

Grant Report
WINTERING RAPTORS OF THE GREAT BASIN
Oases in the High Desert: *Census and Banding Study 1985-2009*



Leucistic Red-tailed Hawk

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INTRODUCTION

Since 1985, Principal Investigator (PI) Al Hinde has conducted a roadside census and banding study of wintering raptors in the Great Basin. Initially, this project was limited to northeastern Nevada and was intended to augment knowledge of regional raptor ecology derived from HawkWatch International's (HWI) long-term migration study in the Goshute Mountains of northeastern Nevada (on-going annually since 1983; Hoffman and Smith 2003, Smith et al. 2008, Smith and Neal 2009a). By 1989, further exploration throughout Utah and Nevada had revealed eight major concentration areas for wintering raptors, with each roughly 50-mi² area consistently containing 100–200+ individuals of 18 species (13 diurnal species and 5 owl species). One such area, Lovelock, Nevada, contained a previously undocumented communal roost of 200+ buteos (Rough-legged Hawks [*Buteo lagopus*], Red-tailed Hawks [*B. jamaicensis*], and Ferruginous Hawks [*B. regalis*]) and several Great Horned Owls (*Bubo virginianus*). Continuing each January, with field assistance from experienced HWI raptor biologists, other ornithologists, and local and state wildlife officials, Mr. Hinde focused on these eight areas, including the Lovelock roost. All sites have continued to sustain similar large numbers of wintering raptors each year. The Lovelock roost routinely contained dozens of mixed-species buteos until this past year. This long-term study suggests that these areas are among the most significant winter ranges for raptors in western North America, and the censuses provide a means of monitoring population changes in relation to habitat, land-use, and climatic changes in the study regions.

The capture and banding of 384 raptors (12 species) over the course of the study—including 112 Rough-legged Hawks, the focal species—also has yielded morphometric, genetic, and photographic data used in several other studies and publications. Following the 2006/2007 season, the project contributed feather and saliva samples to two studies, one examining endocrine disruptors and the other comparing Harlan's Hawks (*B. jamaicensis harlani*) with other subspecies of Red-tailed Hawks. In addition, following the past two winter field seasons, the project contributed feather samples to another study examining toxins, pollutants, and heavy metals in raptors. Each of three buteos analyzed thus far showed mercury concentrations below the level above which adverse effects are predicted; however, one Harlan's Hawk showed a much higher concentration than the others.

This report summarizes the results of winter 2008/2009 roadside census and banding activities conducted in nine primary, known concentration areas in Utah and Nevada, with supplementary information derived from several other areas in the two states.

METHODS

ROADSIDE CENSUS

This winter's crew conducted roadside counts of wintering raptors in 17 different areas of Utah and Nevada between 24 December 2008 and 25 January 2009. Surveys encompassed nine areas known from previous surveys to be major concentration areas for wintering raptors, and eight areas considered of secondary importance (Figures 1 and 2). A comparison count of Eureka, Nevada, also was conducted on 6 December 2008. In the past, the nine areas of major concentration typically have each supported in excess of 100 wintering raptors. These areas consist of agricultural (primarily alfalfa) and pasture lands at elevations between ~1,200–1,800 m (4,000–6,000 ft) above mean sea level (amsl). Most of the areas are well-defined valleys, roughly 125 km² (50 mi²) in extent and enclosed by mountains ranging in height from 1,500–3,000 m (5,000–10,000 ft) amsl. Exceptions include Fallon, Nevada, and Fillmore, Utah, areas bordered by mountains to the east but desert scrub to the west. Nevertheless, similar combinations of agricultural, pasture, and natural grassland/woodland habitats are bounded by the mountains and low desert, and form similarly distinct survey areas (Figures 1 and 2).

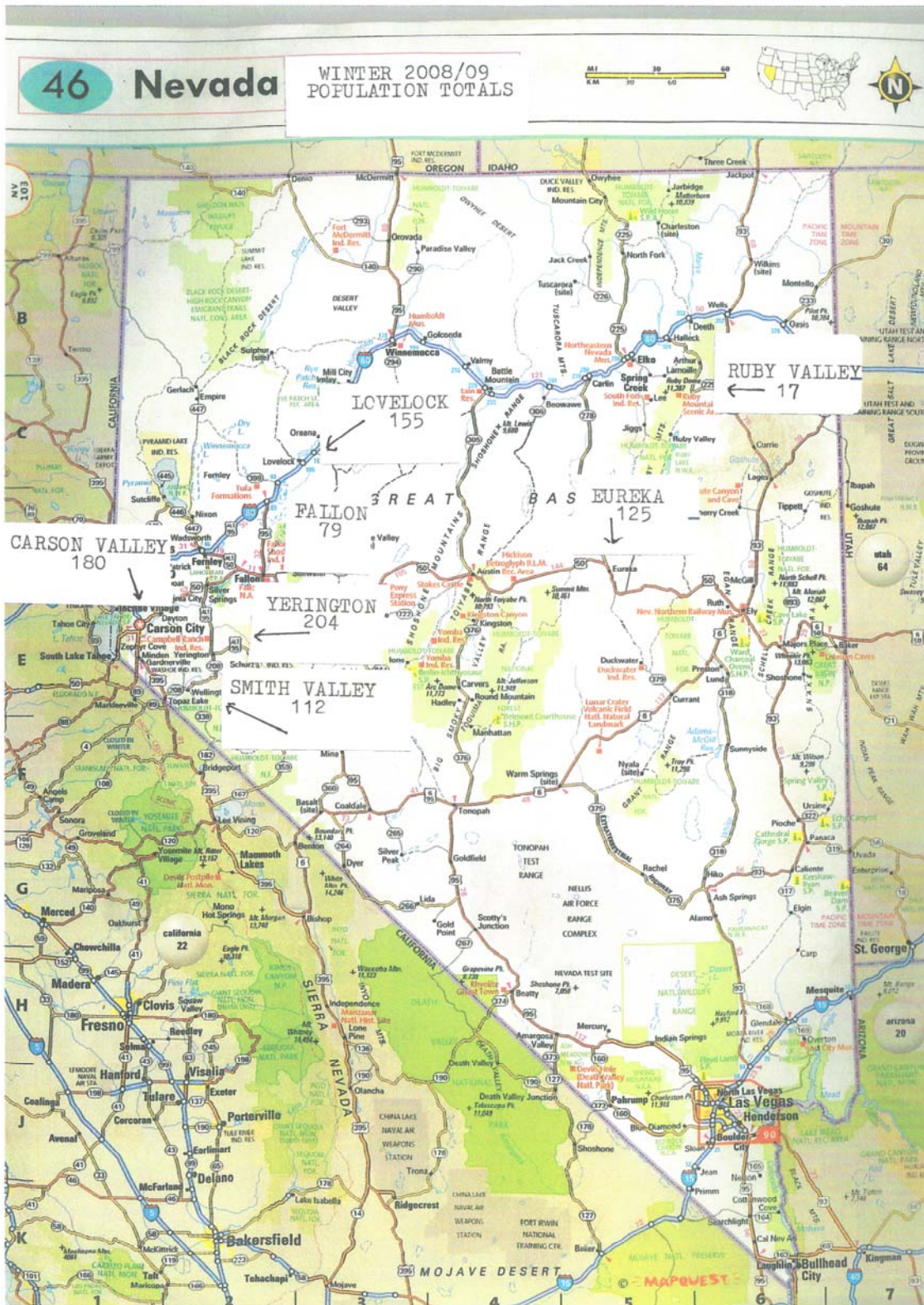


Figure 1. Winter raptor survey areas in Nevada, with numbers indicating total combined-species counts from winter 2008/2009.

