

PEREGRINE FALCON MONITORING PROJECT

SITES 111 AND 88

BIG BEND NATIONAL PARK, TEXAS

February 18 - March 23, 1988

Harlan Doty and Penny Myers

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Big Bend National Park, Texas

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INTRODUCTION

This report documents the results of a 5 week study of courtship behavior of two pairs of Peregrine Falcons at Big Bend National Park (BBNP), Texas. The objective of the field work was to document the normal breeding behavior of the two pairs between February 22 and March 23, 1988, and to determine if the pairs were being disturbed by human activities within the park. Both pairs changed locations of activity more than once during the five week observation period. It was not determined if this was normal courtship behavior for the pairs. Detailed records of possible disturbances were kept in hopes that future observers may find them useful in determining normal and disturbed behavior of the pairs. Eyrie records (B. McKinney, 1985) show that pair 111 exhibited similar behavior in 1985, but no in-depth records of pair 88 exist for comparason. Definite eyrie locations were not determined for either pair by the end of the observation period.

SITE 111

The specific objectives of intensive monitoring at Site 111 were to determine normal breeding behavior of Pair 111, to determine if the building construction in progress in the Chisos Basin was disturbing the pair, to pinpoint the exact eyrie location for future display to park visitors, to document any unusual or disturbed behavior by the pair, and to inform park staff if violations of closure regulations were occurring.

Observation of Site 111 began on 02/18/88 and continued through 03/24/88. Observations lasted 9-11 hours per day, 6 days per week, for a total of 281½ hours. The observation point (OP) was located southeast of the Basin Lodge, between Casa Grande Peak and the main construction site below the Basin Lodge. The OP was a little over ¼ mile below the base of Casa Grande Peak and approximately ¼ mile above the construction site, between the two points. A 25-60 power spotting scope and 10x25 power binoculars were used for observations. The distance was too great for the binoculars to be of much use.

BREEDING CHRONOLOGY:

On 17 February, Kelly Hogan of the Chihuahuan Desert Research Center (and principal Peregrine Falcon researcher, BBNP), pointed out the historic location of Eyrie 111 on the west face of Casa Grande Peak. He said that the female had recently been observed in the eyrie hole.

By 21 February several perches on the cliff face had been noted and the pair were observed to be active in the area, but there was no further sign of them using the historic eyrie hole. During the period of 21 through 25 February, courtship appeared to be progressing

normally with displays of mutual flights, prey transfers, and both birds perching for long hours on the west face of the cliff. Courtship vocalizations were not audible from the OP during construction hours.

On 25 February the first observed attempt at copulation occurred. Copulations were observed daily between the dates of 29 February and 7 March (see Table C), and both Peregrines were often at or in the vicinity of a specific ledge called the "WWC" ledge. The female would sometimes move back out of view behind the rim of the WWC ledge.

On 9 and 10 March the pair's behavior changed. After watching them perch or fly for hours on the west face of Casa Grande Peak, they suddenly became less visible. They were only visible for a few minutes while passing through the area towards the north end of the cliff.

From 11 through 15 March the Peregrines were again occupying the west face of Casa Grande. Their activities included prey transfers, mutual flying, and long hours of perching on the cliff face. They were visible in the area for the entire observation period each day. Two copulations were observed on 13 March.

The female began spending many hours at the WWC ledge 15 through 19 March. She was visible there at first light, for many hours throughout the day, and at the end of daily observation hours. It appeared that she was staying on the ledge during the nights. The ledge appears to extend a good distance back under the overhanging cliff face and many times the female moved back out of view there. The male some-

times landed at the WWC ledge and walked back out of sight for brief periods. Several prey transfers occurred at this ledge. Judging by the behavior of the pair, it was thought that they had chosen the WWC for an eyrie site.

A change in behavior occurred 20 through 24 March. The pair stopped using the WWC ledge. The female had been spending all daylight hours at or in close vicinity of the ledge.

On 20 March there was no sign of either Peregrine in the area until 0935 hours when both landed at the WWC ledge then immediately flew away. The female entered the area 2 more times for prey transfers, staying only briefly. At nightfall she was perched away from the area. Also on this date, the female was observed in the historic eyrie hole for the first time since starting observations on 18 February.

On 22 March the Peregrines were flying together in the area for 60 minutes in the morning, and again for 10 minutes in the afternoon, otherwise there was no sign of them all day during 9 hours and 11 minutes of observation.

On 23 March the pair were flying together in and out of the area and were only seen for 16 minutes during 10 hours and 20 minutes of observation.

The Peregrines were flying and perching intermittently on the north end of the cliff during the morning hours of 24 March. Observation of Site 111 terminated on this date.

