Mexican Spotted Owl Monitoring and Inventory from 2001-2005 in the Lincoln National Forest, New Mexico

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Table of Contents

List of Tables

List of Figures

List of Appendices

Executive Summary

Land management practices, including timber management and fire suppression, have led to a loss of suitable habitat for the Spotted Owl. Although many studies have been conducted concerning Spotted Owl ecology and demography, few have examined the effects of wildfire on this species. The United States Department of Interior-Fish and Wildlife Service (1993) listed the Mexican Spotted Owl (*Strix occidentalis lucida*) as a threatened species in 1993.

In May 2000, the Scott Able wildfire burned nearly 6,500 hectares (16,000 acres) of the Lincoln National Forest in New Mexico, including parts of Mexican Spotted Owl nesting areas. In 2001, the Lincoln National Forest contracted Hawks Aloft, Inc. to annually monitor nine of these sites for Mexican Spotted Owl activity in the burned area and a surrounding buffer zone. Our study began in 2002 and continued through July 2005. Hawks Aloft, Inc. was also contracted to conduct a complete inventory of the burned area and buffer zone in 2005. The inventory study is designed to locate previously undocumented owls in the burned area and buffer, excluding the nine nesting sites. Over the course of the study Hawks Aloft, Inc., found Mexican Spotted Owls in 8 of 9 survey sites. Although owls were rarely observed in burned areas, we often found them in unburned areas adjacent to burned habitat. Based on our results, it appears that the fire shifted Spotted Owl territories; however, our observations indicate that some owls are using burned areas for nocturnal foraging, while breeding in adjacent unburned habitat. The results of this study will assist the United States Forest Service determine where

Mexican Spotted Owl territories have moved as a result of the Scott Able Fire and if new boundaries need to be established for these territories.

Introduction

The Mexican Spotted Owl (*Strix occidentalis lucida*) was listed as threatened in 1993, primarily due to habitat alteration (e.g., timber harvest) and secondarily, to an increasing threat of catastrophic wildfires (USDI 1993, 1995). The Lincoln National Forest, in south-central New Mexico provides habitat for Mexican Spotted Owls. Spotted Owls prefer cool, moist, mixed conifer forests dominated by Douglas fir *(Pseudotsuga menziesii)*, white fir *(Abies concolor)*, and pine-oak (*Pinus* spp. – *Quercus* spp.) woodlands (Ganey and Balda 1989a, Seamans and Gutiérrez 1995, USDI 1995).

In May 2000, the Scott Able fire burned approximately 6,500 ha (16,000 acres) of Spotted Owl habitat in the Lincoln National Forest. This fire varied topographically in intensity, but approximately half of the burn area was severely burned (The Mangi Environmental Group 2000). The Scott Able fire occurred in areas where Mexican Spotted Owls were previously documented. Lincoln National Forest-Sacramento Ranger District biologists have monitored Mexican Spotted Owl activity in the Lincoln National Forest since the late 1980's. Because the Scott Able Fire burned portions of previously known Spotted Owl territories, the Lincoln National Forest wanted to know the effects of the fire on Spotted Owl activity.

Hawks Aloft, Inc. was contracted in 2001, to determine the persistence of owls and reproductive success in areas where owls were documented prior to the fire from 2002 to 2005. Our study answered the following questions:

1. Where are Mexican Spotted Owls located in the fire area?
2. How many of the nine sites are occupied?
3. Are they nesting?
4. How many young fledge from active nests?
5. Where are nests and roost sites located?

Answers to these questions will assist Lincoln National Forest biologists determine the effects of the Scott Able fire, including if Mexican Spotted Owls have established new territories and where they are located. Here, we report the 2001 and 2005 inventory results, and 2001-2005 monitoring results. The United States Forest Service (USFS) conducted all surveys in 2001. Distribution and reproductive success of Mexican Spotted Owls in burned areas of the Lincoln National Forest will contribute information on how this species might respond to wildfire elsewhere.

Study Area

We conducted the study in the Sacramento Ranger District of the Lincoln National Forest near Cloudcroft in Otero County, New Mexico (Fig.1). The study area consists of unburned and severely burned habitat. The major forest types within unburned habitat of the study area include mixed conifer forest dominated by Douglas fir, white fir, ponderosa pine (*Pinus ponderosa*), and pinyon-juniper (*Pinus edulis-Juniperus* spp.) woodlands. Gambel oak *(Quercus gambelii)* and Rocky Mountain maple *(Acer glabrum)*

constitute the major understory components (Dick-Peddie 1993). Mixed conifer habitat is mostly found on north-facing slopes, whereas ponderosa pine forests dominate south-facing slopes. The understory is more developed in mixed conifer forests and consists primarily of Gambel oak. The severely burned habitat consists of areas with very few trees. Scatterings of mixed conifers can be found in drainages, while snags and a few green trees cover the slopes. The new growth in these areas primarily consists of New Mexico locust (*Robinia neomexicana*) and a variety of other herbaceous plants.

Hawks Aloft, Inc. attempted to locate owls at nine Protected Activity Centers (PACs) that were historically occupied prior to the Scott Able fire. These include Crisp, Hidden, Hughes, Pepper, Potato, Pendleton, Spring, Wayland, and Woods. A PAC is an approximately 250-ha habitat patch drawn by a regional biologist. PACs were designated to incorporate known owl locations as well as include the best nesting and roosting habitat in the area. All PACs monitored by Hawks Aloft, Inc. were within a study area consisting of the burned area and an 805-m (half-mile) buffer zone surrounding the burned area (Fig. 1). The PACs are primarily burned or unburned. The PACs within the burned portion of the survey area (i.e. Pendleton, Pepper, and Wayland) are almost completely burned. Crisp, Hughes, and Spring are mostly unburned, with only a small portion of their boundaries inside the burned area. Potato and Woods were moderately burned, but a large portion of these PACs remain intact. Hidden does not have any burned habitat and lies completely outside the fire boundary, but within the buffer zone.

The inventory study area is the same as the PAC monitoring area, but includes additional portions of the burned area and buffer zone. The inventory study is designed to detect

previously undetected Mexican Spotted Owls outside of the known PACs. The inventory study area was divided into two parts, separated by Agua Chiquita Road 64 (Fig. 1). This road divides the study area in half, north to south. The two study areas were named Inventory Area-Scott Able East and Inventory Area-Scott Able West for this report and data sheets.

Methods

Protected Activity Center

We conducted all Spotted Owl surveys according to United States Forest Service Region 3, Spotted Owl Protocol. We conducted surveys during both day and night. We conducted some "pre-visits," which were day or night visits conducted at a site prior to official night surveys. These visits were generally used to explore historically known Spotted Owl locations, such as roost or nest tree areas. Night surveys were conducted between sunset and sunrise. Night surveys consisted of visits to three or four call points previously determined by the USFS in each PAC. As many as six night visits were made to each PAC. We discontinued night visits when a pair was confirmed or after the sixth visit. As required by protocol, we vocally imitated the Spotted Owl's four-note location call (Forsman et al. 1984) for 10 minutes at each PAC point. Spotted Owl locations were determined using an estimation of distance and one or more compass bearings. We plotted all locations on USGS 7.5-minute quadrangle maps.

Daytime follow-up visits were conducted between 30 minutes before sunrise and 30 minutes after sunset and encompassed a half-mile radius search area centered around

Spotted Owl responses from night surveys. Search areas and owl responses were recorded on USGS 7.5-minute quadrangle maps. All follow-up visits were completed within 48 hours of night visit detections and were at least four person-hours long (one person hour equals one person searching for one hour). Spotted Owls located during the daytime were offered live mice to facilitate the detection of mates, determine pair and breeding status, and nest success. Reproductive Spotted Owls often brought the mice directly to their mate or young. Conversely, Spotted Owls that ate or cached five mice during a single visit were considered non-reproductive. Daytime visits were necessary to confirm Spotted Owl presence.

Adult Mexican Spotted Owl taking live mouse.

We conducted reproductive visits during daytime hours to determine the reproductive success of confirmed pairs. We considered a pair confirmed if we recorded a male and a female aurally or visually within 183 m (200 yards) of each other, or young were found. A pair was considered non-reproductive if the following were observed: a pair was found during one visit but not relocated on two consecutive reproductive visits, a pair was found, but no young were observed on four reproductive visits, or a pair was found but one owl ate four mice or ate and cached five mice. A pair was considered reproductive if young were found. We defined absence as no owl detections in six visits on PACs or four inventory visits. A total of four reproductive visits are required until pair and breeding status are determined. When a pair was confirmed within a PAC, the points of that PAC were excluded from night visits.

