	--	---	1	---
1998	10	0	0	7	--	---	5	---
1999	7	0	0	43	11	---	0	---
2000 ¹	---	---	---	22	10	---	---	---
2001 ¹	16	---	---	11	4	---	---	---
2002 ¹	---	---	---	---	---	---	0	---
2003 ¹	12	0	0	15	0	---	0	---
2004 ¹	12	0	0	14	0	---	0	---
2005 ¹	25	0	0	24	0	2	0	14
2006 ¹	28	2	0	23	5	0	1	10
2007	28	0	0	19	0	1	0	7
2008	19	0	0	17	1	0	10	12
2009	11	0	0	12	0	0	0	5
2010	6	0	0	17	0 ²	1	0	2

CR = Christensen Ranch

--- = Lek was not discovered or monitored in the given year.

¹ Peak male counts from the Wyoming Game and Fish Department database; not all leks were monitored in all years.² Four males were observed at this lek by other individuals in 2010 (BLM 2010).

No other male sage-grouse were observed displaying outside of the active leks in 2010. However, one female with nine young was observed in NW SE Section 24, T44N:R77W on July 8. The birds were foraging in sagebrush near a gravel road. The observation was approximately 1.1 miles west of the active Christensen 1 lek site.



Ranch survey areas during spring surveys from 1989 through 2010¹.

¹Not all leks were monitored between 2000 and 2002.

Other Upland Game Birds

In addition to sightings of greater sage-grouse, wild turkeys (*Meleagris gallopavo*) and gray partridge (*Perdix perdix*) have been documented in the survey area in past years. However, neither of those species was documented in 2010.

Raptors

Wildlife surveys were not required or conducted for the Irigaray and Christensen Ranch permit areas from 2000 to 2006. However, biologists continued to monitor nesting raptors in portions of the survey area overlapping coal bed natural gas (CBNG) development during that period. Table 2 presents a compilation of survey results obtained specifically from the Irigaray and Christensen Ranch survey area as well as ICF and Bureau of Land Management (BLM) data (2010) related to CBNG development in the general area from 2006 through 2010. As a result of the aforementioned

modification (i.e., a uniform 1.0-mile perimeter) to the survey area boundary in 2009, several nests that were surveyed in previous years and beyond the 1.0-mile survey perimeter are not included in this report.

Compilation of all known datasets has yielded 130 known nest sites within the Irigaray and Christensen Ranch survey area (Map 1). Over time, several of those nests were destroyed by natural causes. Consequently, 87 of the 130 total nest records were confirmed intact at the end of the 2010 breeding season, while 42 nests were confirmed destroyed in that year or prior to 2010 spring surveys. Confirmed intact nests included:

- 20 red-tailed hawk (*Buteo jamaicensis*) nests,
- 9 ferruginous hawk (*Buteo regalis*) nests,
- 9 great horned owl (*Bubo virginianus*) nests,
- 4 golden eagle (*Aquila chrysaetos*) nests,
- 2 American kestrel (*Falco sparverius*) nests,
- 1 long-eared owl (*Asio otus*) nest,
- 1 prairie falcon (*Falco mexicanus*) nest,
- 34 unknown raptor species nests,
- 6 red-tailed hawk/great horned owl nests, and
- 1 unknown raptor/golden eagle nest.

Only three raptor nests (two red-tailed hawk nests and one golden eagle nest) within the Irigaray and Christensen Ranch survey area were active in 2010 (Table 2). One of those (RTH2c) was rebuilt in 2010 and was the only successful (i.e., fledged young) nest documented in the survey area that year. Two young fledged from that nest.

The two remaining nests both failed. Activity at nest RTH1d was first observed on May 9, when two red-tailed hawks were seen tending to the nest. On June 24, two young were observed in the nest, and both adults were exhibiting defensive behavior in the area. When the biologist visited the site again on July 8, no adults were observed in the area and a search around the nest tree revealed the remnants of the nest, along with the carcass of a single chick. On April 14, an adult golden eagle was observed incubating in nest GE9b; however, subsequent visits on June 1 and 16 revealed no golden eagles (adults or young) at or near the nest, indicating it had failed.

Over time, raptor productivity (total number of fledged young) has fluctuated from as few as 0 (2009) to at least 28 (1998) total fledged young throughout the survey area (Table 3). Productivity was relatively low from 1991 through 1996, but increased in subsequent survey years. Raptor production was the greatest in 1998, with relatively high fledgling counts in the following year (1999) and again in 2007. The high productivity in 1998 was primarily attributable to the enlargement of the survey area that year, though high prey populations (e.g., lagomorphs/hares and rabbits) throughout the region in from 1993 to 1996 and 2005 to 2007 (ICF, unpublished data) likely contributed to greater raptor production during those periods. However, lagomorph counts declined considerably in 2007, and continued to remain low from 2008 through 2010. Reduced lagomorph indices in those 4 years were primarily due to one factor. The extremely high density of lagomorphs in 2006 likely triggered an outbreak of tularemia, which was documented in Campbell

Table 2. Raptor nest locations, status, and productivity¹ in the Irigaray and Christensen Ranch survey area from 2006 through 2010.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
FH1a	CB	NW SW	34	45-77	A,2+,2	A,0+,0	A,2+,2	I	I
FH1b	CB	SE SW	34	45-77	---	I	I	I	I
FH2a	EP	NE NE	28	45-77	D-N in 1998	---	---	---	---
FH2b	ROC	SW SE	21	45-77	I	I	I	D-N	---
FH2c	SS	NE NE	28	45-77	U	U	U	I	D-N
FH2d	CB	NW SE	28	45-77	I	I	I	I	I
FH3a	G	SE SW	19	45-76	U	U	U	I	I
FH3b	CB	NE SW	19	45-76	U	U	U	D-N	---
FH4a	ROC	SW SE	11	44-77	---	I	I	I	D-N
FH4b	CB	NE NE	14	44-77	---	---	I	I	I
FH4c	CB	NE NE	14	44-77	---	---	I	I	I
FH6	W	NE NE	30	44-76	---	A-T	D-N	---	---
FH7a	ROC	SE NE	20	45-76	---	I	U	I	I
FH7b	ROC	SE NE	20	45-76	---	I	U	I	D-N
FH7c	ROC	NW SW	21	45-76	---	I	U	I	I
FH7d	CB	SE SE	20	45-76	---	I	I	I	D-N
FH8	CB	SE NE	2	44-77	---	---	I	I	I
Ferruginous Hawk Subtotals					1,2+,2	2,0+,0	1,2+2	0,0,0	0,0,0
GE1a	CB	NW SW	8	44-76	U	U	A,1+,0	I	I
GE1b	CLF	NW SW	8	44-76	I	A-T	ALT	I	D-N
GE1c	CLF	SW SW	8	44-76	A,2+,2	ALT	ALT	I	D-N
GE4a	CW	NE SW	27	44-76	U	U	I	D-N	---
GE4b	CW	NE SW	27	44-76	U	U	I	D-M	---
GE4c	CW	NW SE	27	44-76	A,1+,1	D-M	---	---	---
GE4d	CW	SW SE	27	44-76	U	U	D-N	---	---
GE5	CLF	NE SE	36	45-77	I	U	I	I	I
GE6a	CW	NE NE	23	45-77	A,2+,2	U	I	D-N	---
GE6b	CW	SW SW	24	45-77	D-N in 2005	---	---	---	---
GE7	CW	SE NE	26	45-77	I	U	I	D-N	---
GE8	POL	NW SW	10	44-76	A,1+,1	U	I	I	I