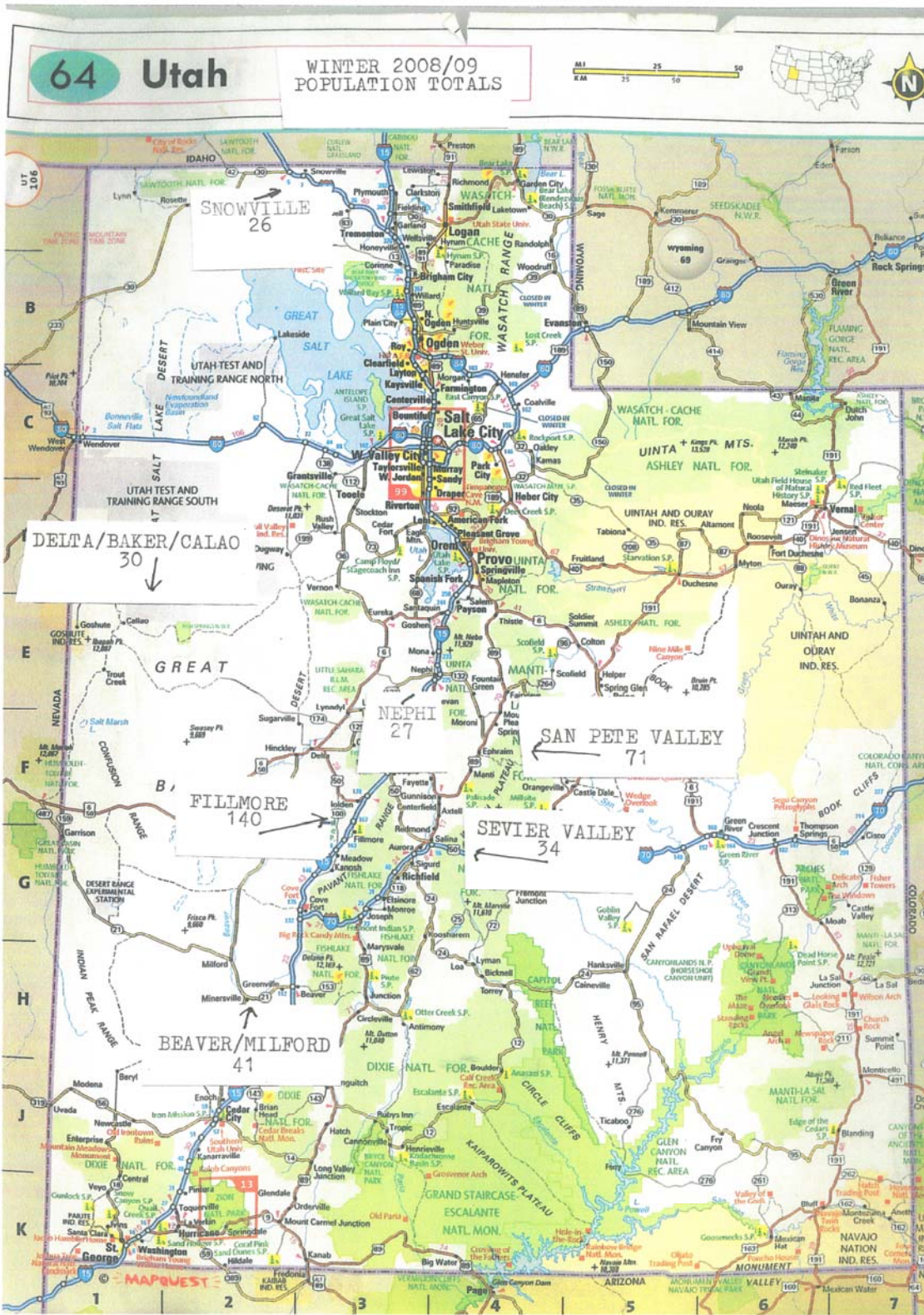


Figure 2. Winter raptor survey areas in Utah, with numbers indicating total combined-species counts from winter 2008/2009.

We surveyed most areas in one day, but required two days in Lovelock and Yerington, Nevada. Survey crews typically included two or three experienced observers. The PI participated in all surveys. Soheil Zende of Lexington, MA, Jeff Smith of HawkWatch International, and Jeff Johnson and Joe Barnes of Las Vegas, NV, assisted in Nevada. Jeff Johnson and Joe Barnes conducted the first comparison census of Eureka, Nevada on 6 December 2008. In Utah, assistants included Jeff Smith, LeRoy Fink of Burley, Idaho, and Robbie Knight and Maggie Peters, biologists from Dugway Proving Ground in Utah. Bob Walters, Nongame Specialist, and Keith Day, Southern Region Biologist, both with the Utah Division of Wildlife Resources, also assisted with fieldwork in Utah. Surveyors tallied observed raptors while traveling in a slow-moving vehicle on established paved and dirt roads along designated routes defined in previous years. All efforts provided as complete a census as possible of wintering raptors in the proscribed survey areas. Similar to the past five annual surveys, surveyors recorded UTM coordinates with a handheld GPS receiver (accuracy $\pm 3\text{--}5$ m) on roads at locations perpendicular to all raptor sightings, and estimated the perpendicular distance of the raptor from the road in meters. Surveyors recorded all visually detected raptors, taking care to avoid double counting of mobile individuals.

TRAPPING AND BANDING

During all surveys, crews simultaneously sought to trap and band selected raptors using bal-chatri traps with mice and hamsters as lures. Trapping efforts focused on Rough-legged Hawks, the project's target species, and secondarily on Ferruginous Hawks and Harlan's Hawks. Opportunistic trapping of other subspecies of Red-tailed Hawks and species such as the Prairie Falcon (*Falco mexicanus*) also occurred.

We banded all captured raptors with uniquely numbered U.S. Geological Survey – National Bird Banding Laboratory aluminum leg bands, recorded the wing chord and mass of each bird, and collected feather samples from all birds. We also took photographs of all Rough-legged, Harlan's, and Ferruginous Hawks. This year we also collected blood samples from 21 birds.

To minimize census disturbance, we typically limited all trapping attempts to five minutes, beyond which time capture success decreases sharply anyway. We sometimes made exceptions for unusual birds, such as dark-morph buteos, Prairie Falcons, and owls.

RESULTS

ROADSIDE CENSUS

This year's crew tallied 1,310 raptors of 13 species across the 17 major and secondary concentration areas, with 872 (67%) seen in Nevada and 438 (33%) in Utah (Table 1). With data for all surveys combined, the most commonly encountered species was the Red-tailed Hawk (525 individuals; 40% of the total), followed by the Rough-legged Hawk (226, 17%), American Kestrel (128, 10%; *Falco sparverius*), Bald Eagle (99, 8%; *Haliaeetus leucocephalus*), Northern Harrier (66, 5%; *Circus cyaneus*), Golden Eagle (58, 4%; *Aquila chrysaetos*), and Prairie Falcon (43, 3%).