From 2003 to 2005, we recorded all other detected raptors while conducting both the Spotted Owl monitoring and inventory surveys. We used Garmin Global Positioning System receivers to document the locations of Spotted Owl nest and roost trees. These data were recorded as Universal Transverse Mercator (UTM) coordinates in North American Datum 27. Monitoring data were recorded on the Rio Peñasco Mexican Spotted Owl Survey Form provided by Rocky Mountain Research Station (Appendix 1). Nest trees were tagged with wildlife and silver metal tags provided by the USFS and flagged with red and white flagging. We present 2005 PAC detection data on Figure 2, Figure 4, Appendix 4, and Appendix 6 (1-40).

Inventory Survey

The monitoring and inventory protocols are slightly different and those differences are outlined below. Approximately 100 inventory points were established in the study area, excluding burned areas, private land, and most areas within the PACs. These call points, established by Rene Guaderrama and Danney Salas USFS biologists, were located 805m (.5 mile) apart, in areas with green trees. Each point was visited for four night time surveys. We visited approximately 20 call points a night. We utilized point and route survey methods to complete these surveys. The point survey method is conducted by standing at a point and vocally imitating the Spotted Owl call (Forsman et al. 1984) for 15 minutes. The route method was used when many points were on a road, in a drainage, or on a ridge top. This method was conducted by continuously alternating between calling and listening, while walking the whole length of the road, drainage, or ridge top. Two minutes were spent at the beginning and end of the route calling and listening. When a pair was confirmed in the study area, PAC and inventory points within an 1125m (.7 mile) radius were dropped from night time surveys. The inventory data were recorded on the USFS Mexican Spotted Owl Inventory Form (Appendix 2). We used the Rio Peñasco Mexican Spotted Owl Survey Form (mentioned above) to record our inventory daytime follow-up and reproductive visit data (Appendix 1). We present 2005 inventory detection data on Figure 3, Figure 5, Appendix 5, and Appendix 6 (41-155).

Results

Protected Activity Centers from 2001-2005

Mexican Spotted Owls were located on 8 of 9 PACs over the course of this study (Appendix 3). The number of owls detected annually from 2001-2005 have been similar, ranging from 10 to 14 owls (Table 1). The number of pairs found from 2001-2005 was also similar and ranged from 3-6 pairs; however, active nests and young were found only during 2003-2005. We found active pairs in PACs that were both severely burned and those that were not (Fig. 1, Appendix 4). Some PAC pairs were located in the same general location from year to year.

Table 1. Spotted Owl Monitoring Results summary from 2001 to 2005 for the nine PACs surveyed in the Lincoln National Forest, New Mexico.

Year	# Owls	Pair	Nest	# Young
2001	12	4	0	0
2002	10	3	0	0
2003	14	5	3	7
2004	14	6	3	5
2005	13	6	2	5

Crisp #56. A pair was found in the Crisp PAC every year of the study, and nesting occurred in 2003 and 2004. A pair was found in the same general area each year from 2002 -2005. This pair was banded prior to the 2003 field season, and a new female was found with the banded male in 2005. This PAC lies almost completely outside the fire area, and there was no damage to the existing habitat.

Hidden #53. The Hidden PAC was occupied by a pair in 2001, 2003, and 2004 and a single individual in 2002 and 2005. A pair nested only in 2004, but the nest did not fledge any young. The habitat of the Hidden PAC was not affected by the fire.

Hughes #35. No pairs were found in the Hughes PAC over the course of this study; however, individuals were located in 2001, 2002, and 2004. Little of the Hughes PAC was burned by the Scott Able fire. A pair has not been located on this PAC since 1992. The habitat within this PAC remains primarily undamaged by the fire.

Pendleton #60. Mexican Spotted Owls have not been detected during any year of the study at the Pendleton PAC. The Pendleton PAC was completely burned and no Spotted Owl habitat remains within the PAC boundary.

Pepper #98. The Pepper PAC was occupied with one individual in 2001, and a pair in 2002. From 2003-2005, two pairs were detected in or near the Pepper PAC and were located in approximately the same location during these years. Much of the Pepper PAC was burned, leaving little to no remaining suitable habitat. Mexican Spotted Owls were regularly found during night visits in the severely burned areas of the Pepper PAC.

Potato #11. The Potato PAC was occupied by a pair from 2003-2005. The pair nested successfully only in 2003. In 2003 and 2004, a pair was located in the same drainage west of the PAC boundary. The Potato PAC was redrawn before the 2005 field season to include the new pair location, and is divided into two sections by private land (Fig.1). In 2005, a pair was located in a new area near Wehinahpay Boy Scout Camp on the northern edge of the PAC boundary, but no evidence of nesting was observed. This location was

exposed to disturbance from timber harvesting and human activity. Approximately one third of this PAC was severely burned. Owls have been found in the remaining unburned habitat.

Spring #31. The Spring PAC was occupied by individual Mexican Spotted Owls in 2001, and 2002, and a pair was found in 2005. The Spring PAC was not occupied in 2003 and 2004. In 2005, we located two Northern Goshawks (*Accipiter gentillis*) near the location of the Mexican Spotted Owl pair originally found during our first reproductive visit. These owls were not found during any subsequent reproductive visit. Because Northern Goshawks are a predator of Mexican Spotted Owls, we believe the pair of owls abandoned this location. The Scott Able Fire did not extend very far into the Spring PAC, leaving almost the entire PAC unburned.

Wayland #55. The Wayland PAC has been occupied by a pair during four of the five study years. The pair nested in the same general location in 2004 and 2005. Only a few drainages in the Wayland PAC remain unburned. The pair nested in one of these unburned drainages which was surrounded by burned habitat in both years.

Woods #107. Individual Mexican Spotted Owls were found in 2003 and 2004, although none were observed in 2005 during monitoring visits. Pairs had been located in the Woods PAC in 2001 and 2002. These birds apparently did not nest in either of these years. The Woods PAC contains a large portion of burned habitat; however, more then half the PAC remained unburned. All Mexican Spotted Owl observations occurred in this remaining unburned habitat.

2001 and 2005 Inventory Study

A similar number of Mexican Spotted Owls were found in both the 2001 and 2005 inventories. In 2001, the USFS detected 20 individual Spotted Owls. No owls were detected during daytime follow-ups except for one Spotted Owl in the Scott Able West area that was heard, but was on private land. This owl was not visually located. No pairs were confirmed during the 2001 inventory. During the Hawks Aloft, Inc. inventory in 2005, 18 different Spotted Owls were detected on both the Scott Able East and West survey areas. We did confirm one new nesting pair in Hoosier Canyon in the Scott Able East study area. No other Spotted Owls were detected during daytime follow-ups.

Additional Raptor Species Detections

From 2003 to 2005 Hawks Aloft, Inc. recorded additional raptor species (nocturnal and diurnal) detected during Mexican Spotted Owl surveys. These raptor detections occurred throughout the study area, both within the fire boundary and the half mile buffer zone. Additional raptors detected include Flammulated Owl (*Otus flammeous*), Great Horned Owl (*Bubo virginianus*), Northern Goshawk (*Accipiter gentilis*), Northern Pygmy-Owl (*Glaucidium gnoma*), Northern Saw-Whet Owl (*Aegolius acadicus*), Red-tailed Hawk (*Buteo jamaicensis*), Sharp-shinned Hawk (*Accipiter striatus*), Short-eared Owl (*Asio flammeus*), and Western Screech Owl (*Otus kennicottii*). More research is needed to better document the effects of the Scott Able fire on these species, as the impact is unclear from our observations.

During 2003-2005, Flammulated Owls were detected most commonly. In 2005, 60% of all additional raptor detections during monitoring and inventory surveys were Flammulated Owls (Appendix 6, Figure 4 and 5). Because our observations occurred mostly at night, we were unable to determine if individuals were using burned or unburned habitat within the fire boundary.

Discussion

There is little information on the effects of fire on Spotted Owls. Bond et al. (2002) found no effect of fire on survival, site or mate fidelity, or reproductive success one year after a fire. Jenness (2000) found that the effects of fire on Spotted Owl presence or reproduction were negligible. Both of these studies examined the effects of low to moderate severity fires (< 55% area burned), and indicate that low to moderate severity fires may be beneficial to Spotted Owls because they reduce fuel loads and thin dense stands that are conducive to high severity, stand-replacing fires. Low to moderate severity fires also reduce ground cover, create canopy gaps, and more complex forest structure, thereby enhancing habitat and potentially increasing prey availability (USDI 1995, Jenness 2000, Bond et al. 2002). High intensity fires that burn through the tree canopy might negatively affect Spotted Owls by destroying nest stands and reducing available habitat. However, little is known about the effects of high intensity or stand-replacing fires. Because most of the nine PACs were occupied by Spotted Owls, we suggest the fire probably did not greatly depress population size, although some displacement occurred.