Table 2. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
GE9a	CW	NE NE	29	44-76	---	I	I	I	I
Golden Eagle Subtotals					4,6+,6	1,0,0	1,1+,0	0,0,0	0,0,0
GH02b	CW	NW NE	8	45-77	---	---	I	I	I
GH04b	ROC	SE NE	32	45-76	---	I	I	D-N	---
GH07a	CW	SE NE	9	45-77	A,?,?	U	I	D-N	---
GH08	CW	NW SE	22	45-77	A,1+,1	U	U	I	I
GH09b	CW	NW NW	27	45-77	---	A-T	U	D-N	---
GH09c	CW	NW NW	27	45-77	---	I	U	D-N	---
GH010a	BOX	NE NE	32	45-76	---	I	I	A,?,?	I
GH011	CW	SW NE	36	45-77	U	U	I	D-N	---
GH012a	CW	SE SE	8	44-76	A, 1+,1	I	I	I	I
GH013	CW	NW NW	19	44-76	---	A,1+,1	A,?,?	I	I
GH014b	CW	SE SW	13	44-77	---	A,1+,1	I	I	I
GH015b	CW	SE SE	25	44-77	A,2+,2	I	I	I	I
GH016	CW	SW NE	30	44-76	A,3+,3	A,2+,2	I	I	I
GH017	CW	SW NE	6	45-77	---	---	---	I	I
Great Horned Owl Subtotals					5,7+,7	4,4+,4	1,?,?	1,?,?	0,0,0
RTH1a	CW	SE SE	5	45-77	D-N in 1996	---	---	---	---
RTH1c	CW	NW NW	9	45-77	ALT	U	U	I	D-N
RTH1d	CW	SW SW	4	45-77	A,?,?	U	I	I	A,2,0; D-N
RTH2b	CW	SE SE	21	44-76	U	U	I	D-N	---
RTH2c	CW	SE SE	21	44-76	A,2+,2	A,1+,1	I	D-N	Rebuilt; A,2,2
RTH3a	CW	SW NW	33	45-76	A,?,?	U	I	I	I
RTH3b	CW	SW NW	33	45-76	I	U	I	I	I
RTH4a	CW	SE SW	1	44-77	---	---	I	D-N	---
RTH4b	ROC	SW NW	1	44-77	A,1+,1	U	I	I	I
RTH4c	CW	SW SW	2	44-77	A,2+,2	U	I	I	I
RTH4d	CLF	SW NW	1	44-77	---	---	I	I	I
RTH5b	CW	NW SE	33	45-77	D-N in 1997	---	---	---	---

Table 2. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
RTH8a	CW	NE SE	21	45-77	D-N in 1995	---	---	---	---
RTH8b	CW	SW SE	21	45-77	---	---	U	I	D-N
RTH8d	CW	SW NW	21	45-77	A,?,?	A,?,?	I	I	I
RTH11	CW	NW NW	13	44-77	U	U	U	I	I
RTH12	CW	NW NW	35	45-76	U	U	U	I	I
RTH13b	CW	NW SE	25	44-77	---	A,2+,2	I	I	I
RTH13c	CW	NW SE	25	44-77	---	A-T	I	I	I
RTH14a	CW	SE NE	9	45-77	A,?,?	U	U	I	I
RTH18	CW	SW SW	18	44-76	---	A,3+,3	I	I	I
RTH20	CW	SW NE	30	44-76	I	A,2+,2	I	I	I
RTH21a	CW	NW SE	27	44-76	I	A,0,0	I	I	I
RTH21b	CW	NW SE	27	44-76	U	U	I	D-N	---
RTH22a	CW	SW NE	6	45-77	---	---	I	I	I
RTH22b	CW	SW NE	6	45-77	---	---	I	I	I
RTH23	CW	NE SE	17	45-77	---	---	U	I	I
RTH24	CW	NE SW	29	44-76	---	---	---	I	I
RTH25	CW	NE SE	28	45-76	---	---	I	I	I
RTH26	CW	SW SE	32	45-76	---	A-T	U	A,?,?	D-N
Red-tailed Hawk Subtotals					7,5+,5	8,8+,8	0,0,0	1,?,?	2,4,2
AMK1	CLF	SE NW	5	45-77	---	---	---	A-T	I
AMK2	ROC	SE SE	4	44-76	A,1+,?	I	I	I	I
American Kestrel Subtotals					1,1+,?	0,0,0	0,0,0	1,0,0	0,0,0
H1	G	NE NE	18	44-76	D-N in 1999	---	---	---	---
Northern Harrier Subtotals					0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
LEO1	CW	SE NW	19	45-76	A,?,?	U	I	I	I
Long-eared Owl Subtotals					1,?,?	0,0,0	0,0,0	0,0,0	0,0,0
PF1b	ROC	NW NW	14	44-76	ALT	A,2+,2	I	I	I
Prairie Falcon Subtotals					0,0,0	1,2+,2	0,0,0	0,0,0	0,0,0

Table 2. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
UNK1	CW	NE SW	16	45-77	U	U	I	I	D-N
UNK2	CW	NW SE	9	45-77	---	I	U	I	I
UNK3	CW	NE NE	15	45-77	I	U	I	I	I
UNK5	CW	NW SE	22	45-77	---	I	D-M	---	---
UNK6	CW	NE NE	23	45-77	I	U	I	D-N	---
UNK7	CW	NW NE	23	45-77	I	U	D-N	---	---
UNK8	CW	SE SE	24	45-77	I	U	I	I	I
UNK9	CW	NE SW	26	45-77	U	U	I	D-N	---
UNK10	CW	SE SW	25	45-77	U	U	I	I	I
UNK11	CW	SW SW	36	45-77	I	U	I	I	I
UNK14	CW	NE NE	1	44-77	---	I	I	I	I
UNK16	CW	SW NW	8	44-77	---	I	I	I	I
UNK17	WIL	NW NE	16	44-76	---	I	I	I	I
UNK18	PP	SE NW	10	44-76	I	I	I	I	I
UNK19	CLF	NW NE	15	44-76	---	I	I	I	I
UNK20	POL	NE NW	15	44-76	---	I	I	I	I
UNK21	CW	SW SW	33	46-77	---	I	I	I	I
UNK23	CW	NE NE	20	45-76	---	I	U	I	I
UNK24	CW	SW SE	20	45-76	---	A-T	U	I	I
UNK26	JU	SE SW	32	45-76	---	U	U	I	I
UNK27	JU	SE SW	32	45-76	---	A-T	U	I	I
UNK28	JU	SE SW	32	45-76	---	U	U	I	I
UNK29	CW	SE SE	17	45-76	U	U	ABBMA	I	I
UNK31	CW	SE SW	33	46-77	---	I	I	I	I
UNK32	CW	NE SE	27	44-76	I	U	I	I	I
UNK33	CW	NW SW	5	45-77	---	---	I	I	I
UNK34	CW	NW SW	5	45-77	---	---	---	I	I
UNK35	CW	NW SW	5	45-77	---	---	I	I	I
UNK36	CW	NE SW	5	45-77	---	---	I	I	I
UNK37	CW	NE SW	5	45-77	---	---	I	I	I
UNK38	CW	NE SW	5	45-77	---	---	I	I	I
UNK39	CW	NE SW	5	45-77	---	---	I	I	I
UNK40	CW	NE SW	5	45-77	---	---	I	I	I