POSSIBLE DISTURBANCES:

One of the main purposes of intensive monitoring at this site was to determine if the construction work in the Basin housing areas was effecting the breeding behavior of the pair at Casa Grande Peak. Construction noise levels varied from week to week. Loud drilling, which occurred during a couple weeks of the study, was audible at the top of the Pinnacles Trail above the Basin, other sounds such as hammering and shouting, did not carry as far. Construction noise continued from 0800 to 1800 daily, six and sometimes seven days per week, during the entire observation period (2/18-3/24). No visible or audible responses by the Peregrines, to any specific noise or activity, were observed. No in-depth records of the pair's previous normal behavior exist in Big Bend National Park records, but it is thought this pair is habituated to a certain level of vehicle and people noise which occurs year-round in the Lodge area. The Lodge is located approximately $\frac{1}{2}$ mile below the eyrie cliff.

On 7 March, seven hikers were observed at the base of the west face of Casa Grande Peak, directly below the perched female. The female remained perched throughout the entire period hikers were visible and after they moved out of the area. No vocal response or flight occurred in reaction to the hikers in the closure area.

On several occasions other raptors passed through the area ^{where} the Peregrines were active. No pursuit or vocal response was noted between the Peregrines and other raptors (see Table D). Although most vocalizations were not audible during construction hours, the female's loud food wailing when chasing the male during prey transfers, was

audible. It is possible the Peregrines will become less tolerant to other raptors during certain periods of the breeding cycle (Ball, 1987).

On two occasions aircraft flew very close to the closure area, and less than 1,000 feet above Casa Grande Peak. On 7 March, at 1434 hours, a small jet flew through the Chisos Basin at an elevation just above the base of Casa Grande Peak; and on 11 March a 4-engine plane flew by the base of Casa Grande and out "The Window" of the Basin. No reaction by the Peregrines was observed.

DISCUSSION:

In summary, there was an 8 day period when the pair were observed copulating one or more times per day and actively using a specific area (the WWC ledge) on the west face of Casa Grande Peak, followed by 2 days of practically no use of the area. This pattern seemed to be repeated later, when the pair spent 10 days active and visible in the vicinity of the WWC ledge, followed by an abrupt change of almost no activity in the area for the following 4 days. After 24 March observation of Site 111 ended.

Peregrine falcon behavior at Site 111 can be interpreted various ways when only intermittent observations are made. For example: For many days the female at Site 111 spent hours back out of view on the WWC ledge, receiving prey transfers and visits from the male, and it was thought possible she had chosen this location as an eyrie site. The abrupt discontinued use of the area later, could appear to be an egg failure or eyrie abandonment. McKinney documented similar behavior by the pair using Site 111 in 1985.

In 1985 one young fledged from the Casa Grande Eyrie. B. McKinney estimated the date of egg laying as 3 May. Prior to this, it appeared the female Peregrine had already started incubating eggs around 22 March. "On 28 March, the falcon could be seen walking around in the eyrie and hunting. Jim Enderson, Bill Heinrich and myself watched the eyrie that afternoon and the falcon would enter the eyrie but leave shortly, we also watched both birds enter the eyrie and the falcon fly out, their behavior was erratic and we thought she may have broken her eggs, we also witnessed copulation between the pair." (B. McKinney, 1985) McKinney's data is based on 33 visits to the site between 18 February and 28 June, 1985.

After witnessing similar behavior with the pair at Site 111 in February and March of this year, I called Bill Heinrich of The Peregrine Fund. Heinrich stated that Peregrine pairs may move from area to area during courtship right up until the point eggs are laid.

In conclusion, continued intensive monitoring may prove that moving from area to area during courtship is a normal, not disturbed behavior for this pair of Peregrines. The behavior of this pair has not previously been intensively monitored throughout the entire breeding period. Continued in-depth observations of this pair throughout the 1988 breeding season would be a valuable tool for park managers.

PEREGRINE FALCON PREFERRED PERCHING SITES

SITE 111 - 1988

NOSE PERCH - Both PFs have used the upper part of the nose perch during later stages of courtship. However, the female used it more than the male. Several copulations took place on the upper part of the "nose". Female often perched there to eat.

WWC LEDGE - Both PFs used this perch. Several prey transfers took place there. The female spent the night at this perch twice and at one point, it appeared she was on eggs there.

STICK PERCH - This perch used exclusively by the female PF. She fed there several times. Several copulations took place there, and the female perched for long periods of time (4.5 hrs.) there.

HISTORIC EYRIE - Female entered the old eyrie site only twice during observation of Site 111. Both occasions were in late March and walking around in the site was her only activity while there.