Nevada Highlights

Lovelock (155 birds). The total count in this area was about average for the past four winters, but substantially less than in 2003/2004 and 2004/2005 (Table 2, Figure 3). The increase compared to last winter reflected a high count of Rough-legged Hawks and slight increases in Red-tailed Hawks, American Kestrels, and Prairie Falcons. The Reservation Road roost in Lovelock was again occupied by nine birds (6 Ferruginous Hawks, 3 Rough-legged Hawks), whereas we recorded no birds there last winter.

Mason Valley/Yerington (204). This winter's total count was the highest for the past six winters (Table 2, Figure 3) and the highest for any of the Nevada and Utah survey areas (Table 1). The count surpassed that of Lovelock for the fourth consecutive winter and included the highest numbers of Ferruginous Hawks (12) and Rough-legged Hawks (16) seen here in 6 years (Table 2). As usual, American Kestrels (31) were more abundant here than in any other survey area, and the count of Northern Harriers (18) rose again to similar levels as seen three and four years ago.

Table 1. Winter 2008/2009 survey dates and raptor counts by species in 17 concentration areas in Nevada and Utah.

SURVEY AREA	DATES	SPECIES ¹																TOTAL	
		NH	SS	CH	RT	HH	FH	RL	UB	GE	BE	UE	AK	ML	PR	GO	UO		UR
NEVADA																			
Mason Valley (Yerington), Lyon Co.	12/24-25	18	1	2	97		12	16	18				31	1	5	1		2	204
Smith Valley, Lyon Co.	12/26	10			56		4	15	15	6			4	1	1				112
Carson Valley, Douglas Co.	12/27	5	2	2	126			11	20		2		11		1				180
Fallon area, Lyon Co.	12/28	6			39			2	5				20	3	1			3	79
Lovelock area, Pershing Co.	12/30-31	20			69	1	5	21	10				17		10	2			155
Diamond Valley/Eureka, Eureka Co.	01/3-4				8		2	94	8	4	1		1		3	4			125
Eureka comparison count²	12/6	6			13		2	125	12	2			3		8			4	175
Ruby Valley, Elko Co.	01/06							7		9					1				17
	Subtotal	59	3	4	395	1	23	166	76	19	3	0	84	5	22	7	1	5	872
UTAH																			
Pahvant Valley (Fillmore/Holden), Millard Co.	01/10-11				54	1	8	21	6	5	29		9	2	5				140
Beaver/Milford area, Beaver Co.	01/13				7		3	1	1	11	10		3	1	4				41
Sevier Valley, Sevier Co.	01/14				19			3	1		3		7		1				34
Delta, Millard Co.	01/15			1	3		1		1	3	4		1	1					15
Nephi area, Juab Co.	01/15	3			11			1			4		5	1	1			1	27
San Pete Valley, San Pete Co.	01/16	2			9	1	1	7	2	2	35	2	7		3				71
Elberta/Lehi/West Valley, Salt Lake Co.	01/17				7			6		1	9	2	5		3				33
Delta/Baker/Calao, Millard and Juab Co.	01/21				7		3	6		8	1				4	1			30
Tooele/Rush Valley/Skull Valley, Tooele Co.	01/23	1			10			1		4	1		4						21
Tremonton/Snowville area, Box Elder Co.	01/25	1			3			14		5			3						26
I	Subtotal	7	0	1	130	2	16	60	11	39	96	4	44	5	21	1	0	1	438
TOTAL		66	3	5	525	3	39	226	87	58	99	4	128	10	43	8	1	6	1310

¹ NH = Northern Harrier; SS = Sharp-shinned Hawk (*Accipiter striatus*); CH = Cooper's Hawk (*A. cooperii*); RT = Red-tailed Hawk; HH = Harlan's Red-tailed Hawk; FH = Ferruginous Hawk, RL = Rough-legged Hawk; RS = Red-shouldered Hawk (*Buteo lineatus*); UB = unknown buteo; GE = Golden Eagle, BE = Bald Eagle; UE = unknown eagle; AK = American Kestrel; ML = Merlin (*Falco columbarius*); PR = Prairie Falcon; GO = Great Horned Owl; UO = unknown owl.

² Totals not included in grand totals.

Table 2. Raptor counts by species in selected Nevada concentration areas during the past six winters: 2003/2004-2008/2009.

	SPECIES ¹																				TOTAL		
	NH	SS	CH	RT	HH	FH	RL	RS	UB	GE	BE	UE	AK	ML	PR	UF	GO	LO	SO	BO		UO	UR
Lovelock																							
2008/2009	20	0	0	69	1	5	21	0	10	0	0	0	17	0	10	0	2	0	0	0	0	0	155
2007/2008	19	0	0	58	0	5	14	0	9	0	0	0	12	0	7	0	6	1	0	0	0	0	131
2006/2007	20	0	0	80	0	10	17	0	15	0	0	0	21	0	6	0	3	0	0	1	0	1	174
2005/2006	20	0	0	84	0	9	9	0	7	0	0	0	10	0	10	0	5	0	0	0	0	3	154
2004/2005	4	0	0	149	0	30	11	0	19	0	1	0	7	0	13	0	9	0	0	0	0	0	247
2003/2004	34	0	0	130	1	22	22	0	20	3	0	0	31	0	13	0	9	0	0	0	0	3	288
Mason Valley/Yerington																							
2008/2009	18	1	2	97	0	12	16	0	18	0	0	0	31	1	5	0	1	0	0	0	0	2	204
2007/2008	9	1	0	88	0	5	9	0	10	0	0	0	14	3	6	0	4	0	0	0	0	5	154
2006/2007	22	1	1	92	0	5	3	0	12	3	1	0	34	1	12	0	0	0	1	1	0	1	191
2005/2006	15	0	1	105	0	9	0	0	14	3	0	0	42	0	4	0	1	0	0	0	0	3	197
2004/2005	11	0	0	86	0	3	0	0	4	3	0	0	23	0	3	0	1	0	0	0	0	0	131
2003/2004	11	1	0	55	0	2	1	0	9	0	0	0	25	0	4	0	0	0	0	0	0	2	110
Smith Valley																							
2008/2009	10	0	0	56	0	4	15	0	15	6	0	0	4	1	1	0	0	0	0	0	0	0	112
2007/2008	0	0	0	34	0	0	7	0	5	3	0	0	1	0	4	0	0	0	0	0	0	1	55
2006/2007	18	0	1	81	0	11	3		16	2	4	1	16	1	7	0	2	0	0	0	0	1	164
2005/2006	no count																						
2004/2005	7	0	0	35	0	1	0	0	16	5	3	0	15	0	2	2	2	0	0	0	0	1	89
2003/2004	7	0	0	27	0	4	5	0	0	2	4	0	5	0	4	0	0	0	0	0	0	0	58
Diamond Valley/Eureka																							
2008/2009	0	0	0	8	0	2	94	0	8	4	1	0	1	0	3	0	4	0	0	0	0	0	125
2007/2008	0	0	0	2	0	0	18	0	4	2	0	0	0	0	1	0	2	0	0	0	0	0	29
2006/2007	1	0	1	17	0	9	94	0	3	4	0	0	0	0	5	0	3	0	3	0	0	0	140
2005/2006	22	0	1	27	0	14	72	0	47	5	0	0	2	0	10	0	0	0	0	0	0	3	200
2004/2005	5	0	0	7	0	2	50	0	14	5	0	0	0	0	1	0	0	0	0	0	0	1	86
2003/2004	0	0	0	0	0	1	26	0	1	1	0	0	0	0	1	0	1	0	0	0	0	1	32
Fallon																							
2008/2009	6	0	0	39	0	0	2	0	5	0	0	0	20	3	1	0	0	0	0	0	0	3	79
2007/2008	9	1	2	68	1	1	7	1	4	1	1	0	18	0	6	0	0	0	0	0	1	0	121
2006/2007	17	0	1	56	0	1	1	0	4	1	0	0	31	0	1	0	0	0	0	0	0	0	113
2005/2006	6	0	0	35	0	2	1	0	0	0	0	0	2	0	3	0	0	0	0	0	0	0	49
2004/2005	7	1	0	20	0	1	0	0	0	1	0	0	13	0	2	0	0	0	0	0	0	0	45
2003/2004	5	0	0	33	0	2	2	0	1	0	1	0	10	0	2	0	3	0	0	0	0	0	59