Table 2. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
UNK41	CW	NE NE	23	45-77	---	---	---	I	I
UNK42	JU	SE NE	2	44-77	---	---	I	I	I
UNK43	CW	SE NW	1	44-77	---	---	I	I	I
UNK44	CW	NW SW	6	44-76	---	---	---	I	I
UNK46	JU	NW NW	28	45-76	---	---	U	I	D-N
UNK47	CW	NE SE	36	45-77	---	---	---	---	I
UNK48	CLF	NE NE	14	44-77	---	---	---	---	I
Unknown Species Subtotals					0,0,0	2,0,0	0,0,0	0,0,0	0,0,0
RTH1b/GHO2	CW	NW NW	9	45-77	ALT	U	U	D-N	---
RTH2a/GHO3	CW	SW SE	21	44-76	U	U	I	D-N	---
RTH8c/GHO5	CW	SE NE	21	45-77	A,2+,2 ^{GHO}	ALT	I	I	I
RTH10a/GHO4a	CW	SE SW	16	44-76	A,3+,3 ^{RTH}	A,?,? ^{GHO}	I	I	I
RTH10b/GHO4b	CW	NW NE	21	44-76	A,?,? ^{GHO}	A,?,? ^{GHO}	I	I	I
RTH13a/GHO15a	CW	NW SE	25	44-77	A,2+,2 ^{RTH}	A,2+,2 ^{GHO}	I	I	I
RTH16a/GHO9a	CW	SW NW	27	45-77	A,3+,2 ^{RTH}	A,?,? ^{GHO}	A,1+,1 ^{GHO}	I	I
RTH17/GHO12b	CW	SW NW	9	44-76	A,2+,2 ^{RTH}	A,2+,2 ^{GHO}	A,?,? ^{RTH}	A,?,? ^{RTH}	I
RTH19/GHO14a	CW	SE SW	13	44-77	A,2+,2 ^{GHO}	I	D-N	---	---
GE11/RTH27	CW	NE NW	20	45-76	---	A,1+,0 ^{GE}	I	A,?,? ^{RTH}	D-N
UNK45/GE9t	CW	NW NW	20	44-76	---	---	I	I	A,0,0 ^{GE}
Multiple Species Subtotals					7,14+,13	6,5+,4	2,1+,1	2,?,?	1,0,0
Grand Totals					26,35+,33	26,19+,18	6,4+,3	5,?,?	3,4,2

¹ Data for 2006 primarily derived from BLM datasets, which do not always include status and productivity. Surveys were not specifically conducted for the Irigaray and Christensen Ranch properties during that year.

X,#,# = Status, number of young hatched, number of young fledged.

? = Unknown number of young hatched or fledged.

#+ = Minimum estimate of number of young fledged.

Species Codes

AMK = American kestrel
 BBMA = Black-billed magpie
 FH = Ferruginous hawk
 GE = Golden eagle
 GHO = Great horned owl
 H = Northern harrier
 LEO = Long-eared owl
 PF = Prairie falcon
 RTH = Red-tailed hawk
 UNK = Unknown species

Nest Substrate Codes

BOX = Boxelder
 CB = Creek bank
 CLF = Cliff
 CW = Cottonwood
 EP = Earth pillar
 G = Ground
 JU = Juniper
 POL = Power pole
 PP = Ponderosa pine
 ROC = Rock
 SS = Sandstone pillar
 WIL = Willow
 W = Windmill

Nest Status Codes

A = Active
 ALT = Alternate nest
 A-T = Active-tended/no eggs laid
 D-N = Destroyed, natural causes
 D-M = Destroyed, manmade causes
 I = Inactive
 U = Unknown
 --- = Undiscovered or nonexistent

Table 3. Annual productivity for nesting raptors in the Irigaray and Christensen Ranch survey area during surveys conducted for those properties from 1991 through 1999 and 2007 through 2010.

Year	Number of young fledged/species					Total
	RTH	GE	GHO	FH	PF	
1991	---	1+	?	---	---	1+
1992	---	3+	0	---	---	3+
1993	---	0	0	---	---	0
1994	---	1+	?	---	---	1+
1995	---	1	0	---	---	1
1996	4	4	0	0	---	8
1997	7+	3	2+	0	---	12+
1998 ¹	17+	4	4	3+	---	28+
1999	11	6	2	2	---	21
2000 to 2006: No surveys conducted						
2007	8+	0	8+	0	2	18+
2008	?	0	1+	2+	---	3+
2009*	?	---	?	---	---	?
2010*	2+	0	---	---	---	2+
Annual Means ²	8.1	1.9	1.9	1.2	2.0	8.2

+ Indicates minimum estimate.

? Indicates nesting status unknown.

--- Indicates that the species was not known to nest in area.

¹ Survey area was increased by 40 mi² in 1998.

² Means calculated within species by dividing total minimum number fledged by the number of years (not including unknown productivity years) the species nested within survey area.

* Productivity numbers likely influenced by limited access to some nests during key productivity times.

Species Codes

FH = Ferruginous hawk
 GE = Golden eagle

GHO = Great horned owl
 RTH = Red-tailed hawk

PF = Prairie Falcon

County the following year. That disease has been known to contribute to the cyclic nature of lagomorph populations in the region, and possibly impacted the population through 2010 as well.

Consequently, raptor productivity was extremely low in 2009 and 2010, though limited access to portions of the survey area associated with sheep ranching (northwest extents of the Irigaray permit and survey areas) during the key nesting period (May - July) may have been a contributing factor in both years.

As mentioned above, fluctuations in raptor nesting attempts and success rates are often linked to variations in prey availability. Large raptor species such as golden eagles, ferruginous hawks, red-

tailed hawks, and great horned owls prey predominantly on lagomorphs (hares and rabbits). Lagomorph surveys are not required for in situ uranium operations in Wyoming. However, surveys for lagomorphs in other parts of the Powder River Basin indicate that populations were severely reduced from 1993 through 1996 and fall 2007 through 2010 (ICF, unpublished data).

Red-tailed hawks are common nesters in the survey area, and were more abundant than other raptor species in most survey years (Table 3). Although the number of nesting pairs of red-tailed hawks within the overall survey area has fluctuated in recent years, at least one pair successfully nested in 6 of the 13 years that surveys were conducted (1991 through 1999 and 2007 through 2010). At the end of the 2010 breeding season, 26 intact red-tailed hawk nests were recorded (six were multi-species nests) within the survey area. Two of those were confirmed active nests with at least two young fledged throughout the survey area.

Golden eagles have also regularly nested in the Irigaray and Christensen Ranch survey area. From 1991 through 1997, four known territories were present within or immediately adjacent to the Irigaray and Christensen Ranch survey area. By 2007, nine golden eagle territories had been recorded within the overall survey area. At least one pair of golden eagles fledged young during 8 of the 13 years surveys were conducted 1991 through 1999 and 2007 through 2010). However, no successful golden eagle nests have been documented in the past 4 years. In 2010, five intact golden eagle nests were recorded within the survey area. Only one nest (GE9b) was active, but the pair failed to produce any young.

One golden eagle pair (GE1a-c, Map 1) nests near the Christensen Ranch facilities and has been monitored with some regularity since 1987. Over the years, the pair has had a history of failed nesting attempts due to their repeated use of a friable cliff bank along Willow Creek as a nest site. From 1987 through 1995, three separate nesting attempts were unsuccessful due to structural failures in the cliff wall either above or below the occupied nest. Chicks perished during two of the incidents, and eggs were destroyed during the third. In 1996, the pair again built a nest on the cliff bank; the nest remained intact and one eaglet fledged. Young also fledged from that nest in two of the subsequent 3 years. In more recent years, the pair was successful in fledging two young in 2006, but only tended an alternate nest in the territory the next year and did not lay eggs. In 2008, the cliff nest site used by the pair once again failed, and no activity has been recorded in the territory since then (i.e., 2009 through 2010).