Since the Scott Able fire in 2000, the USFS and Hawks Aloft, Inc. have located Mexican Spotted Owls within the fire boundary. Areas in which Spotted Owls were located were generally consistent with previously described suitable owl habitat (Ganey and Balda 1989a, 1989b, Ganey and Dick 1995, Seamans and Gutiérrez 1995, May and Gutiérrez 2002). Nests and roosts are most commonly found in mixed conifer habitat, usually in Douglas firs, with mature trees or residual large trees (Ganey and Dick 1995, Seamans and Gutiérrez 1995, May and Gutiérrez 2002). This is consistent with the nests and roosts we located. All of the Scott Able study area pairs were found in mixed conifer habitat, dominated by a Douglas fir overstory; however, some of these nest sites were located in PACs that had been severely burned, including Pepper, Potato, and Wayland. Over the course of the study, we found that Spotted Owls from Pepper and Wayland were using the burned areas of their PACs at night. We suggest that Spotted Owls in our study area have moved away from some severely burned PACs for nesting and roosting, but use burned areas for foraging.

From 2001 to 2005, the number of Spotted Owls detected each year was similar. Due to strict protocol requirements for Spotted Owl monitoring, search effort among years is similar. Hawks Aloft, Inc. has employed at least one returning biologist in every year since 2003. Due to site familiarity, this has resulted in finding some pairs at a faster rate. While some pairs may have been found during the first few visits, others did take longer to locate, resulting in a balanced search effort over the course of the study. Reproductive numbers were consistent, but productivity increased beginning in 2003. There are two possible reasons for this: 1) Owls did not nest in 2001 and 2002 and 2) the experienced

crew located more nests in 2003 to 2005. Both of these reasons may have occurred. Spotted Owls typically do not nest every year (Gutierrez et al. 1995) and although effort was consistent, experience personnel allowed us to locate pairs faster giving more time to search for nests and young.

The 2001 inventory resulted in numerous individual Spotted Owl detections; however, no pairs were confirmed. The 2005 inventory survey conducted by Hawks Aloft, Inc. resulted in one previously undocumented confirmed pair that nested successfully and fledged two young. This new inventory pair could possibly be the birds that previously inhabited either the Pendleton or Hughes PACs before the fire. The Pendleton PAC has not been occupied by Spotted Owls throughout the course of the study. Because this PAC is almost completely burned, Spotted Owls most likely moved to unburned habitat. The habitat of the Hughes PAC remains primarily undamaged by the fire; however, this PAC has had no pair activity over the course of this study. It is unknown why a pair has not occupied this PAC.

We had difficulty over the course of this study determining the number of owls and tracking movements of Spotted Owls. The Hidden and Spring PAC birds were sometimes detected in close proximity, and assumptions were made to determine which birds belonged to which PAC. In 2003, we located two pairs utilizing the Pepper PAC. It is unclear if a new pair moved into the area or if one of the pairs belonged to another PAC in the study area. This could have been simplified if all Spotted Owls were banded prior to our work. Mexican Spotted Owls are highly mobile and occupy home ranges averaging 742 ha for individuals in New Mexico (Zwank et al. 1994), and 648 ha for

individuals in Arizona (Ganey and Balda 1989a), approximately three times the size of the average PAC. Because owls are highly mobile, were unbanded during this study, and there were multiple pairs per PAC, as well as pairs located beyond PAC boundaries, it was difficult to determine which individuals occupied different PACs.

Of the additional raptors detected, Flammulated Owls, Northern Pygmy-Owls, Northern Saw-Whet Owls, and Western Screech Owls are cavity nesters that may have benefited from the fire. The Scott Able fire probably created new nesting habitat by increasing the number of snags, which provide cavities for nesting. We observed that some snags were broken at the top, and many large branches had fallen off, creating many cavities throughout the burned areas. Also, prey species requiring open habitat, seed-eating species, and early successional species (such as the deer mouse) often increase after a fire, while species requiring closed canopies often decline (Ward and Block 1995). Additional study is needed to document the effects of the fire on these species.

Recommendations

1. We recommend that monitoring efforts continue. Because these PACs are part of a large-scale monitoring effort to document Mexican Spotted Owl populations, yearly surveys should be conducted. Long-term data sets provide an opportunity to look at different trends within a population. The long term effects of the Scott Able Fire are still not known as the forest continues to mature.
2. We suggest that PACs be redrawn, because a large portion of habitat has been lost or altered in the Scott Able fire, and many of the PACs no longer include the most

suitable habitat in the area. In some cases, less than 10% of the original PAC area remains unburned.

3. A new PAC boundary should be established for the newly confirmed nesting pair in Hoosier Canyon.
4. Areas where individual Spotted Owls were repeatedly located in 2001 and 2005, but not associated with PACs, should be explored further to confirm pair occupancy and nesting status of these birds. These individuals may be part of a previously undocumented pair.

Acknowledgements

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Figure 1. Scott Able fire, PAC boundaries and Inventory points on USGS 7.5' quadrangle. This section includes portions from Bluff Springs, Rogers Ruins, Bear Spring and Sacramento quads in the Lincoln National Forest, New Mexico.

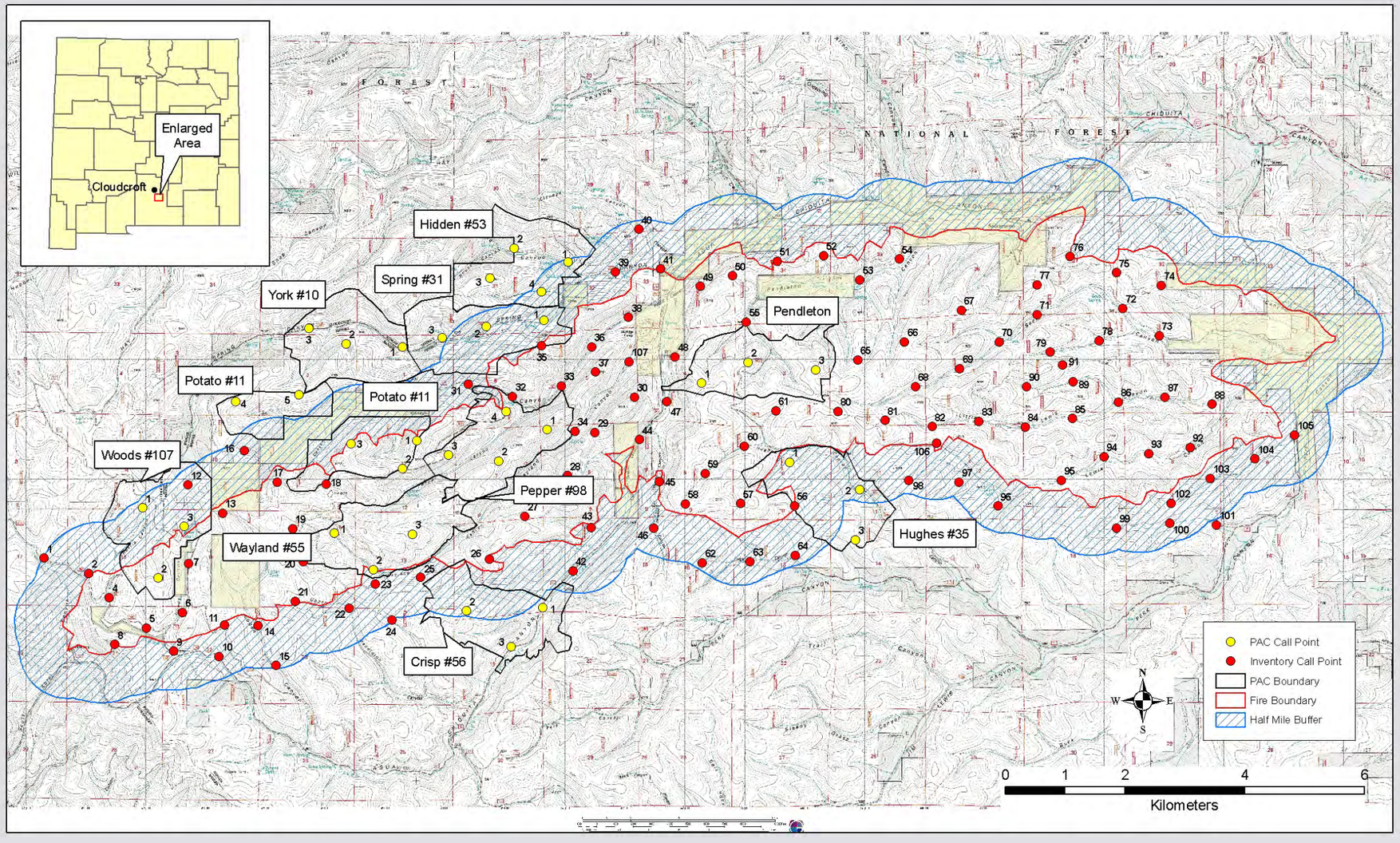


Figure 2. 2005 Spotted Owl Detections on all PACs on USGS 7.5' quadrangle. This section includes portions from Bluff Springs, Rogers Ruins, Bear Spring and Sacramento quads in the Lincoln National Forest, New Mexico.