¹ NH = Northern Harrier; SS = Sharp-shinned Hawk; CH = Cooper's Hawk; RT = Red-tailed Hawk; HH = Harlan's Red-tailed Hawk; FH = Ferruginous Hawk, RL = Rough-legged Hawk; RS = Red-shouldered Hawk; UB = unknown buteo; GE = Golden Eagle; BE = Bald Eagle; UE = unknown eagle; AK = American Kestrel; ML = Merlin; PR = Prairie Falcon; UF = unknown falcon; GO = Great Horned Owl; LO = Long-eared Owl (*Asio otus*); SO = Short-eared Owl (*Asio flammeus*); BO = Barn Owl (*Tyto alba*); UO = unknown owl; UR = unknown raptor.

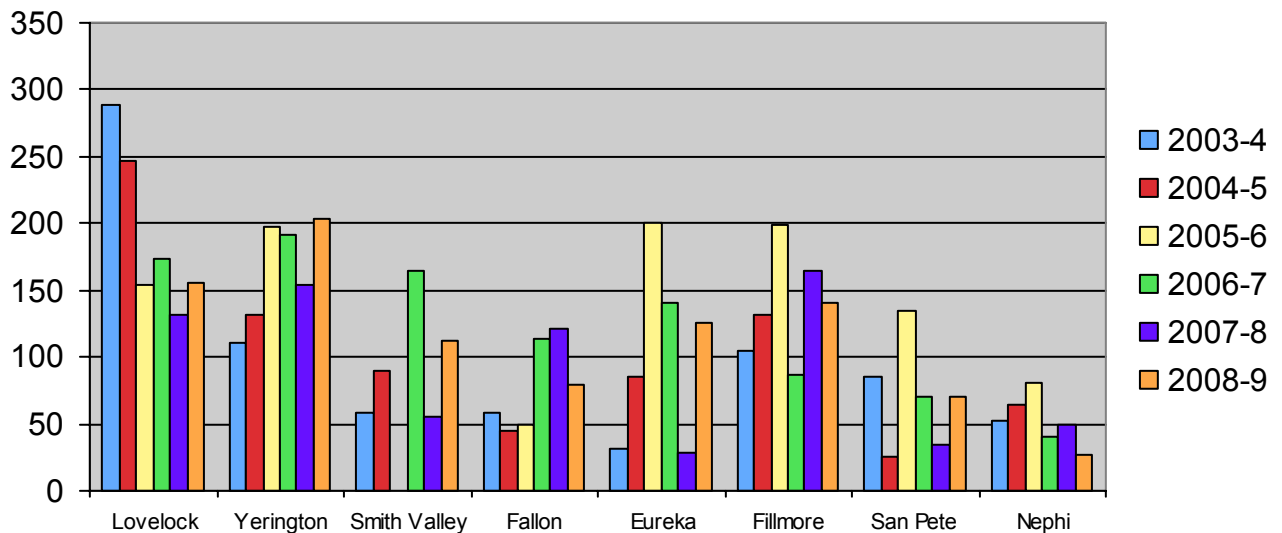


Figure 3. Total raptor counts in selected, major Nevada and Utah concentration areas during the past six winters.

Smith Valley (112). This winter’s total count ranked second highest for the past six winters, reflecting a marked contrast to last year’s low of 55 birds (Table 2, Figure 3). The count of Rough-legged Hawks (15) was more than double that of any of the previous five winters. A leucistic Red-tailed Hawk captured and banded here was the highlight of this area’s count (see cover photo).

Diamond Valley/Eureka (125). After last year’s very low count (29), this “Rough-legged Hawk capital of the Great Basin” contained 94 birds, equaling that of winter 2006/2007 (Table 2, Figure 3). Moreover, a comparison count conducted here for the first time a month earlier on 6 December 2008 yielded a total of 175 birds and a record number of Rough-legged Hawks (125; Table 1). Excluding the 1992 Lovelock roost count of 150+ birds, this is the highest number of Rough-legged Hawks recorded in one location in the 24 years of the study.

Fallon (79). As usual, the count here covered the area from Route 95 eastward about 10 mi to Stillwater. The western half of Fallon, though possibly containing another 35–50 raptors, is too congested and residential to permit a standardized route. This winter’s total count ranked moderate compared to the past five winters, but considerably lower than the past two winters, primarily reflecting fewer Red-tailed Hawks (Table 2, Figure 3).

Carson Valley (180). This winter’s total count (180) was the highest to date for this area, ranked second highest among all areas surveyed this winter, and included the highest count of Red-tailed Hawks (126) for any survey area (Table 1). Conducting a standardized count here is difficult due to sprawling development and congestion; accordingly, our coverage of the area has been intermittent. The Great Basin Bird Observatory also surveys this area regularly.

Ruby Valley (17). We recorded only 17 birds here this winter, which is many fewer than during the last count conducted here in January 2006 (46); however, nine of this winter’s birds were Golden Eagles, which ranked as the second highest total for this species among this year’s survey areas (Table 1).

Utah Highlights

Pahvant Valley/Fillmore (140). This winter's total count was slightly above average, but included roughly four times more Bald Eagles (29) than in any of the previous five winters (Table 3, Figure 3). In contrast, for the second time in the past six winters, we recorded no Northern Harriers in the area, with a high of 29 birds recorded in 2005/2006. This winter's count of Rough-legged Hawks (21) was more than 50% lower than last winter's high count of (45), but still ranked second highest for the past six winters. The count of 8 Ferruginous Hawks was the second lowest in six years and more than seven times lower than the previous high count (57) in 2005/2006.

San Pete Valley (71). This winter's total count ranked about average for the past six winters, with Red-tailed Hawks (9) less common than usual for the second consecutive year, Rough-legged Hawks (7) relatively common for the area, and Bald Eagles (35) present in average numbers (Table 3, Figure 3).

Nephi (27). This year's total count was the lowest for the past six winters (Table 3, Figure 3). In particular, the count of only one Rough-legged Hawk stood in stark contrast to last year's high count of 17 birds (Table 3).

Table 3. Raptor counts by species in selected Utah concentration areas during the past six winters.