Multiple ferruginous hawk territories were first identified in the survey area in 1996. A single adult ferruginous hawk was observed bringing sticks to the FH1a nest (Map 1) in both 1996 and 1997, but no eggs or young were seen in either year. In the following 2 years (1998 and 1999) the FH1 pair nested and fledged a total of five young. In more recent years, the FH1 pair successfully nested in 2006 and 2008, and attempted to nest but failed to fledge any young in 2007 (Table 2). Although nine intact ferruginous hawk nests were recorded within the survey area in 2010, no confirmed active ferruginous hawk nests have been documented in the last 2 years (2009 through 2010).

Great horned owls were found nesting in the area in 1991 and 1994, but their productivity during those years was not determined. No active nests were located in 1995 or 1996, although adult owls were observed roosting during each of those years. From 1997 through 1999 and again in 2007 through 2009, great horned owls were recorded actively nesting each year. In 2010, 15 intact great horned owl nests were confirmed (six were multi-species nests) within the survey area, but none were active.

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CHRISTENSEN RANCH AND IRIGARAY MINES 2010 WILDLIFE MONITORING

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Contents

	Page
Introduction	1
Survey Area	1
Christensen Ranch	1
Irigaray	2
Methods	2
Greater Sage-grouse	2
Raptors.....	2
Results	3
Greater Sage-grouse	3
Other Upland Game Birds.....	5
Raptors.....	5
References	14

Tables

	Page
Table 1. Peak male counts at greater sage-grouse leks in the Irigaray and Christensen Ranch survey area from 1998 through 2010.....	4
Table 2. Raptor nest locations, status, and productivity in the Irigaray and Christensen Ranch survey area from 2005 through 2010.....	7
Table 3. Annual productivity for nesting raptors in the Irigaray and Christensen Ranch survey area during surveys conducted for those properties from 1991 through 1999 and 2007 through 2010.....	12

Figures

	Page
Figure 1. Cumulative peak male sage-grouse attendance at leks in the Irigaray and Christensen Ranch survey areas during spring surveys from 1989 through 2010.....	5

Maps

Map 1. 2010 Wildlife Monitoring: Sage-grouse Leks and Raptor Nests.

Introduction

Uranium One Americas, Inc. (Uranium One) has developed two in situ uranium recovery operations (Christensen Ranch and Irigaray) in eastern Johnson and western Campbell Counties, Wyoming. ICF International (ICF) conducted annual wildlife monitoring surveys at the Irigaray and Christensen Ranch operations from 1995 through 1999, but discontinued surveys in 2000 when operations at both sites were suspended. In preparation for renewed operations, Uranium One commissioned ICF to renew wildlife monitoring efforts at both properties in 2007, with full reinstatement of the annual wildlife monitoring program beginning in 2008.

Past wildlife surveys completed, including those specified in Uranium One's Permit to Mine (No. 478-A2), consisted of:

- voluntary aerial surveys for wintering big game;
- monitoring of known greater sage-grouse (*Centrocercus urophasianus*) leks and searching for new leks; and
- surveys for known and new nesting raptors.

ICF biologists again conducted surveys for nesting raptors and sage-grouse leks in 2010. However, voluntary big game surveys were discontinued in 2009 and not conducted in 2010. The wildlife survey area, survey methods, and results from the 2010 surveys and previous years are described below.

Survey Area

Christensen Ranch

The Christensen Ranch permit area (including a previous Amendment Area) encompasses approximately 22.1 square miles that includes portions of Sections 24, 26, 34, and 35 T45N:R77W; Sections 19 and 31-33 T45N:R76W; Sections 1-3 and 10-12 T44N:R77W; and Sections 3-10 and 16-21 T44N:R76W (Map 1). Although the Christensen Ranch survey area is quite large, activities associated with uranium recovery have been limited to non-contiguous, narrow bands, totaling less than 3.0 square miles.

Much of the Christensen Ranch survey area is divided by numerous drainages associated with the North Butte plateau, which exists in the extreme east-central portion of the survey perimeter. Beyond the North Butte plateau, trees are limited to cottonwoods (*Populus* spp.) along the Willow Creek corridor, which flows northwest through the center of the permit area. The far southeastern portion of the monitoring area consists of somewhat gentler terrain, a few deep drainages, and several rolling hills.

Irigaray

The Irigaray permit area is limited to approximately 1.0 square mile that spans Sections 5, 8, 9 and 16 T45N:R77W (Map 1).

The terrain in the Irigaray portion of the survey area is rugged and heavily dissected by numerous steep drainages. Willow Creek bisects the area from southeast to northwest and flows to the Powder River, just west of the 1.0-mile survey perimeter. Individuals and small stands of cottonwood trees occur along Willow Creek, but few trees are found elsewhere.

The combined Christensen Ranch and Irigaray wildlife survey area has varied over time, ranging from 53.0 to 64.0 square miles. Beginning in 2009, the boundary for the wildlife monitoring area was modified to include a perimeter that was uniformly 1.0 mile around both of the Christensen Ranch and Irigaray permit boundaries (survey area), totaling 64.2 square miles.

Methods

Greater Sage-grouse

Eight greater sage-grouse leks are known to exist within 1.0 mile of the Irigaray and Christensen Ranch permit areas (Wyoming Game and Fish Department [WGFD] 2010). All eight leks are designated as 'occupied' according to WGFD guidelines. Although none of the leks are located within the Irigaray permit area, three (Christensen Ranch 1, 3, and 7) are located within the Christensen Ranch permit area. The five remaining leks (Irigaray and Irigaray II, and Christensen Ranch 2, 4, and 5) are located within the surrounding survey perimeter (Map 1).

Both aerial surveys and ground-based counts for sage-grouse leks were conducted during spring 2010. Aerial surveys were used primarily as a means to search for new leks, while ground surveys were used to confirm activity and obtain accurate counts at the known leks. Aerial surveys were conducted on April 8 and 9. Ground counts were conducted on April 16, 20, 27, and May 5. All aerial surveys were completed between 30 minutes before and 1 hour after sunrise by two ICF biologists and a pilot in a fixed-wing Cessna 172XP, 182, or 205 at a speed and altitude of 80-100 mph and 100-300 feet above ground level, respectively. The surveys were conducted by flying north-south transects spaced at 0.62-mile (1 kilometer [km]) intervals over both permit areas and the surrounding 1.0-mile perimeter. Ground-based counts were conducted between 30 minutes before and 30 minutes after sunrise. During the ground surveys, biologists searched for displaying grouse while slowly driving through the area, concentrating efforts in likely lek habitat (level to rolling sagebrush-grassland). Frequent stops were also made at vantage points to scan and listen for strutting birds. Biologists also watched for and recorded grouse or their sign (droppings, fecal deposits, or feathers) during all other ground surveys.

Raptors

Raptor nest monitoring and searches were conducted from late March through early July 2010. Guidelines recommended by Grier and Fyfe (1987) were followed to prevent nest abandonment and injury to eggs or young. Early in the breeding season, known nests were monitored from a distance

with the aid of binoculars and a spotting scope. Nests were not approached on foot until after May. All nests previously identified within the survey area were checked at least once during the breeding season.

New nests were located by walking or slowly driving throughout the survey area and frequently stopping to examine typical nesting habitat. Rough breaks and tree groves were searched on foot. Personnel continually watched for adult raptors and noted behavior that could indicate a nearby nest. Areas where individuals or pairs were repeatedly seen were thoroughly searched for nests. Six small prairie dog colonies, totaling 0.2 square miles and representing potential burrowing owl (*Athene cunicularia*) habitat, were also carefully searched.