TABLE A

Mutual Flights - Pair 111

<u>Date</u>	<u>Time</u>
02/26/88	1325-1539, 1655
02/27/88	1325-1539
02/28/88	1241-1245
03/06/88	1641
03/07/88	0820-0828
03/08/88	0829-0834, 0901, 0920-0930
03/11/88	0715
03/13/88	1347
03/16/88	0730
03/19/88	1405
03/22/88	0706-0708

TABLE B

Prey Transfers - Pair 111

<u>Date</u>	<u>Time</u>
02/21/88	1816
02/25/88	0920
03/04/88	1239, 1703
03/09/88	1359 at WWC
03/13/88	1300, 1635
03/15/88	0834
03/16/88	0744, 1321 at WWC
03/17/88	1220 at WWC
03/20/88	1845

TABLE C

Copulations - Pair 111

<u>Date</u>	<u>Time & Location</u>
02/25	1408 stick perch (male's first attempt)
02/29	1252 trees center of cliff
03/01	1240 stick perch; 1245 above stick perch
03/02	0854 nose perch
03/03	0832 0856, 1348, nose perch; 1810 below base of nose
03/04	0729 1814, nose perch
03/06	1253 trees at center of cliff
03/07	0840 1835, nose perch
03/09	0709 stick perch
03/10	1843 below nose
03/13	1344 stick perch; 1645 the nose perch
03/17	1245 below WWC ledge

TABLE D

Other Raptors - Site 111

<u>Date</u>	<u>Time & Location</u>
02/28	1158 Raven over SW end of cliff, no visible response
02/29	1630 Raven over SW end of cliff, no visible response
03/01	1507 Turkey Vulture fly by area, no visible response
03/02	1711 5 Turkey Vultures over cliff, no vis. resp.
03/08	1634 Red-tailed hawk, over cliff area, no vis. resp.
03/10	1525 RT over Nend of cliff, PF fly by, no visible resp.
03/19	1820 Vultures fly by at eyrie level, no vis. resp.
03/22	1328 4 Ravens cross cliff top, no vis. resp.
	1337 TV flies mid-cliff level, no vis. resp.
	1822 10 TVs in cliff area, no visible response
03/23	1510 4 Ravens fly across top of cliff, no vis. resp.

SITE 111 (2/18-3/24, 1988)

TALBE E

Visitors to Closure Area - Site 111

<u>Date</u>	<u>Time</u>	
03/15	1300-1400	7 people in closure area at base of cliff below WWC area, no observable response by PFs.

TABLE F

Aircraft in Closure Area - Site 111

<u>Date</u>	<u>Time</u>	
03/07	1434	Small jet low in area
03/11	----	4-engine aircraft low in area, exits through "Window"

TABLE G

National Park Service Weather Records:

Chisos Basin 02/18/88-03/24/88

<u>Date</u>	<u>High</u>	<u>Low</u>	<u>8 AM</u>
2/18	54	33	35
2/19	51	35	41
2/20	52	28	28
2/21	54	28	35
2/22	67	51	55
2/23	64	37	38
2/24	64	41	43
2/25	67	45	46
2/26	68	45	48
2/27	72	48	52
2/28	73	49	52
2/29	72	51	60
3/1	74	54	58
3/2	65	51	52
3/3	54	35	35
3/4	60	36	37
3/5	66	37	45
3/6	68	45	53
3/7	70	49	53
3/8	55	41	44
3/9	60	41	44
3/10	74	34	59
3/11	73	54	54
3/12	63	40	45
3/13	62	40	43
3/14	53	30	37

<u>Date</u>	<u>High</u>	<u>Low</u>	<u>8 AM</u>
3/15	65	34	40
3/16	67	40	44
3/17	60	43	47
3/18	47	21	22
3/19	58	22	30
3/20	69	30	39
3/21	74	37	50
3/22	76	48	62
3/23	77	51	53
3/24	83	52	66

SITE 111 (2/18-3/24, 1988)

TABLE H

Notes of Interest - Site 111

Date

03/01/88 Possible scrape at WWC ledge by female, 1541-1543

03/03/88 Female perches at WWC ledge for night (stop obs at 1845, lighting very poor)

03/06/88 Both PFs in WWC ledge, possible scrape there, female using horizontal stance in WWC at 1551

03/08/88 first day PFs spend away from area, spend most of day on NE end of cliff

03/09/88 Female perch in WWC 1504-1730, food transfer at WWC 1359

3/8-3/10 PFs change behavior, spend most of their time on N end

03/11/88 Female fly back and forth at WWC ledge, & perch there for night

03/15/88 7 people below cliff in closure area, PFs in & out of WWC all day, no response to people in area for approx. 1 hr., female stays at ledge for night

03/16/88 Female at WWC at daybreak, 0715 she moves back down inside ledge out of view, 0828, back out to front, 1323 - male to WWC and back out of view inside, then leaves, Female moves back out of view, catch glimpses of her occasionally - stay the night ?

03/17/88 0701-0759 female at WWC, 1205-1245 female perched just below WWC eating, 1516-1840 (dark), female at WWC (stays the night)

03/18/88 0655-0935 Female at WWC, sometimes back out of sight, 1548 through 1648 Female at WWC, 1824-1835 Female at WWC at dark

03/19/88 0654-0736 Female at WWC, 0721 Male lands at WWC and sits for a moment

03/20/88 Female enters HISTORIC eyrie hole for first time.