	SPECIES ¹																		TOTAL	
	NH	SS	CH	RT	HH	FH	RL	UB	GE	BE	UE	AK	ML	PR	UF	GO	SO	BO		UR
Pahvant Valley/Fillmore																				
2008/2009	0	0	0	54	1	8	21	6	5	29	0	9	2	5	0	0	0	0	0	140
2007/2008	12	0	0	42	1	13	45	14	2	7	2	10	0	7	0	10	0	0	0	165
2006/2007	0	0	0	40	2	5	13	0	6	8	1	5	1	2	0	0	1	0	3	87
2005/2006	29	0	0	40	0	57	16	18	8	6	0	15	0	7	0	0	0	0	0	199
2004/2005	4	1	0	67	0	16	13	9	5	6	0	5	0	0	1	3	1	0	0	131
2003/2004	8	0	0	48	0	13	17	16	2	5	0	8	0	3	0	2	0	0	0	105
San Pete Valley																				
2008/2009	2	0	0	9	1	1	7	2	2	35	2	7	0	3	0	0	0	0	0	71
2007/2008	0	0	0	7	0	0	3	1	3	17	1	1	1	0	0	0	0	0	0	34
2006/2007	0	0	1	28	0	0	1	1	7	23	1	3	1	5	0	0	0	0	0	71
2005/2006	9	1	0	44	0	6	2	1	8	47	0	14	0	2	0	0	0	0	0	134
2004/2005	species-specific records unavailable																		25	
2003/2004	2	0	0	15	0	0	9	10	6	38	0	5	0	0	0	0	0	0	0	85
Nephi																				
2008/2009	3	0	0	11	0	0	1	0	0	4	0	5	1	1	0	0	0	0	1	27
2007/2008	1	0	0	9	1	2	17	2	1	11	0	4	0	2	0	0	0	0	0	50
2006/2007	1	0	0	11	0	3	8	5	1	6	0	5	0	0	0	0	0	1	0	41
2005/2006	20	0	0	24	0	4	8	6	1	2	0	9	0	3	1	0	0	0	2	81
2004/2005	6	1	0	28	0	3	7	2	4	4	0	8	0	2	0	0	0	0	0	65
2003/2004	14	0	0	19	0	4	8	4	0	1	0	4	0	0	0	0	0	0	1	52

¹ NH = Northern Harrier; SS = Sharp-shinned Hawk; CH = Cooper's Hawk; UA = unknown accipiter; RT = Red-tailed Hawk; HH = Harlan's Red-tailed Hawk; FH = Ferruginous Hawk, RL = Rough-legged Hawk; UB = unknown buteo; GE = Golden Eagle, BE = Bald Eagle; UE = unknown eagle; AK = American Kestrel; ML = Merlin; PR = Prairie Falcon; UF = unknown falcon; GO = Great Horned Owl; SO = Short-eared Owl; BO = Barn Owl.

Short-term Trends

In Nevada, counts of most species increased at least slightly in 2008/2009 compared to the previous winter, except in Fallon. Most notably, Mason Valley/Yerington contained the highest total count of raptors anywhere in Utah and Nevada. Except for a moderate drop in 2007/2008, counts in this area generally have increased over the past six winters (Figure 3). In contrast, after dropping substantially in 2005/2006, the counts in Lovelock have remained relatively stable at moderate levels since then. In Smith Valley, this year's count was above average and, with the exception of last winter's low count, counts here appear to be on an increasing trajectory since 2003/2004 (Figure 3). Similarly, the count in Eureka (125) rebounded strongly again after a count of only 29 birds the previous winter (but still fell well short of the 200 birds counted in 2005/2006) and again counts here appear to be on an increasing, albeit unsteady, trajectory since 2003/2004. A similar scenario also applies to Fallon except that the counts there have been relatively high for the past three winters.

In Utah, the Pahvant Valley/Fillmore area has consistently contained the most birds of any surveyed area in the state (Figure 3). The 2008/2009 count ranked moderately high for the past six winters, with the recent high count occurring in 2005/2006, similar to Eureka, Nevada (Figure 3). Counts in San Pete Valley and Nephi showed similar peaks in 2005/2006; however, the 2008/2009 count in San Pete Valley was slightly above average, whereas the 2008/2009 count in Nephi dropped to the lowest level for the past six winters (Figure 3).

Red-tailed Hawks. Counts of this species increased at least slightly compared to the previous winter in seven of the eight major concentration areas in Utah and Nevada, and the patterns of interannual variation generally have followed the pattern for total counts in these areas except for the absence of pronounced peak in abundance in 2005/2006 in the Pahvant Valley/Fillmore area of Utah (Figure 4).

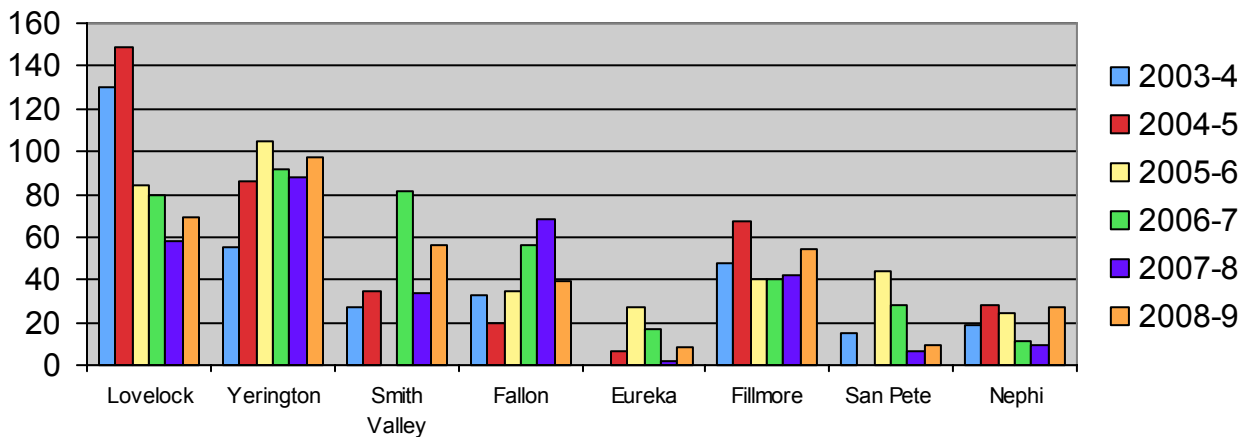


Figure 4. Interannual variation in counts of Red-tailed Hawks in eight major winter concentration areas in Utah and Nevada.

Rough-legged Hawks. Winter 2008/2009 was a good year for Rough-legged Hawks, with counts among the highest to date since 2003/2004 in all areas except Fallon, Nevada and Nephi, Utah (Figure 5). The apparent shift eastward into Utah that occurred the previous winter—when the total for three major areas in Utah (65) surpassed the total for five areas in Nevada (55) for the first time—was reversed this winter. Nevada's total for the five study areas in 2008/2009 (148) increased 70% compared to the previous winter, whereas Utah's total count for the three areas (29) declined by approximately 50% to more usual levels. In particular, Eureka, Nevada regained its usual position with the greatest abundance of Rough-

legged Hawks (94), after a dismal showing of only 18 birds in 2007/2008. Among the eight major Utah/Nevada sites, this year's total of 177 Rough-legged Hawks exceeded the previous high since 2003/2004 of 140 birds by 21%. As noted previously, of particular interest in this regard was the count of 125 birds recorded in Eureka, Nevada a month earlier than the usual survey period, which is the highest total survey count of this species ever recorded during this study in a single location (again except for the higher roost count of 150+ birds in Lovelock during 1992).