The substrate, condition, status, location, and other site-specific information were recorded for all raptor nests. Universal Transverse Mercator (UTM NAD83, Zone 13N) coordinates (uncorrected, less than 10m accepted error) for new nests were determined using a hand-held global positioning system receiver (Garmin GPS 72). The status (active, inactive, alternate, etc.) and condition of nests and the number of young hatched successfully and raised to fledglings were recorded for each nest.

Results

Greater Sage-grouse

Eight greater sage-grouse leks have been documented in the Irigaray and Christensen Ranch survey area; all are currently designated as occupied according to WGFDF guidelines. Four of those leks (Irigaray and Christensen Ranch 1-3) were discovered in 1989. The Christensen Ranch 4 and 5 leks were discovered in 1998 and 1999, respectively, and the Irigaray II and Christensen Ranch 7 leks were discovered in 2005. Though suitable sage-grouse habitat is found throughout the survey area, it is not situated in any of the sage-grouse core population areas or defined connectivity corridors identified by the state of Wyoming (Wyoming EO 2010-4).

ICF biologists documented activity at four (Irigaray II, Christensen Ranch 1, 4, and 7) of the eight known sage-grouse leks in 2010 (Table 1). One additional lek (Christensen Ranch 5) was also reported as active in the WGFDF (2010) database. Peak male counts at the active leks in 2010 ranged from 1 to 17 birds with the highest count occurring at Christensen Ranch 4 lek (Table 1). Sage-grouse habitat is fairly abundant within the survey area and observations beyond the known lek sites typically occur in appropriate habitats. A few potential lek sites have been identified in past years, but no additional leks have been officially designated by the WGFDF.

Most sage-grouse leks were monitored nearly every year since their respective discoveries, whether by agency (WGFDF) or consulting biologists. As a result, long-term data are available for each site. The grouse population in the Irigaray and Christensen Ranch area, as measured by male attendance at the monitored leks, declined from 1989 through 1995 (Figure 1). Cumulative peak attendance dropped from 42 to 7 males during that period. Male grouse counts remained quite low through 1997, with several leks abandoned by the late 1990s (Table 1). However, populations began to increase in 1998, rising to a cumulative high of 69 males in 2006. Since 2006, the peak male counts have been dropping again, with a sharp decline observed between 2008 and 2010. It should be noted that leks were only monitored sporadically in 2000 and 2001, and according to the WGFDF database records, only the Irigaray lek was monitored in 2002.

Table 1. Peak male counts at greater sage-grouse leks in the Irigaray and Christensen Ranch survey area from 1989 through 2010.

Year	CR 1	CR 2	CR 3	CR 4	CR 5	CR 7	Irigaray	Irigaray II
1989	23	--	9	--	--	---	10	---
1990	16	--	4	--	--	---	6	---
1991	21	3	0	--	--	---	2	---
1992	13	6	0	--	--	---	6	---
1993	8	10	0	--	--	---	5	---
1994	4	3	0	--	--	---	5	---
1995	3	1	1	--	--	---	2	---
1996	7	0	0	--	--	---	1	---
1997	7	0	0	--	--	---	1	---
1998	10	0	0	7	--	---	5	---
1999	7	0	0	43	11	---	0	---
2000 ¹	---	---	---	22	10	---	---	---
2001 ¹	16	---	---	11	4	---	---	---
2002 ¹	---	---	---	---	---	---	0	---
2003 ¹	12	0	0	15	0	---	0	---
2004 ¹	12	0	0	14	0	---	0	---
2005 ¹	25	0	0	24	0	2	0	14
2006 ¹	28	2	0	23	5	0	1	10
2007	28	0	0	19	0	1	0	7
2008	19	0	0	17	1	0	10	12
2009	11	0	0	12	0	0	0	5
2010	6	0	0	17	0 ²	1	0	2

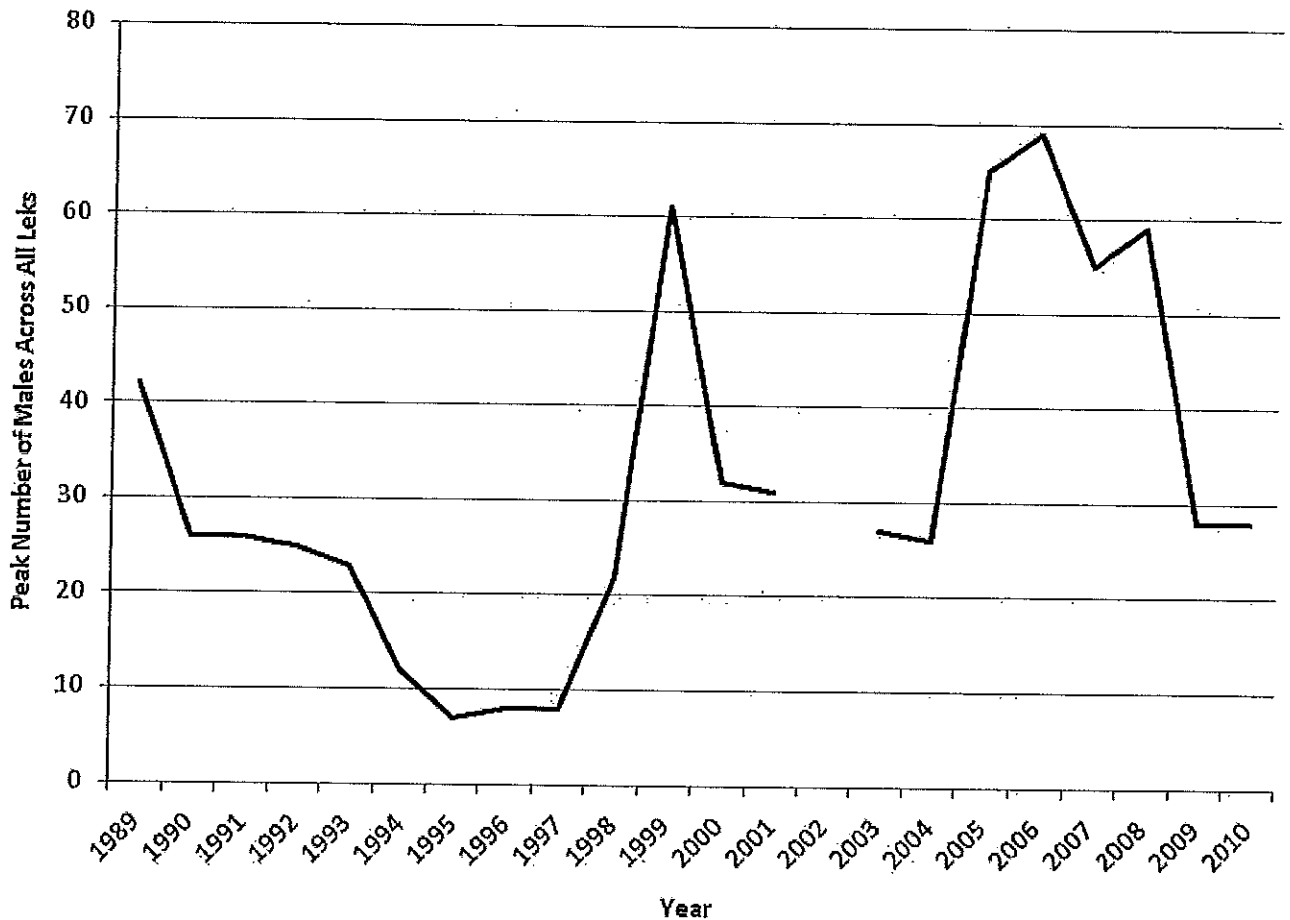
CR = Christensen Ranch

--- = Lek was not discovered or monitored in the given year.

¹ Peak male counts from the Wyoming Game and Fish Department database; not all leks were monitored in all years.