3/22-3/24 PFs change pattern- do not use known perches, fly around

The primary objective of intensive monitoring of eyrie site 88 was to enforce closure regulations in the area. Secondary goals were to determine the exact location of the eyrie within the closure area, and to document breeding behavior of pair 88.

Observation of site 88 began on 02/22/88 and continued through 03/23/88, for a total of 228 hours. Observation of the site averaged 8.5 hours daily, 6 days per week. Several observation points were used, varying from 200 feet to $\frac{1}{2}$ mile in distance from the areas the pair were active. In areas near to Peregrine activity, natural blinds were used but when observing from areas outside of the closure, no effort at concealment was made. A 60 power spotting scope and 9x25 power binoculars were used for observations. The trail closure area (approximately $\frac{1}{2}$ mile of trail along the southeast rim of Chisos Basin) was patrolled for tracks or any sign of closure violations at least once daily; and areas of the trail were swept clean so that any new tracks could be noted.

BREEDING CHRONOLOGY:

On 02/22/88 Kelly Hogan pointed out the possible eyrie ledge in an alcove towards the east end of the closure area, and a perch the male used in the vicinity. This area was thought to be the possible location of the 1988 eyrie and was closed to park visitor use on 02/01/88. A popular hiking trail passes approximately 100 feet directly above the ledge and continues along the top of the South Rim in either direction.

On 22 through 24 February the pair were observed in the "eyrie alcove",

engaged in various courtship behaviors including cliff racing, mutual flying, vocalizing with each other, and bowing and echupping at the eyrie ledge. A horizontal solicitation and prey transfer occurred at the eyrie ledge. During this time observations were made from a blind in close proximity to the eyrie ledge.

On 25 and 26 February the pair were observed using the area but fewer hours than the previous three days. The observation point was $\frac{1}{2}$ mile from the alcove and this may have effected the quality of the observations. Vocalizations were not audible from this farther point.

On 27 February NPS observer, Raymond Skyles, reported the pair active in the eyrie alcove throughout most of his observation hours (0700 through 1645 hours). One observation point used was on the rim of the eyrie alcove and the other was approximately $\frac{1}{4}$ mile west on the rim top. Skyles remained in open view during the observation hours and documented no apparent disturbance to the pair by his presence.

An abrupt change in behavior occurred on 28 February. There was no sign of the pair in the alcove vicinity during observation hours (0936 through 1645 hours). The observation point was located outside the closure area, approximately $\frac{1}{2}$ mile from the alcove.

During the week of 29 February through 3 March the Peregrines were spotted in the alcove vicinity only briefly two or three times per day. They soared together through the area along the rim.

On 4 through 7 March there was no sign of the pair in the area for

the entire observation period each day. Several observation points along the Southwest and Southeast Rim were used as well as those within the closure area.

On 8 and 9 March the male perched in the eyrie alcove for several hours in the afternoon, but there was no sign of the female. The male perched in clear view of the observer, approximately 200 feet across the alcove and at the same elevation as the observer. He left and returned to the same perch several times between short flights to the west. There were no vocalizations or other interaction with the observer.

The male and female Peregrine were visible soaring together in the alcove vicinity on 10 and 11 March. They vocalized briefly with each other while passing through the area.

There was no sign of the pair in the area for the entire observation period on 12 March.

For the following 10 days, 13 through 23 March, the pair were active in a new location, approximately $\frac{1}{4}$ mile west from the original area of activity in the alcove to the east. They actively courted each other and defended the new territory. One perch was used frequently and several copulations occurred there. Observations were made from a point approximately $\frac{1}{4}$ mile west of the area of activity, after a closer observation point proved to disturb the female.

POSSIBLE DISTURBANCES:

The primary purpose of intensive monitoring at this site was to

keep park visitors out of the closure area. In three instances tracks of illegal hikers were found in the closure area. *

On 15 March, five hikers set up camp in the west end of the closure area. At 1747 hours the female Peregrine was wailing from the pinnacle area. (The pair were active in that area, courting and driving Red-tailed hawks from the area). At 1750 both Peregrines were flying in the pinnacle area. The female continued to wail from the area and at 1800 the wailing became louder and more frequent. At 1809 the wailing stopped. Three people walked out of the west end of the closure area at 1810. They had been standing near the rim, approximately 1/8 mile from the pinnacle area, for the last several minutes. I contacted them and discovered they had been in the closure area since approximately 1500 that afternoon. I asked them to leave immediately.

On 17 March at 1303 hours, I discovered a fresh set of tracks going through the closure area from the east to the west end. No contact with the illegal hiker was made. Most likely, the hiker passed through the area while I was in a blind watching the Peregrines.