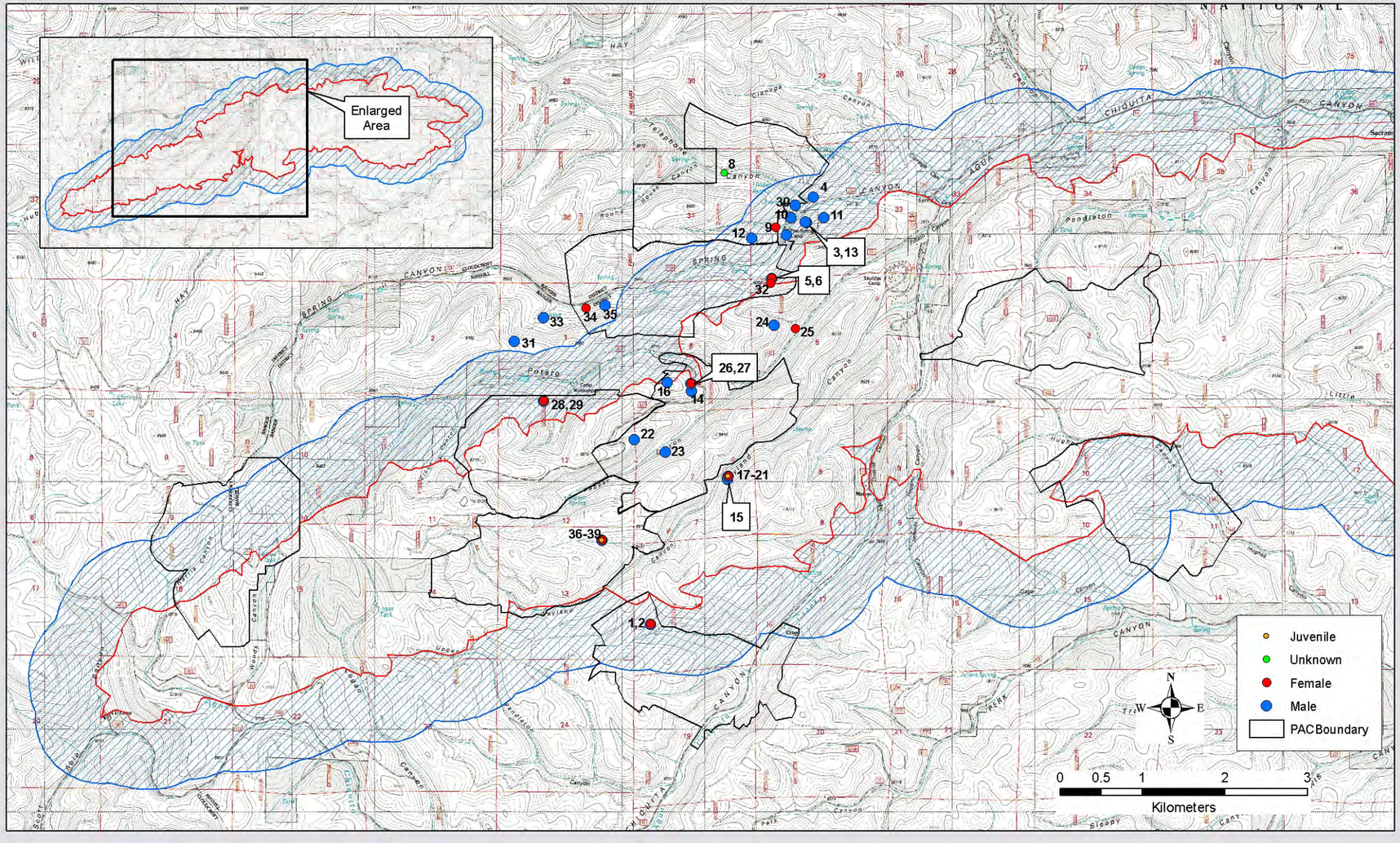


Figure 3. 2005 Spotted Owl Detections in the Inventory Study Area (excluding detections on all PACs) on USGS 7.5' quadrangle. This section includes portions from Bluff Springs, Rogers Ruins, Bear Spring and Sacramento quads in the Lincoln National Forest, New Mexico.

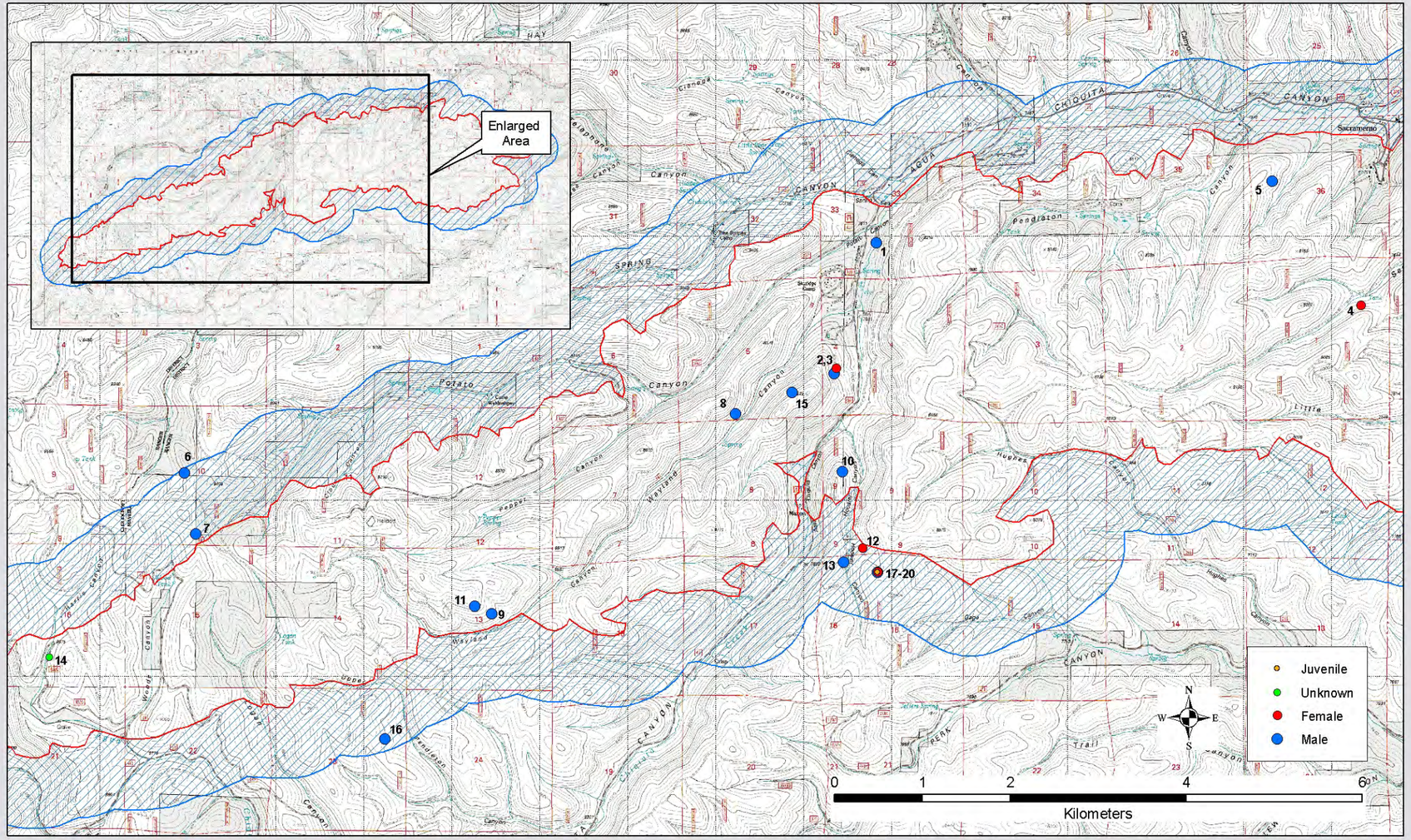


Figure 4. 2005 Additional Raptor Species Detections on all PACs on USGS 7.5' quadrangle. This section includes portions from Bluff Springs, Rogers Ruins, Bear Spring and Sacramento quads in the Lincoln National Forest, New Mexico.