² Four males were observed at this lek by other individuals in 2010 (BLM 2010).

No other male sage-grouse were observed displaying outside of the active leks in 2010. However, one female with nine young was observed in NW SE Section 24, T44N:R77W on July 8. The birds were foraging in sagebrush near a gravel road. The observation was approximately 1.1 miles west of the active Christensen 1 lek site.



Ranch survey areas during spring surveys from 1989 through 2010¹.

¹Not all leks were monitored between 2000 and 2002.

Other Upland Game Birds

In addition to sightings of greater sage-grouse, wild turkeys (*Meleagris gallopavo*) and gray partridge (*Perdix perdix*) have been documented in the survey area in past years. However, neither of those species was documented in 2010.

Raptors

Wildlife surveys were not required or conducted for the Irigaray and Christensen Ranch permit areas from 2000 to 2006. However, biologists continued to monitor nesting raptors in portions of the survey area overlapping coal bed natural gas (CBNG) development during that period. Table 2 presents a compilation of survey results obtained specifically from the Irigaray and Christensen Ranch survey area as well as ICF and Bureau of Land Management (BLM) data (2010) related to CBNG development in the general area from 2006 through 2010. As a result of the aforementioned

modification (i.e., a uniform 1.0-mile perimeter) to the survey area boundary in 2009, several nests that were surveyed in previous years and beyond the 1.0-mile survey perimeter are not included in this report.

Compilation of all known datasets has yielded 130 known nest sites within the Irigaray and Christensen Ranch survey area (Map 1). Over time, several of those nests were destroyed by natural causes. Consequently, 87 of the 130 total nest records were confirmed intact at the end of the 2010 breeding season, while 42 nests were confirmed destroyed in that year or prior to 2010 spring surveys. Confirmed intact nests included:

- 20 red-tailed hawk (*Buteo jamaicensis*) nests,
- 9 ferruginous hawk (*Buteo regalis*) nests,
- 9 great horned owl (*Bubo virginianus*) nests,
- 4 golden eagle (*Aquila chrysaetos*) nests,
- 2 American kestrel (*Falco sparverious*) nests,
- 1 long-eared owl (*Asio otus*) nest,
- 1 prairie falcon (*Falco mexicanus*) nest,
- 34 unknown raptor species nests,
- 6 red-tailed hawk/great horned owl nests, and
- 1 unknown raptor/golden eagle nest.

Only three raptor nests (two red-tailed hawk nests and one golden eagle nest) within the Irigaray and Christensen Ranch survey area were active in 2010 (Table 2). One of those (RTH2c) was rebuilt in 2010 and was the only successful (i.e., fledged young) nest documented in the survey area that year. Two young fledged from that nest.

The two remaining nests both failed. Activity at nest RTH1d was first observed on May 9, when two red-tailed hawks were seen tending to the nest. On June 24, two young were observed in the nest, and both adults were exhibiting defensive behavior in the area. When the biologist visited the site again on July 8, no adults were observed in the area and a search around the nest tree revealed the remnants of the nest, along with the carcass of a single chick. On April 14, an adult golden eagle was observed incubating in nest GE9b; however, subsequent visits on June 1 and 16 revealed no golden eagles (adults or young) at or near the nest, indicating it had failed.

Over time, raptor productivity (total number of fledged young) has fluctuated from as few as 0 (2009) to at least 28 (1998) total fledged young throughout the survey area (Table 3). Productivity was relatively low from 1991 through 1996, but increased in subsequent survey years. Raptor production was the greatest in 1998, with relatively high fledgling counts in the following year (1999) and again in 2007. The high productivity in 1998 was primarily attributable to the enlargement of the survey area that year, though high prey populations (e.g., lagomorphs/hares and rabbits) throughout the region in from 1993 to 1996 and 2005 to 2007 (ICF, unpublished data) likely contributed to greater raptor production during those periods. However, lagomorph counts declined considerably in 2007, and continued to remain low from 2008 through 2010. Reduced lagomorph indices in those 4 years were primarily due to one factor. The extremely high density of lagomorphs in 2006 likely triggered an outbreak of tularemia, which was documented in Campbell

Table 2. Raptor nest locations, status, and productivity¹ in the Irigaray and Christensen Ranch survey area from 2006 through 2010.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
FH1a	CB	NW SW	34	45-77	A,2+,2	A,0+,0	A,2+,2	I	I
FH1b	CB	SE SW	34	45-77	---	I	I	I	I
FH2a	EP	NE NE	28	45-77	D-N in 1998	---	---	---	---
FH2b	ROC	SW SE	21	45-77	I	I	I	D-N	---
FH2c	SS	NE NE	28	45-77	U	U	U	I	D-N
FH2d	CB	NW SE	28	45-77	I	I	I	I	I
FH3a	G	SE SW	19	45-76	U	U	U	I	I
FH3b	CB	NE SW	19	45-76	U	U	U	D-N	---
FH4a	ROC	SW SE	11	44-77	---	I	I	I	D-N
FH4b	CB	NE NE	14	44-77	---	---	I	I	I
FH4c	CB	NE NE	14	44-77	---	---	I	I	I
FH6	W	NE NE	30	44-76	---	A-T	D-N	---	---
FH7a	ROC	SE NE	20	45-76	---	I	U	I	I
FH7b	ROC	SE NE	20	45-76	---	I	U	I	D-N
FH7c	ROC	NW SW	21	45-76	---	I	U	I	I
FH7d	CB	SE SE	20	45-76	---	I	I	I	D-N
FH8	CB	SE NE	2	44-77	---	---	I	I	I
Ferruginous Hawk Subtotals					1,2+,2	2,0+,0	1,2+2	0,0,0	0,0,0
GE1a	CB	NW SW	8	44-76	U	U	A,1+,0	I	I
GE1b	CLF	NW SW	8	44-76	I	A-T	ALT	I	D-N
GE1c	CLF	SW SW	8	44-76	A,2+,2	ALT	ALT	I	D-N
GE4a	CW	NE SW	27	44-76	U	U	I	D-N	---
GE4b	CW	NE SW	27	44-76	U	U	I	D-M	---
GE4c	CW	NW SE	27	44-76	A,1+,1	D-M	---	---	---
GE4d	CW	SW SE	27	44-76	U	U	D-N	---	---
GE5	CLF	NE SE	36	45-77	I	U	I	I	I
GE6a	CW	NE NE	23	45-77	A,2+,2	U	I	D-N	---
GE6b	CW	SW SW	24	45-77	D-N in 2005	---	---	---	---
GE7	CW	SE NE	26	45-77	I	U	I	D-N	---
GE8	POL	NW SW	10	44-76	A,1+,1	U	I	I	I