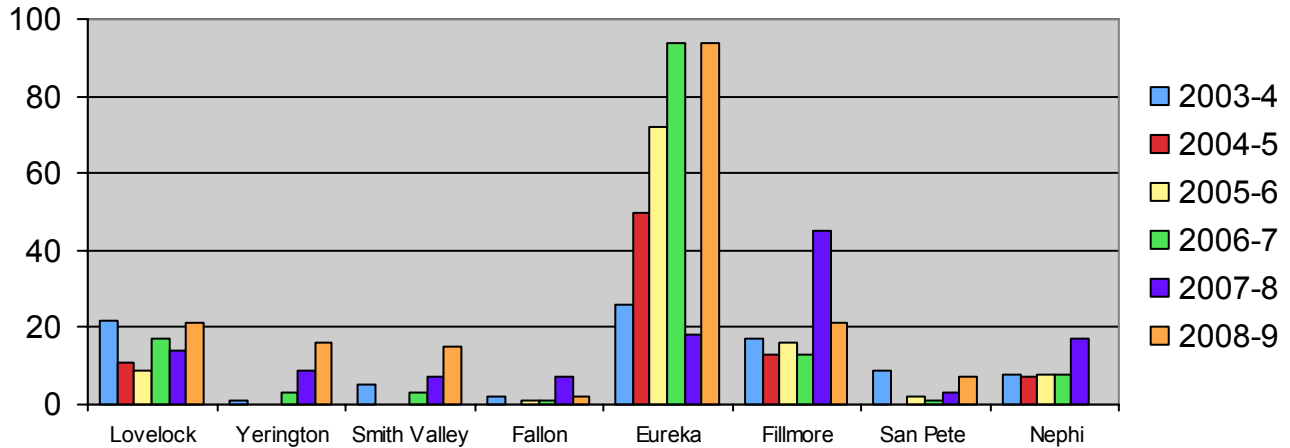


Figure 5. Interannual variation in counts of Rough-legged Hawks in eight major winter concentration areas in Utah and Nevada.

Ferruginous Hawks. The total 2008/2009 count of 32 Ferruginous Hawks across the eight major survey areas was 23% higher than the previous winter, primarily reflecting a high count of 12 birds in Yerington, Nevada (Figure 6). The season's total was still much lower, however, than the total count recorded just in Fillmore, Utah during 2005/2006 (57), with the 2008/2009 count there a comparatively dismal 8 birds, similar to 2006/2007 (5 birds; Figure 6). The Yerington, Nevada counts have shown a gradual increasing trend since 2003/2004, whereas the counts in Lovelock, Nevada, and Nephi, Utah have been declining (Figure 6).

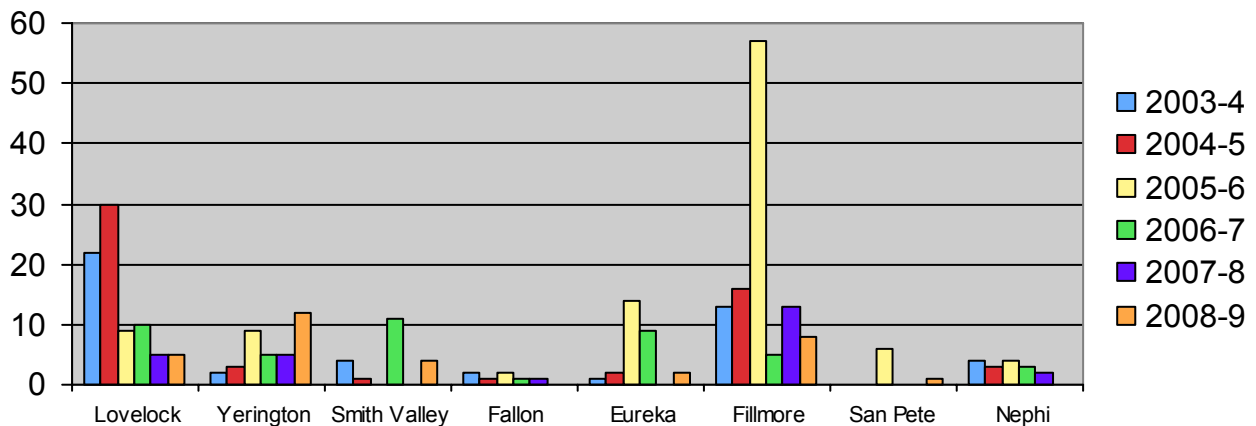


Figure 6. Interannual variation in counts of Ferruginous Hawks in eight major winter concentration areas in Utah and Nevada.

Red-shouldered Hawks. Our surveys recorded two rare (but recently increasing in frequency) sightings of Red-shouldered Hawks in Nevada in 2007/2008, but none in 2008/2009.

Northern Harriers. Counts of this species rose sharply across all three of the major survey areas in Utah and in Eureka, Nevada in 2005/2006, but were well below average in all of these areas in 2008/2009 (Figure 7). In contrast, 2006/2007 generally was a peak year for this species across the other Nevada survey areas and 2008/2009 an average year. More generally, counts of this species have shown high interannual variability but no obvious overall increasing or decreasing trends across the eight major concentration areas in Utah and Nevada (Figure 7).

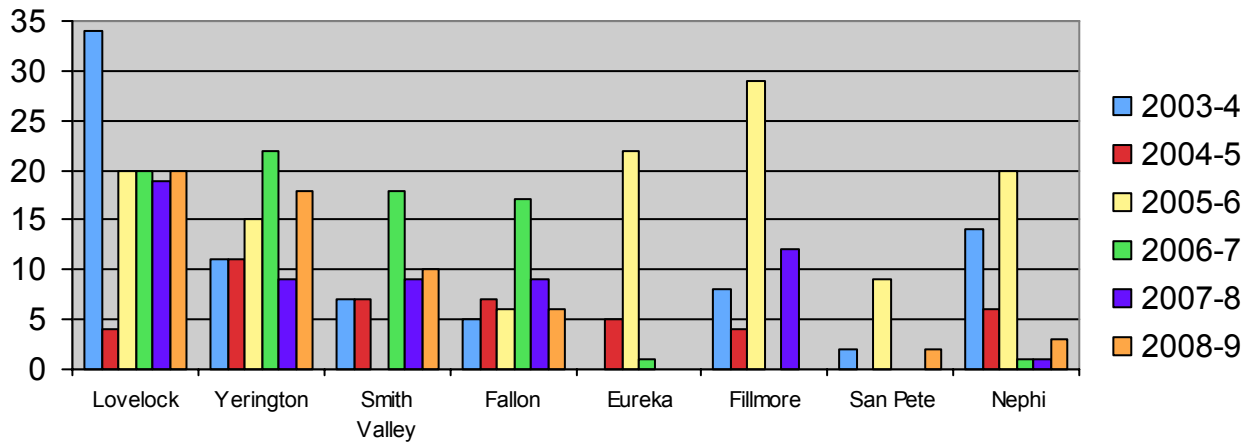


Figure 7. Interannual variation in counts of Northern Harriers in eight major winter concentration areas in Utah and Nevada.