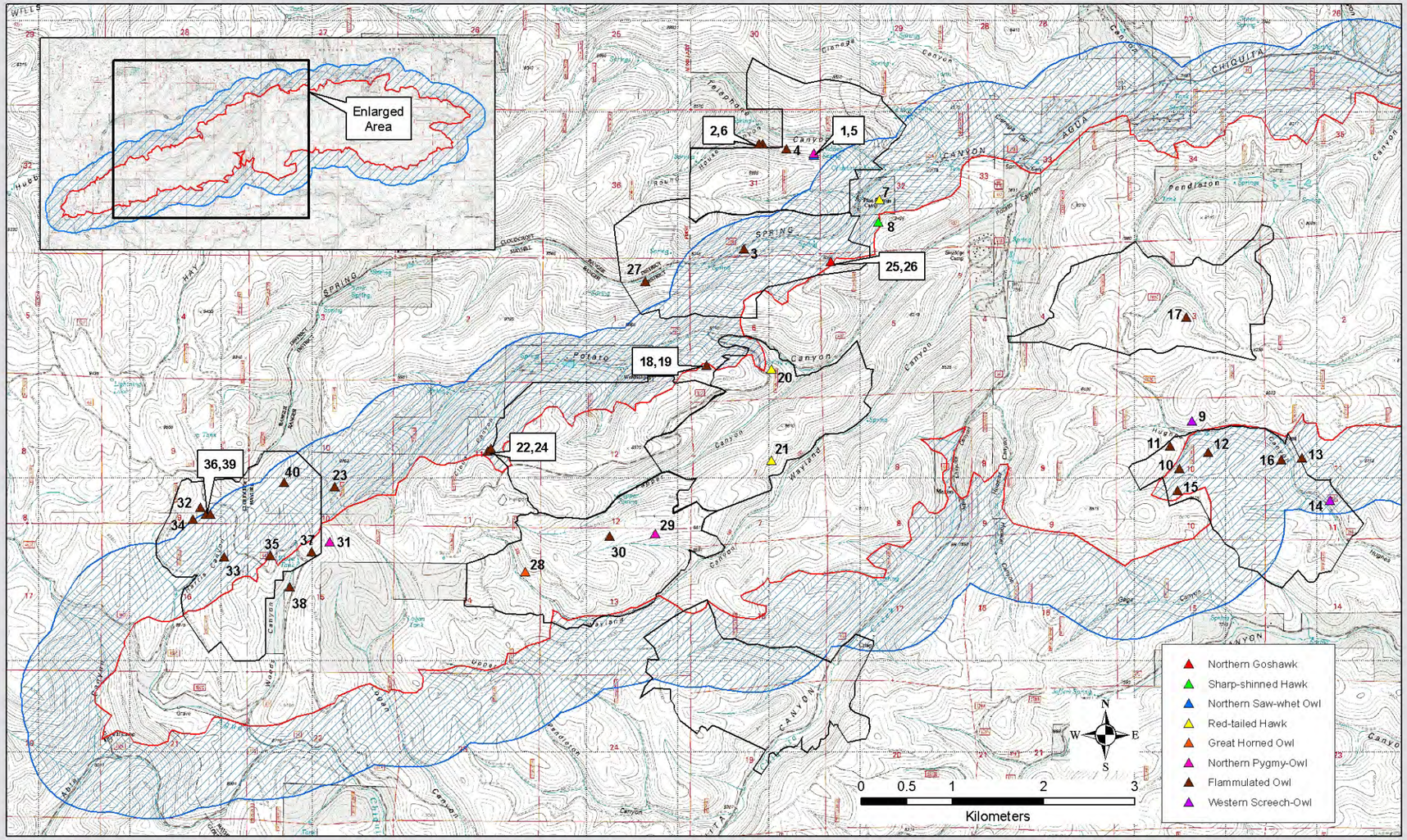
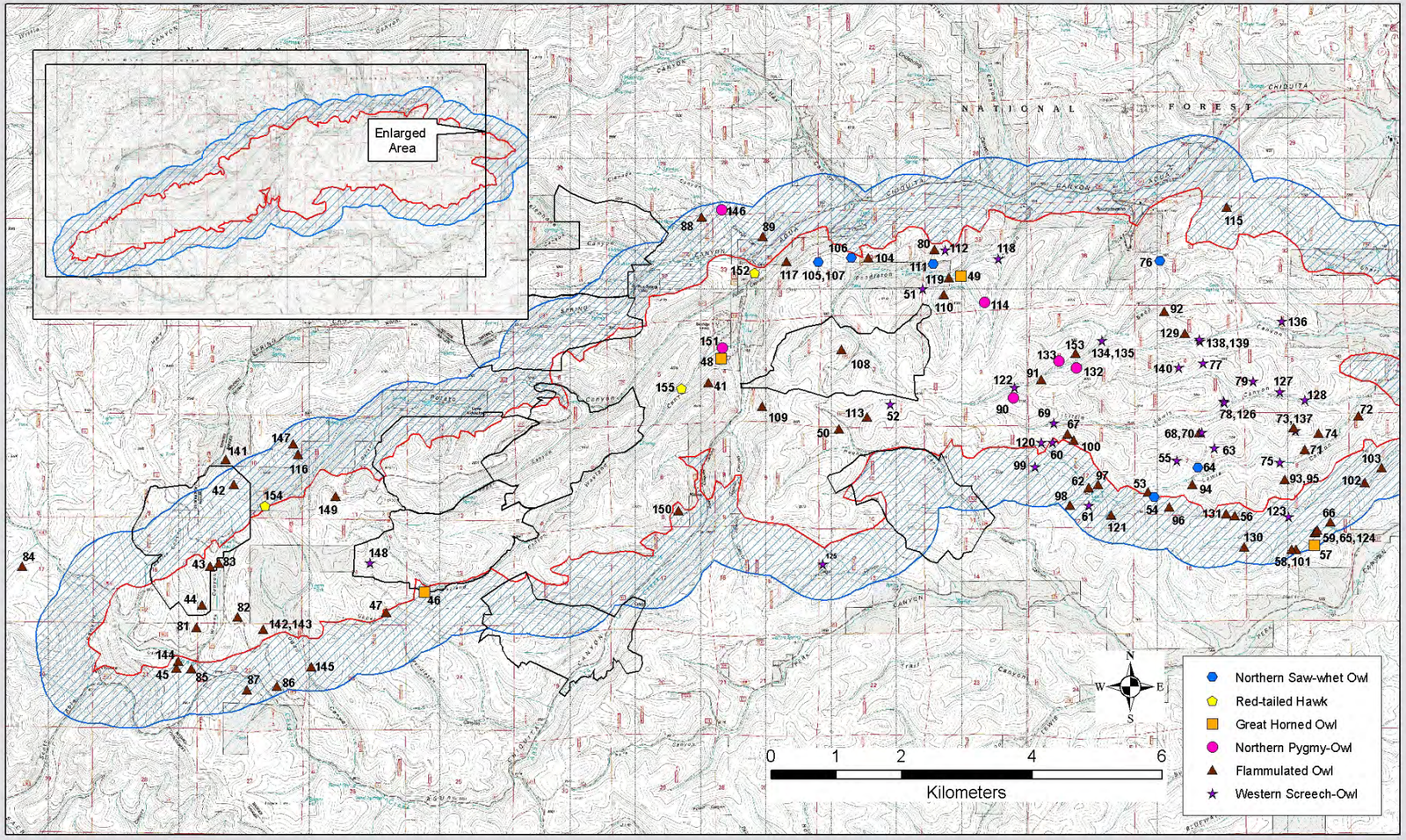


Figure 5. 2005 Additional Raptor Species Detections in the Inventory area (excluding detections on all PACs) on USGS 7.5' quadrangle. This section includes portions from Bluff Springs, Rogers Ruins, Bear Spring and Sacramento quads in the Lincoln National Forest, New Mexico.