Table 2. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
GE9a	CW	NE NE	29	44-76	---	I	I	I	I
Golden Eagle Subtotals					4,6+,6	1,0,0	1,1+,0	0,0,0	0,0,0
GH02b	CW	NW NE	8	45-77	---	---	I	I	I
GH04b	ROC	SE NE	32	45-76	---	I	I	D-N	---
GH07a	CW	SE NE	9	45-77	A,?,?	U	I	D-N	---
GH08	CW	NW SE	22	45-77	A,1+,1	U	U	I	I
GH09b	CW	NW NW	27	45-77	---	A-T	U	D-N	---
GH09c	CW	NW NW	27	45-77	---	I	U	D-N	---
GH010a	BOX	NE NE	32	45-76	---	I	I	A,?,?	I
GH011	CW	SW NE	36	45-77	U	U	I	D-N	---
GH012a	CW	SE SE	8	44-76	A,1+,1	I	I	I	I
GH013	CW	NW NW	19	44-76	---	A,1+,1	A,?,?	I	I
GH014b	CW	SE SW	13	44-77	---	A,1+,1	I	I	I
GH015b	CW	SE SE	25	44-77	A,2+,2	I	I	I	I
GH016	CW	SW NE	30	44-76	A,3+,3	A,2+,2	I	I	I
GH017	CW	SW NE	6	45-77	---	---	---	I	I
Great Horned Owl Subtotals					5,7+,7	4,4+,4	1,?,?	1,?,?	0,0,0
RTH1a	CW	SE SE	5	45-77	D-N in 1996	---	---	---	---
RTH1c	CW	NW NW	9	45-77	ALT	U	U	I	D-N
RTH1d	CW	SW SW	4	45-77	A,?,?	U	I	I	A,2,0; D-N
RTH2b	CW	SE SE	21	44-76	U	U	I	D-N	---
RTH2c	CW	SE SE	21	44-76	A,2+,2	A,1+,1	I	D-N	Rebuilt; A,2,2
RTH3a	CW	SW NW	33	45-76	A,?,?	U	I	I	I
RTH3b	CW	SW NW	33	45-76	I	U	I	I	I
RTH4a	CW	SE SW	1	44-77	---	---	I	D-N	---
RTH4b	ROC	SW NW	1	44-77	A,1+,1	U	I	I	I
RTH4c	CW	SW SW	2	44-77	A,2+,2	U	I	I	I
RTH4d	CLF	SW NW	1	44-77	---	---	I	I	I
RTH5b	CW	NW SE	33	45-77	D-N in 1997	---	---	---	---

Table 2. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
RTH8a	CW	NE SE	21	45-77	D-N in 1995	---	---	---	---
RTH8b	CW	SW SE	21	45-77	---	---	U	I	D-N
RTH8d	CW	SW NW	21	45-77	A,?,?	A,?,?	I	I	I
RTH11	CW	NW NW	13	44-77	U	U	U	I	I
RTH12	CW	NW NW	35	45-76	U	U	U	I	I
RTH13b	CW	NW SE	25	44-77	---	A,2+,2	I	I	I
RTH13c	CW	NW SE	25	44-77	---	A-T	I	I	I
RTH14a	CW	SE NE	9	45-77	A,?,?	U	U	I	I
RTH18	CW	SW SW	18	44-76	---	A,3+,3	I	I	I
RTH20	CW	SW NE	30	44-76	I	A,2+,2	I	I	I
RTH21a	CW	NW SE	27	44-76	I	A,0,0	I	I	I
RTH21b	CW	NW SE	27	44-76	U	U	I	D-N	---
RTH22a	CW	SW NE	6	45-77	---	---	I	I	I
RTH22b	CW	SW NE	6	45-77	---	---	I	I	I
RTH23	CW	NE SE	17	45-77	---	---	U	I	I
RTH24	CW	NE SW	29	44-76	---	---	---	I	I
RTH25	CW	NE SE	28	45-76	---	---	I	I	I
RTH26	CW	SW SE	32	45-76	---	A-T	U	A,?,?	D-N
Red-tailed Hawk Subtotals					7,5+,5	8,8+,8	0,0,0	1,?,?	2,4,2
AMK1	CLF	SE NW	5	45-77	---	---	---	A-T	I
AMK2	ROC	SE SE	4	44-76	A,1+,?	I	I	I	I
American Kestrel Subtotals					1,1+,?	0,0,0	0,0,0	1,0,0	0,0,0
H1	G	NE NE	18	44-76	D-N in 1999	---	---	---	---
Northern Harrier Subtotals					0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
LEO1	CW	SE NW	19	45-76	A,?,?	U	I	I	I
Long-eared Owl Subtotals					1,?,?	0,0,0	0,0,0	0,0,0	0,0,0
PF1b	ROC	NW NW	14	44-76	ALT	A,2+,2	I	I	I
Prairie Falcon Subtotals					0,0,0	1,2+,2	0,0,0	0,0,0	0,0,0

Table 2. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
UNK1	CW	NE SW	16	45-77	U	U	I	I	D-N
UNK2	CW	NW SE	9	45-77	---	I	U	I	I
UNK3	CW	NE NE	15	45-77	I	U	I	I	I
UNK5	CW	NW SE	22	45-77	---	I	D-M	---	---
UNK6	CW	NE NE	23	45-77	I	U	I	D-N	---
UNK7	CW	NW NE	23	45-77	I	U	D-N	---	---
UNK8	CW	SE SE	24	45-77	I	U	I	I	I
UNK9	CW	NE SW	26	45-77	U	U	I	D-N	---
UNK10	CW	SE SW	25	45-77	U	U	I	I	I
UNK11	CW	SW SW	36	45-77	I	U	I	I	I
UNK14	CW	NE NE	1	44-77	---	I	I	I	I
UNK16	CW	SW NW	8	44-77	---	I	I	I	I
UNK17	WIL	NW NE	16	44-76	---	I	I	I	I
UNK18	PP	SE NW	10	44-76	I	I	I	I	I
UNK19	CLF	NW NE	15	44-76	---	I	I	I	I
UNK20	POL	NE NW	15	44-76	---	I	I	I	I
UNK21	CW	SW SW	33	46-77	---	I	I	I	I
UNK23	CW	NE NE	20	45-76	---	I	U	I	I
UNK24	CW	SW SE	20	45-76	---	A-T	U	I	I
UNK26	JU	SE SW	32	45-76	---	U	U	I	I
UNK27	JU	SE SW	32	45-76	---	A-T	U	I	I
UNK28	JU	SE SW	32	45-76	---	U	U	I	I
UNK29	CW	SE SE	17	45-76	U	U	ABBMA	I	I
UNK31	CW	SE SW	33	46-77	---	I	I	I	I
UNK32	CW	NE SE	27	44-76	I	U	I	I	I
UNK33	CW	NW SW	5	45-77	---	---	I	I	I
UNK34	CW	NW SW	5	45-77	---	---	---	I	I
UNK35	CW	NW SW	5	45-77	---	---	I	I	I
UNK36	CW	NE SW	5	45-77	---	---	I	I	I
UNK37	CW	NE SW	5	45-77	---	---	I	I	I
UNK38	CW	NE SW	5	45-77	---	---	I	I	I
UNK39	CW	NE SW	5	45-77	---	---	I	I	I
UNK40	CW	NE SW	5	45-77	---	---	I	I	I

Table 2. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>
UNK41	CW	NE NE	23	45-77	---	---	---	I	I
UNK42	JU	SE NE	2	44-77	---	---	I	I	I
UNK43	CW	SE NW	1	44-77	---	---	I	I	I
UNK44	CW	NW SW	6	44-76	---	---	---	I	I
UNK46	JU	NW NW	28	45-76	---	---	U	I	D-N
UNK47	CW	NE SE	36	45-77	---	---	---	---	I
UNK48	CLF	NE NE	14	44-77	---	---	---	---	I
Unknown Species Subtotals					0,0,0	2,0,0	0,0,0	0,0,0	0,0,0
RTH1b/GHO2	CW	NW NW	9	45-77	ALT	U	U	D-N	---
RTH2a/GHO3	CW	SW SE	21	44-76	U	U	I	D-N	---
RTH8c/GHO5	CW	SE NE	21	45-77	A,2+,2 ^{GHO}	ALT	I	I	I
RTH10a/GHO4a	CW	SE SW	16	44-76	A,3+,3 ^{RTH}	A,?,? ^{GHO}	I	I	I
RTH10b/GHO4b	CW	NW NE	21	44-76	A,?,? ^{GHO}	A,?,? ^{GHO}	I	I	I
RTH13a/GHO15a	CW	NW SE	25	44-77	A,2+,2 ^{RTH}	A,2+,2 ^{GHO}	I	I	I
RTH16a/GHO9a	CW	SW NW	27	45-77	A,3+,2 ^{RTH}	A,?,? ^{GHO}	A,1+,1 ^{GHO}	I	I
RTH17/GHO12b	CW	SW NW	9	44-76	A,2+,2 ^{RTH}	A,2+,2 ^{GHO}	A,?,? ^{RTH}	A,?,? ^{RTH}	I
RTH19/GHO14a	CW	SE SW	13	44-77	A,2+,2 ^{GHO}	I	D-N	---	---
GE11/RTH27	CW	NE NW	20	45-76	---	A,1+,0 ^{GE}	I	A,?,? ^{RTH}	D-N
UNK45/GE9t	CW	NW NW	20	44-76	---	---	I	I	A,0,0 ^{GE}
Multiple Species Subtotals					7,14+,13	6,5+,4	2,1+,1	2,?,?	1,0,0
Grand Totals					26,35+,33	26,19+,18	6,4+,3	5,?,?	3,4,2