American Kestrels. The 2008/2009 counts of this species were average to above average in most survey areas (Figure 8). Similar to Northern Harriers, peak counts during the past six winters occurred in 2005/2006 in Utah and Eureka, Nevada, but were higher in 2006/2007 in all other areas of Nevada except Yerington (Figure 8). With the exception of an unusual, dismal showing in 2005/2006, counts of this species generally have been increasing in Fallon, Nevada, but have shown no definitive trends elsewhere.

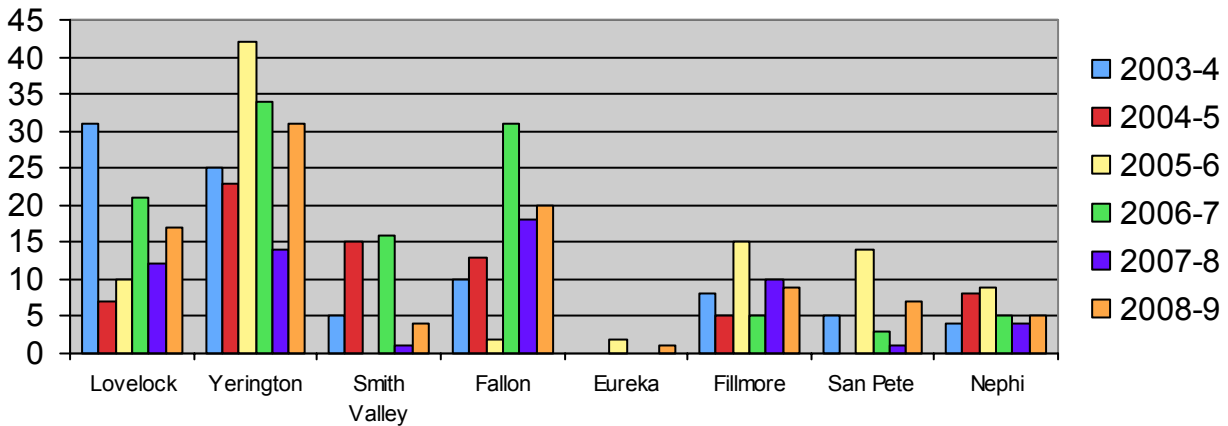


Figure 8. Interannual variation in counts of American Kestrels in eight major winter concentration areas in Utah and Nevada.

Prairie Falcons. As was true for kestrels, counts of this species were average to above average in a majority of the survey areas in 2008/2009 (Tables 2 and 3). In addition, similar to several species, spikes in abundance occurred in most areas of Utah and in eastern Nevada (Eureka) in 2005/2006, whereas substantial spikes in abundance occurred during 2006/2007 in two areas of western Nevada. Otherwise, this species shows a common pattern of reduced abundance in the Lovelock area after 2004/2005, but otherwise no distinct overall trends in abundance.

Golden Eagles. The tallies of Golden Eagles across Nevada and Utah in 2008/2009 were about average, except for a high count of six birds in Smith Valley, Nevada (Table 2) and a low count of two birds in San Pete Valley, Utah (Table 3). No distinct overall trends are apparent in the data for this species, but it is again noteworthy that counts either rose to distinct peaks in 2005/2006 or were at least among the highest recorded since 2003/2004 in two of three Utah survey areas and in Eureka, Nevada.

Bald Eagles. Bald Eagles typically are scarce across the Nevada survey areas and 2008/2009 was no exception (Table 2). In contrast, the species occurs regularly in modest numbers in all three of the major Utah survey areas (Table 3). No distinct overall trends are apparent in the data collected since 2003/2004, but the 2008/2009 count of 29 birds in the Pahvant Valley/Fillmore area was noteworthy in being almost four times higher than during any of the previous five winters.

Owls. Sightings of owls were uncommon in 2008/2009, with only six Great Horned Owls seen in Nevada and none in Utah, and no Barn Owls, Short-eared Owls, or Long-eared Owls encountered anywhere.

Distribution of Species

Among eight regularly surveyed areas, the highest average species-specific counts over the past six seasons were (in descending order of abundance within species):

Northern Harrier	Lovelock, NV, Yerington, NV, Fillmore, UT
Red-tailed Hawk	Lovelock, NV, Yerington, NV, Fillmore, UT
Ferruginous Hawk	Fillmore, UT, Lovelock, NV
Rough-legged Hawk	Eureka, NV, Fillmore, UT, Lovelock, NV
Golden Eagle	San Pete, UT, Fillmore, UT, Eureka, NV
Bald Eagle	San Pete, UT, Fillmore, UT, Nephi, UT
American Kestrel	Yerington, NV, Lovelock, NV, Fallon, NV
Prairie Falcon	Lovelock, NV, Yerington, NV, Fillmore, UT

Lovelock Roost Dynamics

Following identification in 1989 of the Lovelock, Nevada area as the most substantial wintering area for raptors in the Great Basin (until 2005/2006), we have monitored since 1991 a unique multi-species communal roost located in a 2-ha (5-acre) grove of cottonwood trees ~4.8 km (3 mi) south of town on Reservation Road. This grove of trees apparently has not been altered nor has there been any apparent change in agricultural practices near the grove in the past 19 years. Rough-legged and Ferruginous Hawks are the most common users of the roost, with Red-tailed Hawks and Great Horned Owls less common. Previously, the number of birds documented at the roost in a given winter ranged from a high of 200+ individuals in 1992/1993 (highest area census total to date) to lows of six birds in 2006/2007 (moderate census total) and none in 2007/2008 (well below average census total; Table 2). In 2008/2009, with the census total rising again back to a moderate level, at least a few birds (6 Ferruginous Hawks and 3 Rough - legged Hawks) again occupied the roost. One note of interest is the fact that, with dozens of trees to choose from in the roost, the Ferruginous Hawks always occupy the same two, adjacent cottonwood trees.

TRAPPING AND BANDING

We captured 30 raptors of six species between 25 December 2008 and 25 January 2009 (Table 4). We transported one previously injured Red-tailed Hawk to a rehabilitation facility in Salt Lake City, Utah.

Table 4. Raptors banded during December 2008 and January 2009 in Utah and Nevada.

SPECIES	AGE	SEX			TOTAL	COMMENT
		M	F	U		
Rough-legged Hawk	HY	2	1	–	3	
	SY	1	1	–	2	
	ASY	3	2	–	5	
	TY	1	0	–	1	
	ATY	2	0	–	2	
Subtotal		9	4	–	13	
Red-tailed Hawk	HY	–	–	3	3	
	SY	–	–	1	1	
	AHY	–	–	2	2	one leucistic
	ASY	–	–	2	2	
Subtotal		–	–	8	8	
Ferruginous Hawk	SY	–	–	1	1	dark morph
	ASY	–	–	2	2	
Subtotal		–	–	3	3	
Prairie Falcon	HY	–	1	–	1	
	SY	–	1	–	1	
	ASY	1	1	–	2	
Subtotal		1	3	–	4	
Cooper's Hawk	ATY	0	1	–	1	
American Kestrel	ASY	1	0	–	1	
TOTAL		11	8	11	30	

¹ HY = hatch year; SY = second year; AHY = after hatch year; ASY = after second year; TY = third year; ATY = after third year.