Appendix 1. Mexican Spotted Owl Survey Form, Rio Peñasco CRMMP (front and back page).

MEXICAN SPOTTED OWL SURVEY FORM
RIO PEÑASCO CMMRP

PAC #:____ Pass #:_____ Follow-up: _____ Day or Night:_____ Date:___/___/___
dd / mmm / yy

Observer(s):____/____/____ Number of observers: _____ Time began:_____ Time ended:_____

Area Surveyed: attach 8 ½" x 11" topo map of area or route to form (see Mapping Protocol); include date and time on the map.

CALL POINT LOG

USGS quad	Call Point	Time began	USGS Quad	Call point	Time began	USGS quad	Call point	Time began

OWL RESPONSE INFORMATION

USGS Quad	Resp Pt	Resp Time	OT	Owl Species	Sex	Age	Radio Freq	USFWS Bands Leg	USFWS Bands Band Number	Leg	Color Main	Bands Sec	Pat	UTME	UTMN	Mouse Fates

RESPONSE SUMMARY (Total Numbers):

Adult male	Adult female	Adult unknown	Subadult male	Subadult female	Subadult unknown	Unknown age/sex	Juveniles

Pair Status:____ Nest Status:____ Metal Tag #:____ Nest UTME:_____ Nest UTMN:_____

GPS? (Y or N)_____ USGS Quad_____ No. Pellets_____

Entered by:_____ RMRS (revised 23 Mar 2003)

Comments:

Appendix 2. Mexican Spotted Owl Inventory Form.

Page __ of __

Mexican Spotted Owl Inventory Form

Forest ________ District ________ Inventory Area ________ Date ________

Quad Map Name(s): ________ PAC# ________

Inventory ____ ; Informal Monitoring ____ ; Formal Monitoring ____

Survey Type: Nighttime ____ Daytime ____ Survey # ____ Outing # ____

Complete Survey? ____ Aborted? ____ Visit Results ________ % Area Surveyed ____

Observer(s): ________

Weather: Start: Wind ____ mph, Clouds ____ %, PPT ______ , Temp ____

End : Wind ____ mph, Clouds ____ %, PPT ______ , Temp ____

Call Point Data							Raptor Response Data												
		Time										Bearing		Weather				UTM Location	
Call Point	Surv. Meth	Start	End	Total	Call Meth	Moo Vis?	A-V	Sex	Age	Spp.	Time of	1st	2nd	Wind	Cloud	PPT	Temp	E	N

Appendix 3. Spotted Owl Monitoring Results from 2001 to 2005 for ten PACs monitored. We summarize the number of adult owls detected, pair status, nesting status, and number of young in each year. Pair and nesting status are confirmed or unconfirmed according to USDA-FS Region 3 Spotted Owl Monitoring Protocol.

Year	Pac Name	# Owls	Pair?[1]	Nest?[2]	# Young
2001	Crisp	2	Y	N	0
	Hidden	2	Y	N	0
	Hughes	1	UNK	UNK	0
	Pendleton	0	N	N	0
	Pepper	1	UNK	UNK	0
	Potato	1	N	UNK	0
	Spring	1	N	N	0
	Wayland	2	Y	UNK	0
	Woods	2	Y	N	0
Total		**12**	**4-Y**	**0-Y**	**0**
2002	Crisp	2	Y	UNK	0
	Hidden	1	UNK	UNK	0
	Hughes	1	UNK	UNK	0
	Pendleton	0	UNK	UNK	0
	Pepper	2	Y	UNK	0
	Potato	1	UNK	UNK	0
	Spring	1	N	N	0
	Wayland	0	UNK	UNK	0
	Woods	2	Y	N	0
Total		**10**	**3-Y**	**0-Y**	**0**
2003	Crisp	2	Y	Y	2
	Hidden	2	Y	N	0
	Hughes	0	N	N	0
	Pendleton	0	N	N	0
	Pepper A	2	Y	Y	3
	Pepper B	2	Y	UNK	0
	Potato	2	Y	Y	2
	Spring	0	N	N	0
	Wayland	3	N	N	0
	Woods	1	N	N	0
Total		**14**	**5-Y**	**3-Y**	**7**

Appendix 3. Continued

Year	Pac Name	# Owls	Pair?[1]	Nest?[2]	# Young
2004	Crisp	2	Y	Y	2
	Hidden	2	Y	Y	1
	Hughes	1	N	N	0
	Pendleton	0	N	N	0
	Pepper A	2	Y	N	0
	Pepper B	2	Y	N	0
	Potato	2	Y	N	0
	Spring	0	N	N	0
	Wayland	2	Y	Y	2
	Woods	1	N	N	0
Total		**14**	**6-Y**	**3-Y**	**5**
2005	Crisp	2	Y	N	0
	Hidden	1	N	N	0
	Hughes	0	N	N	0
	Pendleton	0	N	N	0
	Pepper A	2	Y	Y	3
	Pepper B	2	Y	N	0
	Potato	2	Y	N	0
	Spring	2	Y	N	0
	Wayland	2	Y	Y	2
	Woods	0	N	N	0
Total		**13**	**6-Y**	**2-N**	**5**

[1] Y=pair confirmed, N=no pair confirmed

[2] Y=nesting status confirmed, N=non-nesting status confirmed, UNK=nesting status unknown

Appendix 4. UTM coordinates (Nad 27) for Spotted Owls detected on the PACs of the Scott Able Fire Study Area in the Lincoln National Forest, New Mexico in 2005. Numbers 1 to 39 indicate individual observations plotted on Figure 3.

#	PAC Name	Date	Sex	UTM
1	Crisp	12-Apr,25-May,4-Jun-05	Female	438347/3622271
2	Crisp	12-Apr,25-May,4-Jun-05	Male	438347/3622271
3	Hidden	14-Apr-05	Male	440240/3627140
4	Hidden	14-Apr-05	Male	440320/3627450
5	Hidden/Spring	15-Apr-05	Male	439819/3626460
6	Hidden/Spring	15-Apr-05	Female	439819/3626460
7	Hidden	26-Apr-05	Male	440000/3626990
8	Hidden	10-May-05	Unknown	439244/3627745
9	Hidden	24-May-05	Female	439860/3627080
10	Hidden	24-May-05	Male	440050/3627200
11	Hidden	24-May-05	Male	440450/3627200
12	Hidden	7-Jun-05	Male	439575/3626950
13	Hidden	7-Jun-05	Male	440220/3627150
14	Pepper A/B	13-Apr-05	Male	438843/3625098
15	Pepper A/B	13-Apr-05	Male	439285/3624028
16	Pepper A/B	13-Apr-05	Male	438550/3625200
17	Pepper A	13-Apr,25-May,21-Jun-05	Male	439287/3624065
18	Pepper A	13-Apr,25-May,4-Jun,21-Jun-05	Female	439287/3624065
19	Pepper A	25-May,4-Jun,21-Jun-05	Juvenile	439287/3624065
20	Pepper A	25-May,4-Jun,21-Jun-05	Juvenile	439287/3624065
21	Pepper A	21-Jun-05	Juvenile	439287/3624065
22	Pepper B	14-Apr-05	Male	438150/3624510
23	Pepper B	14-Apr-05	Male	438530/3624360
24	Pepper B	25-May-05	Male	439850/3625900
25	Pepper B	25-May-05	Female	440100/3625850
26	Pepper B	27-Jun,29-Jul-05	Female	438837/3625188
27	Pepper B	27-Jun,29-Jul-05	Male	438837/3625188
28	Potato	5-Jun-05	Female	437049/3624979
29	Potato	5-Jun-05	Male	437049/3624979
30	Spring	11-Apr-05	Male	440100/3627350
31	Spring	11-Apr-05	Male	436700/3625700
32	Spring	11-Apr-05	Female	439800/3626400
33	Spring	26-Apr-05	Male	437050/3625990
34	Spring	26-Apr-05	Female	437560/3626100
35	Spring	26-Apr-05	Male	437800/3626140
36	Wayland	13-Apr,25 May,8 Jun,21-Jun-05	Male	437756/3623291
37	Wayland	13-Apr,25 May,8 Jun,21-Jun-05	Female	437756/3623291
38	Wayland	25 May,8 Jun,21-Jun-05	Juvenile	437756/3623291
39	Wayland	25 May,8 Jun,21-Jun-05	Juvenile	437756/3623291

Appendix 5. UTM coordinates (Nad 27) for Spotted Owls detected in the Inventory Study Area in the Lincoln National Forest, New Mexico in 2001 and 2005. Numbers 1 to 18 indicate individual observations plotted on Figure 3.