¹ Data for 2006 primarily derived from BLM datasets, which do not always include status and productivity. Surveys were not specifically conducted for the Irigaray and Christensen Ranch properties during that year.

X,#,# = Status, number of young hatched, number of young fledged.

? = Unknown number of young hatched or fledged.

#+ = Minimum estimate of number of young fledged.

Species Codes

AMK = American kestrel
 BBMA = Black-billed magpie
 FH = Ferruginous hawk
 GE = Golden eagle
 GHO = Great horned owl
 H = Northern harrier
 LEO = Long-eared owl
 PF = Prairie falcon
 RTH = Red-tailed hawk
 UNK = Unknown species

Nest Substrate Codes

BOX = Boxelder
 CB = Creek bank
 CLF = Cliff
 CW = Cottonwood
 EP = Earth pillar
 G = Ground
 JU = Juniper
 POL = Power pole
 PP = Ponderosa pine
 ROC = Rock
 SS = Sandstone pillar
 WIL = Willow
 W = Windmill

Nest Status Codes

A = Active
 ALT = Alternate nest
 A-T = Active-tended/no eggs laid
 D-N = Destroyed, natural causes
 D-M = Destroyed, manmade causes
 I = Inactive
 U = Unknown
 --- = Undiscovered or nonexistent

Table 3. Annual productivity for nesting raptors in the Irigaray and Christensen Ranch survey area during surveys conducted for those properties from 1991 through 1999 and 2007 through 2010.

Year	Number of young fledged/species					Total
	RTH	GE	GHO	FH	PF	
1991	---	1+	?	---	---	1+
1992	---	3+	0	---	---	3+
1993	---	0	0	---	---	0
1994	---	1+	?	---	---	1+
1995	---	1	0	---	---	1
1996	4	4	0	0	---	8
1997	7+	3	2+	0	---	12+
1998 ¹	17+	4	4	3+	---	28+
1999	11	6	2	2	---	21
2000 to 2006: No surveys conducted						
2007	8+	0	8+	0	2	18+
2008	?	0	1+	2+	---	3+
2009*	?	---	?	---	---	?
2010*	2+	0	---	---	---	2+
Annual Means ²	8.1	1.9	1.9	1.2	2.0	8.2

+ Indicates minimum estimate.

? Indicates nesting status unknown.

--- Indicates that the species was not known to nest in area.

¹ Survey area was increased by 40 mi² in 1998.

² Means calculated within species by dividing total minimum number fledged by the number of years (not including unknown productivity years) the species nested within survey area.

* Productivity numbers likely influenced by limited access to some nests during key productivity times.

Species Codes

FH = Ferruginous hawk

GHO = Great horned owl

PF = Prairie Falcon

GE = Golden eagle

RTH = Red-tailed hawk

County the following year. That disease has been known to contribute to the cyclic nature of lagomorph populations in the region, and possibly impacted the population through 2010 as well.

Consequently, raptor productivity was extremely low in 2009 and 2010, though limited access to portions of the survey area associated with sheep ranching (northwest extents of the Irigaray permit and survey areas) during the key nesting period (May - July) may have been a contributing factor in both years.

As mentioned above, fluctuations in raptor nesting attempts and success rates are often linked to variations in prey availability. Large raptor species such as golden eagles, ferruginous hawks, red-

tailed hawks, and great horned owls prey predominantly on lagomorphs (hares and rabbits). Lagomorph surveys are not required for in situ uranium operations in Wyoming. However, surveys for lagomorphs in other parts of the Powder River Basin indicate that populations were severely reduced from 1993 through 1996 and fall 2007 through 2010 (ICF, unpublished data).

Red-tailed hawks are common nesters in the survey area, and were more abundant than other raptor species in most survey years (Table 3). Although the number of nesting pairs of red-tailed hawks within the overall survey area has fluctuated in recent years, at least one pair successfully nested in 6 of the 13 years that surveys were conducted (1991 through 1999 and 2007 through 2010). At the end of the 2010 breeding season, 26 intact red-tailed hawk nests were recorded (six were multi-species nests) within the survey area. Two of those were confirmed active nests with at least two young fledged throughout the survey area.

Golden eagles have also regularly nested in the Irigaray and Christensen Ranch survey area. From 1991 through 1997, four known territories were present within or immediately adjacent to the Irigaray and Christensen Ranch survey area. By 2007, nine golden eagle territories had been recorded within the overall survey area. At least one pair of golden eagles fledged young during 8 of the 13 years surveys were conducted 1991 through 1999 and 2007 through 2010). However, no successful golden eagle nests have been documented in the past 4 years. In 2010, five intact golden eagle nests were recorded within the survey area. Only one nest (GE9b) was active, but the pair failed to produce any young.

One golden eagle pair (GE1a-c, Map 1) nests near the Christensen Ranch facilities and has been monitored with some regularity since 1987. Over the years, the pair has had a history of failed nesting attempts due to their repeated use of a friable cliff bank along Willow Creek as a nest site. From 1987 through 1995, three separate nesting attempts were unsuccessful due to structural failures in the cliff wall either above or below the occupied nest. Chicks perished during two of the incidents, and eggs were destroyed during the third. In 1996, the pair again built a nest on the cliff bank; the nest remained intact and one eaglet fledged. Young also fledged from that nest in two of the subsequent 3 years. In more recent years, the pair was successful in fledging two young in 2006, but only tended an alternate nest in the territory the next year and did not lay eggs. In 2008, the cliff nest site used by the pair once again failed, and no activity has been recorded in the territory since then (i.e., 2009 through 2010).

Multiple ferruginous hawk territories were first identified in the survey area in 1996. A single adult ferruginous hawk was observed bringing sticks to the FH1a nest (Map 1) in both 1996 and 1997, but no eggs or young were seen in either year. In the following 2 years (1998 and 1999) the FH1 pair nested and fledged a total of five young. In more recent years, the FH1 pair successfully nested in 2006 and 2008, and attempted to nest but failed to fledge any young in 2007 (Table 2). Although nine intact ferruginous hawk nests were recorded within the survey area in 2010, no confirmed active ferruginous hawk nests have been documented in the last 2 years (2009 through 2010).

Great horned owls were found nesting in the area in 1991 and 1994, but their productivity during those years was not determined. No active nests were located in 1995 or 1996, although adult owls were observed roosting during each of those years. From 1997 through 1999 and again in 2007 through 2009, great horned owls were recorded actively nesting each year. In 2010, 15 intact great horned owl nests were confirmed (six were multi-species nests) within the survey area, but none were active.

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