Collection of Biological Samples

We collected feather and blood samples from most birds banded this winter. We sent these samples to Josh Hull (University of California at Davis) for a genetic study and to Chris DeSorbo (BioDiversity Research Institute [BRI], Gorham, Maine) to facilitate his study of contaminants (toxins and heavy metals, especially mercury and lead) in raptors. Previous feather samples provided to Mike Schindlinger (Lesley University, Cambridge, Massachusetts) to facilitate his ongoing study of endocrine disruptors in birds will now be archived by BRI for future examination. Pending available funding, BRI is holding these samples for broader analyses; e.g., a full metal scan. BRI also sent blood swabs to Buffalo State University for consideration in other ongoing genetic research.

Among three birds analyzed thus far for contaminants, the mercury levels in a Rough-legged Hawk (0.608 ppm), a Ferruginous Hawk (0.175 ppm), and a Harlan's Hawk (4.514 ppm) were below the level above which adverse effects are predicted, but note the much higher concentration in the Harlan's Hawk.

DISCUSSION

With six years of standardized counts in eight major winter concentration areas completed, some noteworthy patterns are now evident:

- For the second time in six years, Yerington, Nevada, contained the greatest population of wintering raptors in the Great Basin, surpassing Lovelock, Nevada as the former highest concentration area.
- In the last four years in Nevada, a distinct southward shift of abundance from Lovelock to areas south has occurred, despite no obvious change in land-use practices in the Lovelock area.
- Last year an apparent eastward shift in abundance of Rough-legged Hawks from Eureka, Nevada, to Fillmore, Utah occurred for the first time in the history of the survey, but that pattern reversed again in 2008/2009, when this species was present in record-high numbers in five Nevada areas but was back to average numbers in Utah.
- This winter's count (913) of the major eight areas, an increase of 19% over last year's record low, is attributable to a return to average numbers of Red-tailed Hawks and American Kestrels in most areas, and record-high numbers of Rough-legged Hawks in seven of the eight major areas surveyed.
- Most species showed patterns of increasing abundance from 2003/2004 through either 2005/2006 (high peaks common in Utah and eastern Nevada) or 2006/2007 (high peaks more common in western Nevada). Then in most areas and for most species, counts dropped again over the next 1–2 years but generally recovered again to at least moderate levels in 2008/2009. This pattern of recent ups and downs appears to correlate with variation in regional drought severity (e.g., see Figure 9). A major drought began plaguing the Intermountain/Great Basin region in 1999; 2003 was the most severe drought year; 2005 finally saw a substantial, albeit temporary, return to favorable snowpacks and spring rains; but then severe drought conditions returned by 2007 and generally continued through 2008. Thus, the peaks in abundance of winter raptors during 2005/2006 correspond to the initial return of favorable moisture levels and the delayed response in some areas until winter 2006/2007 may reflect a lag-effect associated with prey populations requiring a year to recover substantially after the return of favorable conditions. Such a pattern also emerged in nesting ecology data collected during the past decade in northwest Utah (Smith and Slater 2009), and long-term data from the Goshute Mountains Raptor Migration Project site in northeastern Nevada also show prominent drought-related trends in counts of most species of migrating raptors that pass through this region (Hoffman and Smith 2003, Smith et al. 2008).

CONCLUSION

These oases in the high desert, refuges for upwards of 1,000 wintering raptors, are worthy of more attention than our annual visits. To monitor these winter populations more accurately, a monthly if not weekly winter census would undoubtedly be more effective than our one-time visits each winter. Indeed, this past winter a comparison count in Eureka, Nevada, conducted for the first time a month before the main census, revealed a record-high number of Rough-legged Hawks in that location, confirming the value of additional surveys. To this end, we continue actively seeking to enlist the support of local birders and biologists for the expansion of future surveys, and continue working to promote and increase awareness of this significant population. As of this past winter, there are now several experienced individuals with the interest, familiarity, and capability of conducting future surveys in the study area. Finally, the increased interest in the collection of biological samples, and early evidence of high mercury levels in one of the three biological samples analyzed thus far, demonstrates the potential and increasing value of our trapping and banding operations.

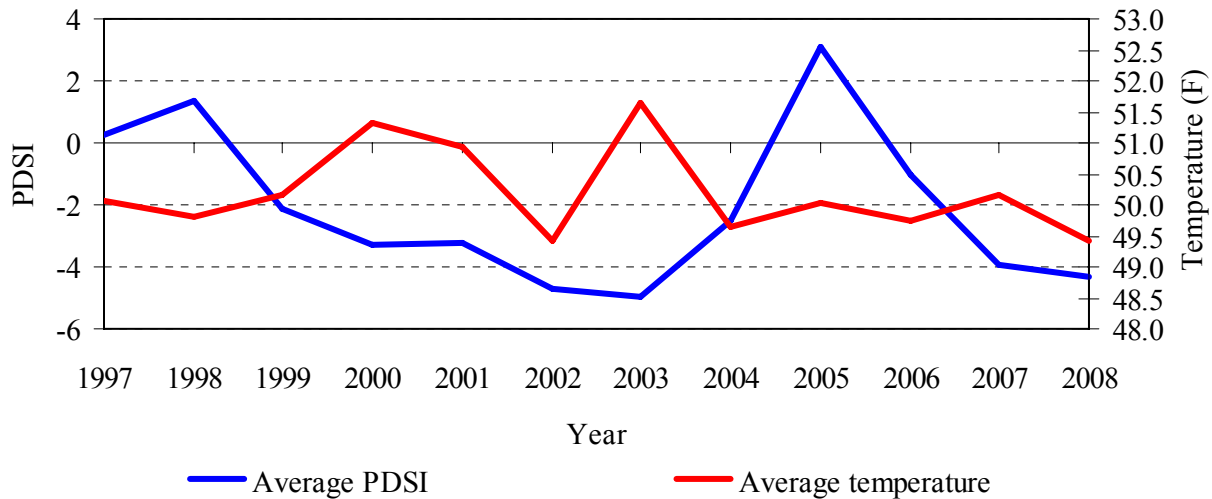


Figure 9. Variation in annual average drought severity (Palmer Drought Severity Index [PDSI] and ambient temperatures in the NOAA western climate division (see <http://gis.ncdc.noaa.gov/website/ims-cdo/div/viewer.htm>) of Utah from 1997–2008.

ACKNOWLEDGMENTS

The generous support of the Charles Blake Fund of the Nuttall Ornithological Club once enabled this year's effort and ensured its success. The survey and banding operations also could not have been conducted without the invaluable participation of several individuals, including Jeff Smith, Science Director at HawkWatch International, who assisted Mr. Hinde with surveys in Nevada and Utah; Soheil Zendehe of Lexington, Massachusetts who assisted in Nevada; Jeff Johnson and Joe Barnes of Las Vegas, Nevada, who conducted the early comparison count in Eureka, Nevada and assisted again in Nevada a month later; LeRoy Fink of Burley, Idaho, who assisted in Utah for his third season; Bob Walters, Nongame Specialist, and Keith Day, Southern Region Biologist, both with the Utah Division of Wildlife, who assisted in Utah; and Robbie Knight and Maggie Peters, biologists from the Dugway Proving Ground, who assisted in Utah. Many thanks to Joanne Stoddard of Salt Lake City, Utah, for caring for the injured Red-tailed Hawk we trapped. Lastly, many thanks to Art and Deb Sandack of Salt Lake City, Utah, for again providing generous hospitality for Mr. Hinde and his grumpy dog, Dodger.

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