On 19 March at 1420 hours, K. Hogan and I passed through the closure area from the east to west end. At the east end of the closure Hogan continued on to the Basin and I returned to the west end of the closure after sweeping the trail clear of tracks. Hogan made contact with a group of 8 hikers headed in the direction of the closure area. He informed them of the closure in effect. (pers. comm. K. Hogan)

At 1550 eight hikers exited the closure area at the west end. I

contacted the hikers to find out why they were in the closure area. They said they were in the area less than 30 minutes and didn't stand on the cliff edge while passing through. There was a photographer in the group and it is probable that at least he stood on the edge to take pictures. It is unknown if any interaction with the Peregrines took place. Jim Webb, the leader of the group, assured me that, had they known the area was closed because of Peregrines, they would not have entered it. They passed by a sign and over barricades to enter the area.

Another possible source of disturbance to the pair was the presence of myself and other NPS contractors and employees in the closure area. I made daily trips through the closure area, but avoided standing on the rim or making loud noises. Toni Ruth, mountain lion researcher for BBNP, made weekly trips through part of the area, but she was less obtrusive than myself, leaving the trail entirely and cutting inland in the areas of Peregrine activity. On at least two occasions NPS patrols passed through the area on my days off, and two times Raymond Skyles, Resource Manager BBNP, took over the entire observation hours. The following are incidents which MAY have effected the pair of Peregrines at Site 88.

On 22 February, Kelly Hogan and myself set up an observation point in open view on the South Rim. This was my first day at the site and Hogan pointed out areas that the pair were active. We were above the alcove where the pair had been most active. There was no sign of the Peregrines during our stay there (approximately 3 hours).

At 1817 hours on the same day, I returned to the same observation

point. I was in open view on the rim approximately 200 feet from the "eyrie ledge". A Peregrine landed on the rim, approximately 150 feet across the alcove at eye level. The Peregrine, and possibly another, was wailing and echupping. I left the area immediately.

On 23 February I was in a blind near the same spot, at the alcove rim. The female wailed intermittently from a perch approximately 250 feet across the alcove and below me. She continued to wail intermittently for 55 minutes, followed by 45 minutes of preening, then 18 more minutes of wailing. After another 48 minutes of silence she began wailing again (still at the same perch) and when a raven entered the area she began to kak but did not pursue it.

On the same date at 1500-1513 hours, I stopped on the trail approaching the alcove and scanned the rim for sign of the Peregrines. A Peregrine flew from the rim directly to me. It passed approximately 20 feet overhead, then silently on out of sight. I was probably 100 yards from the alcove at the time.

On 27 February from 0700 to 1200 hours R. Skyles watched the pair from a point near the eyrie alcove. His impression was that the birds were aware of him during that time but did not seem to be disturbed by his presence. At 1200 he moved to a location farther away and watched until 1645. He noticed no difference in Peregrine behavior in connection with the location of his observation point.

On 8 March the male Peregrine perched approximately 200 feet across the alcove from me at eye level. I was in open view on the rim when

he landed at the perch. He left 3 times to the west and returned to the same perch each time. He spent a total of 2 hours and 25 minutes at the perch between 1200 and 1644. His activities were preening and looking around. I did not see the female on that date.

On 9 March the male repeated the same behavior, perching at the alcove for 2½ hours between 1254 and 1644 hours. Again, I was in open view at the rim when the male came into the area.

On 13 March I was near the rim above the pinnacle area (¼ mile west of the alcove). The female Peregrine flew into the area and began chugging as she circled just below my level. A second peregrine answered from below (no visual observation of the second). The female flew to the west out of view.

On the same date at 1551-1554 hours the female perched on a boulder approximately 50 feet below me and wailed while looking up directly at me. I left the observation point as quickly as possible. That was the first time I noted the pair using the area west of the alcove. Use of the area to the west continued throughout the observation period (23 March).

On 19 March, at 1000-1300 hours, K. Hogan and I observed the pair from partial concealment near the alcove. It is likely the Peregrines were aware of our presence. They were active in the alcove and pinnacle areas. They sometimes soared low above us as they passed between the two areas, but made no vocalizations.

On 21 March R. Skyles set up an observation point approximately 200 yards inside the west end of the closure area (directly above the pinnacle area), in open view at the rim top. The Peregrines were active in the vicinity intermittently throughout observation hours. On several occasions Skyles heard wailing and kaking from the pair, perched out of view below the observation point. At one point the pair chased a Red-tailed hawk from the area.

Peregrine falcon interactions also occurred with people outside the closure area.

On 25 February, at approximately 1200 hours, a Peregrine flew from east along the cliff face, directly to a group of trail crew workers seated along the Southwest Rim, approximately 3/4 mile to the west of the "eyrie alcove". The Peregrine was silent and passed by them approximately 20 feet away at eye level, then continued silently on past out of sight to the west. (pers. comm. AHS Volunteer Trail Crew members)

On 26 February, at 0948 hours, a Peregrine flew directly towards me. I was located in the same area that the trail crew used the day before. When the Peregrine came within 20 feet of me, it swerved to the side and passed by, moving below eye level. It continued into the west out of view. The Peregrine came from the alcove area.