#	Survey	Inventory Area	Date	Nearest Call Point	Sex	UTM
1	1	East	29-April-05	48	Male	441826/3626925
2	1	East	29-April-05	48	Male	441347/3625443
3	1	East	29-April-05	48	Female	441370/3625500
4	1	East	1-May-05	70	Female	447337/3626212
5	1	East	2-May-05	67	Male	446328/3627628
6	2	West	10-May-05	12	Male	433964/3624313
7	2	West	10-May-05	13	Male	434097/3623618
8	2	West	11-May-05	107	Male	440227/3624984
9	2	West	13-May-05	23	Male	437457/3622714
10	2	East	13-May-05	near 45	Male	441442/3624326
11	3	West	7-June-05	23	Male	437266/3622799
12	3	East	1-June-05	45-46	Female	441671/3623452
13	3	East	1-June-05	45-46	Male	441454/3623296
14	4	West	19-June-05	3	Unknown	432432/3622220
15	4	West	21-June-05	107	Male	440868/3625227
16	4	West	22-June-05	22	Male	436245/3621292
17	4	East	3, 18, and 27-June 05	45-46	Male	441845/3623184
18	4	East	3, 18, and 27-June 05	45-46	Female	441845/3623184
19	4	East	3, 18, and 27-Jun-05	45-46	Juvenile	441845/3623184
20	4	East	18, and 27-Jun-05	45-46	Juvenile	441845/3623184

Appendix 6. UTM coordinates (Nad 27) for additional raptor species detected on the PACs and Inventory areaof the Lincoln National Forest, New Mexico in 2005. Numbers 1 to 155 indicate individual observations plotted on Figure 3.

#	Pac Nam	Date	Species	Common Name	UTM
1	Hidden	14-April-05	*Aegolius acadicus*	Northern Saw-whet Owl	439500/3627530
2	Hidden	26-April-05	*Otus flammeolus*	Flammulated Owl	438940/3627650
3	Hidden	10-May-05	*Otus flammeolus*	Flammulated Owl	438730/3626500
4	Hidden	11-May-05	*Otus flammeolus*	Flammulated Owl	439200/3627600
5	Hidden	11-May-05	*Glaucidium gnoma*	Northern Pygmy-Owl	439500/3627550
6	Hidden	24-May-05	*Otus flammeolus*	Flammulated Owl	438900/3627650
7	Hidden	25-May-05	*Buteo jamaicensis*	Red-tailed Hawk	440220/3627047
8	Hidden	25-May-05	*Accipiter striatus*	Sharp-shinned Hawk	440207/3626798
9	Hughes	12-April-05	*Otus kennicottii*	Western Screech-Owl	443750/3625430
10	Hughes	30-April-05	*Otus flammeolus*	Flammulated Owl	443500/3624100
11	Hughes	30-April-05	*Otus flammeolus*	Flammulated Owl	443400/3624350
12	Hughes	16-May-05	*Otus flammeolus*	Flammulated Owl	443820/3624280
13	Hughes	16-May-05	*Otus flammeolus*	Flammulated Owl	444840/3624220
14	Hughes	23-May-05	*Otus kennicottii*	Western Screech-Owl	445150/3623750
15	Hughes	4-June-05	*Otus flammeolus*	Flammulated Owl	443480/3623860
16	Hughes	15-June-05	*Otus flammeolus*	Flammulated Owl	444620/3624200
17	Pendleton	12-April-05	*Otus flammeolus*	Flammulated Owl	443580/3625760
18	Pepper B	14-April-05	*Otus flammeolus*	Flammulated Owl	438320/3625230
19	Pepper B	14-April-05	*Otus flammeolus*	Flammulated Owl	438320/3625230
20	Pepper B	22-June-05	*Buteo jamaicensis*	Red-tailed Hawk	439034/3625191
21	Pepper B	22-June-05	*Buteo jamaicensis*	Red-tailed Hawk	439034/3624191
22	Potato	12-April-05	*Otus flammeolus*	Flammulated Owl	435929/3624292
23	Potato	13-April-05	*Otus flammeolus*	Flammulated Owl	434250/3623900
24	Potato	23-May-05	*Otus flammeolus*	Flammulated Owl	435960/3624320
25	Spring	24-May-05	*Aegolius acadicus*	Northern Saw-whet Owl	439683/3626365
26	Spring	25-May-05	*Aegolius acadicus*	Northern Saw-whet Owl	439683/3626365
27	Spring	20-June-05	*Otus flammeolus*	Flammulated Owl	437650/3626150
28	Wayland	13-April-05	*Bubo virginianus*	Great Horned Owl	436340/3622970
29	Wayland	13-April-05	*Glaucidium gnoma*	Northern Pygmy-Owl	437760/3623390
30	Wayland	13-April-05	*Otus flammeolus*	Flammulated Owl	437260/3623360
31	Woods	12-April-05	*Glaucidium gnoma*	Northern Pygmy-Owl	434200/3623300
32	Woods	26-April-05	*Otus flammeolus*	Flammulated Owl	432780/3623680
33	Woods	26-April-05	*Otus flammeolus*	Flammulated Owl	433040/3623140
34	Woods	10-May-05	*Otus flammeolus*	Flammulated Owl	432700/3623550
35	Woods	10-May-05	*Otus flammeolus*	Flammulated Owl	433550/3623150
36	Woods	23-May-05	*Otus flammeolus*	Flammulated Owl	432840/3623600
37	Woods	23-May-05	*Otus flammeolus*	Flammulated Owl	434000/3623190
38	Woods	23-May-05	*Otus flammeolus*	Flammulated Owl	433760/3622810
39	Woods	6-June-05	*Otus flammeolus*	Flammulated Owl	432890/3623600
40	Woods	19-June-05	*Otus flammeolus*	Flammulated Owl	433700/3623950

Appendix 6.

#	Call Point	Date	Species	Common Name	UTM
41	107	26-April-05	*Otus flammeolus*	Flammulated Owl	441130/3625560
42	12	26-April-05	*Otus flammeolus*	Flammulated Owl	433850/3624000
43	7	26-April-05	*Otus flammeolus*	Flammulated Owl	433490/3622750
44	6	26-April-05	*Otus flammeolus*	Flammulated Owl	433360/3622160
45	9	26-April-05	*Otus flammeolus*	Flammulated Owl	432970/3621190
46	23	30-April-05	*Bubo virginianus*	Great Horned Owl	436775/3622360
47	22	30-April-05	*Otus flammeolus*	Flammulated Owl	436190/3622040
48	48	29-April-05	*Bubo virginianus*	Great Horned Owl	441320/3625940
49	53	29-April-05	*Bubo virginianus*	Great Horned Owl	444990/3627200
50	61	30-April-05	*Otus flammeolus*	Flammulated Owl	443130/3624850
51	53	30-April-05	*Otus kennicottii*	Western Screech-Owl	444410/3627010
52	61	30-April-05	*Otus kennicottii*	Western Screech-Owl	443910/3625240
53	95	1-May-05	*Otus flammeolus*	Flammulated Owl	447864/3623890
54	95	1-May-05	*Aegolius acadicus*	Northern Saw-whet Owl	447957/3623816
55	95	1-May-05	*Otus kennicottii*	Western Screech-Owl	448304/3624380
56	99	1-May-05	*Otus flammeolus*	Flammulated Owl	449197/3623524
57	100	1-May-05	*Bubo virginianus*	Great Horned Owl	450409/3623075
58	100	1-May-05	*Otus flammeolus*	Flammulated Owl	450136/3623006
59	100	1-May-05	*Otus flammeolus*	Flammulated Owl	450418/3623265
60	97	1-May-05	*Otus kennicottii*	Western Screech-Owl	446402/3624658
61	97	1-May-05	*Otus kennicottii*	Western Screech-Owl	446957/3623686
62	97	1-May-05	*Otus flammeolus*	Flammulated Owl	446957/3623954
63	94	1-May-05	*Otus kennicottii*	Western Screech-Owl	448877/3624570
64	94	1-May-05	*Aegolius acadicus*	Northern Saw-whet Owl	448632/3624264
65	101	1-May-05	*Otus flammeolus*	Flammulated Owl	450427/3623274
66	100	1-May-05	*Otus flammeolus*	Flammulated Owl	450659/3623427
67	80-85	1-May-05	*Otus flammeolus*	Flammulated Owl	446630/3624778
68	80-85	1-May-05	*Otus flammeolus*	Flammulated Owl	448654/3624794
69	80-85	1-May-05	*Otus kennicottii*	Western Screech-Owl	446421/3624955
70	80-85	1-May-05	*Otus kennicottii*	Western Screech-Owl	448691/3624811
71	92	1-May-05	*Otus flammeolus*	Flammulated Owl	450270/3624537
72	92	1-May-05	*Otus flammeolus*	Flammulated Owl	451094/3625056
73	92	1-May-05	*Otus kennicottii*	Western Screech-Owl	450127/3624838
74	92	1-May-05	*Otus flammeolus*	Flammulated Owl	450478/3624783
75	92	1-May-05	*Otus kennicottii*	Western Screech-Owl	449886/3624348
76	77	2-May-05	*Aegolius acadicus*	Northern Saw-whet Owl	448045/3627434
77	89	2-May-05	*Otus kennicottii*	Western Screech-Owl	448706/3625874
78	85-88	2-May-05	*Otus kennicottii*	Western Screech-Owl	449025/3625282
79	85-88	2-May-05	*Otus kennicottii*	Western Screech-Owl	449474/3625588