At 1254 hours the same day, 3 Peregrines were vocalizing and touching talons, approximately 200 feet above and behind me. I was at the same observation point, outside the closure area, approximately 3/4 mile west of the alcove and on the cliff top edge.

On 10 March, at approximately 1630 hours, 2 hikers on the Southwest Rim saw a Peregrine falcon fly towards them from the east, along the rim, then up to eye level when it reached them. The Peregrine passed within 10 feet of the hikers and continued silently on out of sight to the west. (pers. comm. with hikers 11 March)

OTHER RAPTORS:

On 23 February at 1146 hours, both Peregrines engaged in mutual flying, then broke away from each other to stoop on 2 ravens which had been in the alcove area for several minutes. The ravens stayed in the area despite the stooping, kaking, Peregrines. Finally the Peregrines lost interest in harassing the ravens and flew out of the area together.

On 26 February, at 1254, three Peregrines were vocalizing and making contact with each other over the west end of the cliff. Two broke away and headed back to the eyrie alcove. The third flew out of view to the west.

On 27 February, at approximately 1230 hours, Noland Hissey (volunteer trail worker, NPS) observed, "...five boys flying kites at the intersection of the Southeast Rim and Boot Canyon trails. One of the falcons repeatedly dove at the kite. This action continued for approximately 45 minutes. He would dive a few times then rest on the cliff, then attack again. During this time a Red-tailed hawk flew close by and the falcon went at him, then back to the kites."

On 1 March, at 1344, I heard rapid kaking from below. I was observing from the cliff top just outside the west edge of the closure area.

(approximately $\frac{1}{2}$ mile from the alcove area) A Peregrine was chasing two Red-tailed hawks. The Red-tails flew into the cliff face below me and the Peregrine returned to the alcove area.

On 13 March, from 1423-1426 hours, three Peregrines were observed near the alcove area. Two females (by size) and one male were vocalizing and making contact in the air. The male and female stooped on the intruder female. All three flew out of view to the east. The female of the pair was doing the majority of the stooping on the intruder. At 1429, I was at the alcove rim and the female flew by, only 30 feet away at eye level. She continued silently out of view to the west along the cliff top.

On 20 March at 1540, the male and female were stooping on a Red-tailed hawk near the west end of the closure. All three birds were vocal. When the Peregrines stooped at the Red-tail, it would roll over with its talons extended. The stooping continued for 3 minutes, then the Red-tail flew out of view to the west below the rim. The Peregrine pair returned to the pinnacle area and immediately copulated . -

On 21 March, at 1546 hours, R. Skyles observed, "... Turkey Vulture comes around East rim in front of potential eyrie site.(referring to alcove, not pinnacle area) One PF gives chase, makes one pass, then a contact pass. TV flies away..."

On 22 March at 0836, the Female Peregrine stooped into the cliff face directly below my observation point at the Boot and Southwest Rim trail junction. Most likely she was stooping at a Red-tailed hawk which commonly used that area.

On 23 March, at 1027, the female stooped on a Red-tailed hawk just below the trail junction observation point (approximately $\frac{1}{4}$ mile from the pinnacle area).

AIRCRAFT:

On 28 February, a small aircraft flew very fast, west to east across the flats below the rim, in Dodson Spring area. (The spring is immediately below the closure area)

On 4 March two aircraft were in the area. At 1128 a 4-engine flew low over the Boot Springs area (less than 1,000 feet above rim). At 1400 a large millitary helicopter flew east to west below the rim, about half way between the cliff face and the Dodson Spring area. (This area is used regularly by the Peregrines.)

On 7 March two aircraft entered the area. At 1128 a 4-engine flew less than 1,000 feet above the Southeast Rim in the closure area. At 1400 an NPS contracted, single engine aircraft flew less than 1,000 feet above the closure area.

On 11 March at 1335, a 4-engine made 2 passes over the closure area, less than 1,000 feet above the rim.

On 21 March at 1237 a single engine aircraft flew over the Boot and Rim trails junction at approximately 1,000 feet elevation above the ground. (R. Skyles)

On 12 March a small white jet passed very low over the closure area.

DISCUSSION:

In summary, Pair 88 were actively courting in at least two separate areas during the 4 week observation period. There was a space of several days, between use of the first and second locations, when no observation of the pair occurred.

It is difficult to determine the extent people outside the closure area disturbed the Peregrines. On several occasions the male flew very close to people on the Southwest Rim, approximately $\frac{1}{4}$ mile outside the closure area. The male did not vocalize or stoop at people, but was obviously effected by their presence. On other occasions people used the same areas with no observable response by either of the pair.

The pair may have been disturbed by people within the closure area. There were times when I am sure they were aware of my presence, but did not vocalize or appear to react. On other occasions wailing vocalizations by the female were directed at me and at least twice, one of the pair flew very close by me, but did not vocalize.

Aircraft using the immediate area were a possible disturbance to the Peregrines. I observed no interaction between Peregrine and aircraft, but on five occasions aircraft flew low enough in the immediate vicinity of the pair's activities that physical harm to the pair could have occurred. Twice aircraft flew over the flood plane below the eyrie cliff, within $\frac{1}{4}$ mile of the cliff face. The area was often used by the pair.

If may be normal for Pair 88 to move to different cliff areas during courtship; or they may have changed locations because they were disturbed. It is interesting that the pair moved closer to an area of high visitor use. The area they moved towards was the junction of two popular hiking trails and a favorite lunch spot for large groups of hikers.

At this time, no detailed information exists in park files difining the normal or disturbed breeding behavior of Pair 88. In the limited time I observed them, I was unable to determine whether the pair were acting disturbed or progressing ^(normally) successfully in courtship. Continued observation of the pair throughout the entire breeding season should releal their specific breeding behaviors; which will help park managers determine what measures to take to promote sucessful nesting seasons. If it can be determined early in the breeding cycle that a pair are being dusturbed, park managers can take protective measures before an eyrie is lost.

MANAGEMENT RECOMMENDATIONS FOR SITE 111 and SITE 88

Intensive monitoring of specific Peregrine Falcon pairs, during entire breeding seasons, would be a very useful tool for BBNP Resource Managers. Monitoring for several seasons would be more realistic than basing management decisions on one season of observations or, as is done now, part of a seasons observations.

Except for Site 44, (Netherton, Johnson, Hunt 1978 CDRI, and Doty, Myers 1987) no previous in-depth record of each pair's normal breeding behavior exists in park files. The determination of normal breeding behavior for a specific pair is necessary base line information for comparason in determining changes in behavior due to disturbances (man-caused or natural) or health of the pair. The determination of actual or potential site abandonment or eyrie failure depends on knowlege of a specific pair's behavior and health.

Intensive monitoring enables observers to positively identify individual birds at each eyrie. Managers can then determine population dynamics such as age of the birds, changes in health and behavior, numbers of returning mature individuals versus influx of immature or new partners within the pairs at BBNP. The age of a pair can relate to fertility of their eggs and/or build up of toxins such as DDT in parent birds.

Another ma agement tool, especially in relatively accessible eyries such as Site 88, would be to test for eggshell thinning. Perhaps some eyrie failures have been due to the health of the breeding pair

(not human disturbance). Eggshell testing could answer the question of whether the pairs are laying thin shelled eggs, one of many possibilities for eyrie failure .

Another recommendation for improving chances of eyrie success in BBNP is more timely education of park visitors. When visitors pay entrance fees they should be verbally informed that closures are in effect in certain parts of the park and to check bulletin boards or with Rangers before day hiking in the park. Overnight hikers are required to get permits and are informed of closures but day hikers are a problem in closure areas because of their lack of contact with information prior to hiking.

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Thanks to Ranger Dale Thompson for arranging to have drinking water delivered to the South Rim field site.

Our thanks to NPS Resource Manager Raymond Skyles for contributing to the field work at the South Rim and for the timely documentation of his Peregrine Falcon observations.

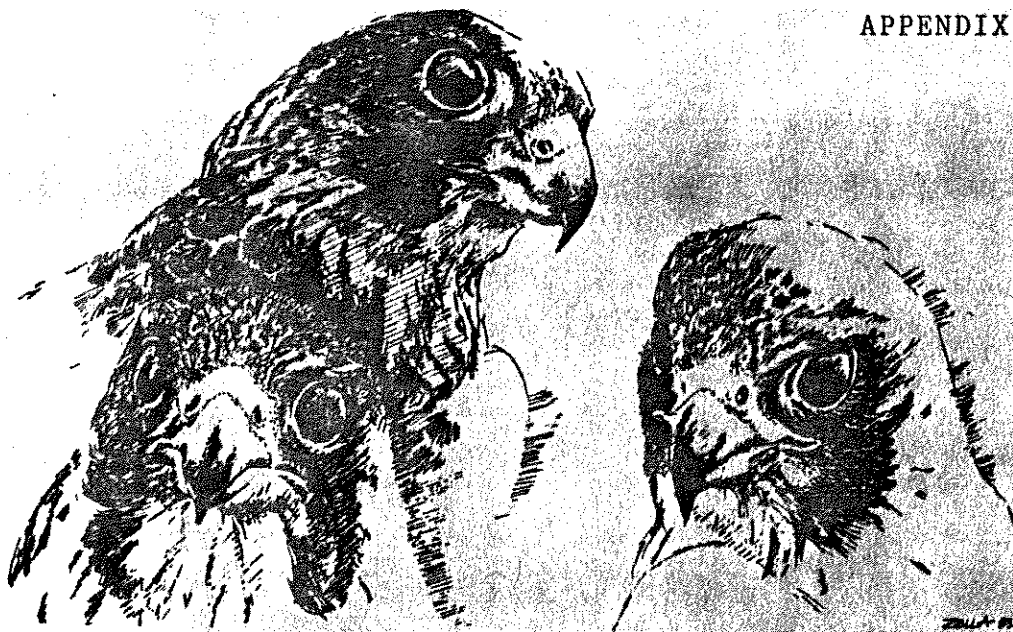
Our special thanks to Resource Managers Tom and Betty Alex, for their hospitality and support. Including paycheck cashing which saved us a couple 200 mile round trips to the Alpine Bank.