Appendix 6. Continued

#	Call Point	Date	Species	Common Name	UTM
80	52	3-May-05	*Otus flammeolus*	Flammulated Owl	444593/3627605
81	5	10-May-05	*Otus flammeolus*	Flammulated Owl	433277/3621809
82	6	10-May-05	*Otus flammeolus*	Flammulated Owl	433908/3621974
83	7	10-May-05	*Otus flammeolus*	Flammulated Owl	433620/3622797
84	1	12-May-05	*Otus flammeolus*	Flammulated Owl	430610/3622749
85	9	12-May-05	*Otus flammeolus*	Flammulated Owl	433197/3621177
86	10	12-May-05	*Otus flammeolus*	Flammulated Owl	434516/3620908
87	10	12-May-05	*Otus flammeolus*	Flammulated Owl	434057/3620858
88	40	13-May-05	*Otus flammeolus*	Flammulated Owl	441019/3628096
89	40	13-May-05	*Otus flammeolus*	Flammulated Owl	441959/3627800
90	68	14-May-05	*Glaucidium gnoma*	Northern Pygmy-Owl	445800/3625338
91	68	14-May-05	*Otus flammeolus*	Flammulated Owl	446232/3625610
92	71	14-May-05	*Otus flammeolus*	Flammulated Owl	448116/3626655
93	92	14-May-05	*Otus flammeolus*	Flammulated Owl	449962/3624076
94	94	14-May-05	*Otus flammeolus*	Flammulated Owl	448547/3624004
95	93	14-May-05	*Otus flammeolus*	Flammulated Owl	449962/3624076
96	95	14-May-05	*Otus flammeolus*	Flammulated Owl	448188/3623660
97	97	14-May-05	*Otus flammeolus*	Flammulated Owl	447103/3624004
98	97	14-May-05	*Otus flammeolus*	Flammulated Owl	446672/3623684
99	98	14-May-05	*Otus kennicottii*	Western Screech-Owl	446131/3624278
100	80-88	14-May-05	*Otus flammeolus*	Flammulated Owl	446730/3624678
101	100	15-May-05	*Otus flammeolus*	Flammulated Owl	450069/3623005
102	102-105	15-May-05	*Otus flammeolus*	Flammulated Owl	451189/3624030
103	102-105	15-May-05	*Otus flammeolus*	Flammulated Owl	451449/3624257
104	51-52	15-May-05	*Otus flammeolus*	Flammulated Owl	443581/3627475
105	51-52	15-May-05	*Aegolius acadicus*	Northern Saw-whet Owl	442815/3627414
106	51-52	15-May-05	*Aegolius acadicus*	Northern Saw-whet Owl	443316/3627480
107	50	15-May-05	*Aegolius acadicus*	Northern Saw-whet Owl	442815/3627414
108	55	15-May-05	*Otus flammeolus*	Flammulated Owl	443165/3626072
109	47	15-May-05	*Otus flammeolus*	Flammulated Owl	441946/3625197
110	53	15-May-05	*Otus flammeolus*	Flammulated Owl	444739/3626913
111	53	15-May-05	*Aegolius acadicus*	Northern Saw-whet Owl	444569/3627381
112	53	15-May-05	*Otus kennicottii*	Western Screech-Owl	444758/3627603
113	61	16-May-05	*Otus flammeolus*	Flammulated Owl	443562/3625037
114	66	18-May-05	*Glaucidium gnoma*	Northern Pygmy-Owl	445358/3626795
115	76	18-May-05	*Otus flammeolus*	Flammulated Owl	449068/3628255
116	16	8-June-05	*Otus flammeolus*	Flammulated Owl	434840/3624466
117	49	1-June-05	*Otus flammeolus*	Flammulated Owl	442320/3627422
118	54	1-June-05	*Otus kennicottii*	Western Screech-Owl	445563/3627471
119	53	1-June-05	*Otus flammeolus*	Flammulated Owl	444816/3627167
120	106	1-June-05	*Otus kennicottii*	Western Screech-Owl	446232/3624655

Appendix 6. Continued

#	Call Point	Date	Species	Common Name	UTM
121	96	1-June-05	*Otus flammeolus*	Flammulated Owl	447304/3623530
122	68	4-June-05	*Otus kennicottii*	Western Screech-Owl	445818/3625499
123	102-105	4-June-05	*Otus kennicottii*	Western Screech-Owl	450019/3623512
124	101	4-June-05	*Otus flammeolus*	Flammulated Owl	450463/3623301
125	62	4-June-05	*Otus kennicottii*	Western Screech-Owl	442880/3622791
126	80-88	4-June-05	*Otus kennicottii*	Western Screech-Owl	449037/3625266
127	80-88	4-June-05	*Otus kennicottii*	Western Screech-Owl	449886/3625433
128	80-88	4-June-05	*Otus kennicottii*	Western Screech-Owl	450268/3625307
129	79-78	5-June-05	*Otus flammeolus*	Flammulated Owl	448432/3626321
130	99	15-June-05	*Otus flammeolus*	Flammulated Owl	449342/3623041
131	99	15-June-05	*Otus flammeolus*	Flammulated Owl	449062/3623551
132	69	16-June-05	*Glaucidium gnoma*	Northern Pygmy-Owl	446761/3625793
133	69	16-June-05	*Glaucidium gnoma*	Northern Pygmy-Owl	446495/3625899
134	70	16-June-05	*Otus kennicottii*	Western Screech-Owl	447161/3626215
135	70	16-June-05	*Otus kennicottii*	Western Screech-Owl	447161/3626215
136	73	16-June-05	*Otus kennicottii*	Western Screech-Owl	449914/3626509
137	93	16-June-05	*Otus flammeolus*	Flammulated Owl	450091/3624878
138	78-79	17-June-05	*Otus kennicottii*	Western Screech-Owl	448661/3626206
139	78-79	17-June-05	*Otus kennicottii*	Western Screech-Owl	448648/3626232
140	91	17-June-05	*Otus kennicottii*	Western Screech-Owl	448332/3625799
141	12	19-June-05	*Otus flammeolus*	Flammulated Owl	433731/3624384
142	11	19-June-05	*Otus flammeolus*	Flammulated Owl	434302/3621786
143	11	19-June-05	*Otus flammeolus*	Flammulated Owl	434302/3621786
144	5	19-June-05	*Otus flammeolus*	Flammulated Owl	432998/3621298
145	14	19-June-05	*Otus flammeolus*	Flammulated Owl	435040/3621209
146	40	20-June-05	*Glaucidium gnoma*	Northern Pygmy-Owl	441328/3628213
147	16	21-June-05	*Otus flammeolus*	Flammulated Owl	434757/3624628
148	20	21-June-05	*Otus kennicottii*	Western Screech-Owl	435934/3622802
149	17	21-June-05	*Otus flammeolus*	Flammulated Owl	435412/3623823
150	43	22-June-05	*Otus flammeolus*	Flammulated Owl	440668/3623596
151	48	30-April-05	*Glaucidium gnoma*	Northern Pygmy-Owl	441340/3626100
152	48	30-April-05	*Buteo jamaicensis*	Red-tailed Hawk	441839/3627251
153	70	2-May-05	*Otus flammeolus*	Flammulated Owl	446758/3626013
154	12&13	12-May-05	*Buteo jamaicensis*	Red-tailed Hawk	434327/3623681
155	107	22-June-05	*Buteo jamaicensis*	Red-tailed Hawk	440713/3625476