Thanks to Kelly Hogan, the Bird Man" of CDRI and primary Peregrine Falcon researcher in BBNP, for enthusiastically supporting our work, and for sharing his knowledge of the Peregrine Falcons of BBNP and elsewhere. Also for including us in local social events!

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SPECIAL THANKS to The Peregrine Fund Inc., for supplying educational materials (Appendix A: Life History of Peregrine Falcons) to benefit the visitors and employees of BBNP. And for providing us with the opportunity to study the Peregrines of BBNP.



Life History of Peregrine Falcons

Eyes up to eight times more powerful than ours, long toes with sharp talons, and a strong beak make the fast-flying Peregrine Falcon (*Falco peregrinus*) an expert bird hunter. The crow-sized adult has a dark helmet, slate gray back, and tan to white breast streaked with brown. During the first year of life young Peregrines have dark brown heads and backs, and heavily streaked underparts. The Peregrine is about the same size as the lighter colored and more common Prairie Falcon. In flight Prairie Falcons have contrasting dark patches under their wings which Peregrines lack. Peregrines hunt during the day frequenting wetlands and other areas where prey are concentrated. Small birds, including pigeons, starlings, swallows, and shorebirds, make up the bulk of the Peregrine diet.

Peregrines typically nest on cliffs near mountainous areas, but have occasionally raised their families on man-made structures including bridges, buildings, and towers. The mating season usually begins in March. Peregrines do not build nests, but lay their eggs in a gravel or sand depression. Three or four reddish-brown speckled eggs may be laid in April.

During the 34-day incubation both the female and her mate, two-thirds her size, incubate the eggs. Newly hatched young are small and helpless, but reach their full size by about six weeks of age. After leaving the nest, the young Peregrines are dependent on their parents for food and protection for several weeks. Young and adults typically leave the nesting area during fall and winter.

Peregrine Decline

Slowly, screams of defensive adult Peregrines at their cliff nests (eyries) were replaced with silence throughout much of North America. By 1960 all Peregrine nesting sites east of the Mississippi River were abandoned and all but ten percent of nesting territories in the West were vacant. Scientists seeking answers to explain the dramatic decline of Peregrines found that a pesticide, DDT, was the culprit. Peregrines ate small birds which had eaten DDT-laden insects. DDT interfered with the formation of the Peregrines' eggshell. Falcons were laying eggs that were so thin that the weight of the incubating parent crushed the eggs. The Peregrine population was not being replenished with young each year. Many wondered if Peregrine Falcons were destined for the same fate as the extinct Passenger Pigeon. The United States Fish and Wildlife Service placed the Peregrine on the Endangered Species List in 1969 and began to make plans for Peregrine recovery. Three years later DDT use was banned in the United States. These actions were important steps in arresting the Peregrines' decline. The way was made ready for creation of The Peregrine Fund and restoring Peregrines to their rightful homes.



SITE 88

22 February - 23 March, 1988

TABLE I

Mutual Flights - Pair 88

<u>Date</u>	<u>Time and Location</u>
2/23	1136 - 1158 (22 min.) alcove area
	1500 - 1513 (13 min.) alcove area
2/29	0834 - alcove area
3/01	0958 - alcove area
3/10	1219-1221 (2 min.), and 1508-1510 (2 min.) - alcove area
3/11	1252 - alcove area
3/13	0955-1002 (7 min) - along cliff face, W to E
	1427 - east of alcove
3/16	1724-1759 (35 min) pinnacle area & west alcove area
3/17	0901-0903 (2 min) pinnacle area
	0947-0959 (12 min) South Rim vicinity
3/18	1745-1752 (7 min) pinnacle area
	1805 - pinnacle area
3/19	1120-1212 (52 min) pinnacle area
3/20	0946-1105 (1 hr, 20 min) pinnacle area
	1610 - east end of alcove
3/21	1256 - pinnacle area (R. Skyles)
	1323 - 85 eyrie area (R. Skyles)
3/23	1241 - alcove area

TABLE J

Copulations - Pair 88

<u>Date</u>	<u>Time and Location</u>
3/20	1547 - snag perch (near pinnacle)
3/22	0841 - snag perch, 1534-snag perch, 1645 - snag perch

SITE 88

22 February - 23 March, 1988

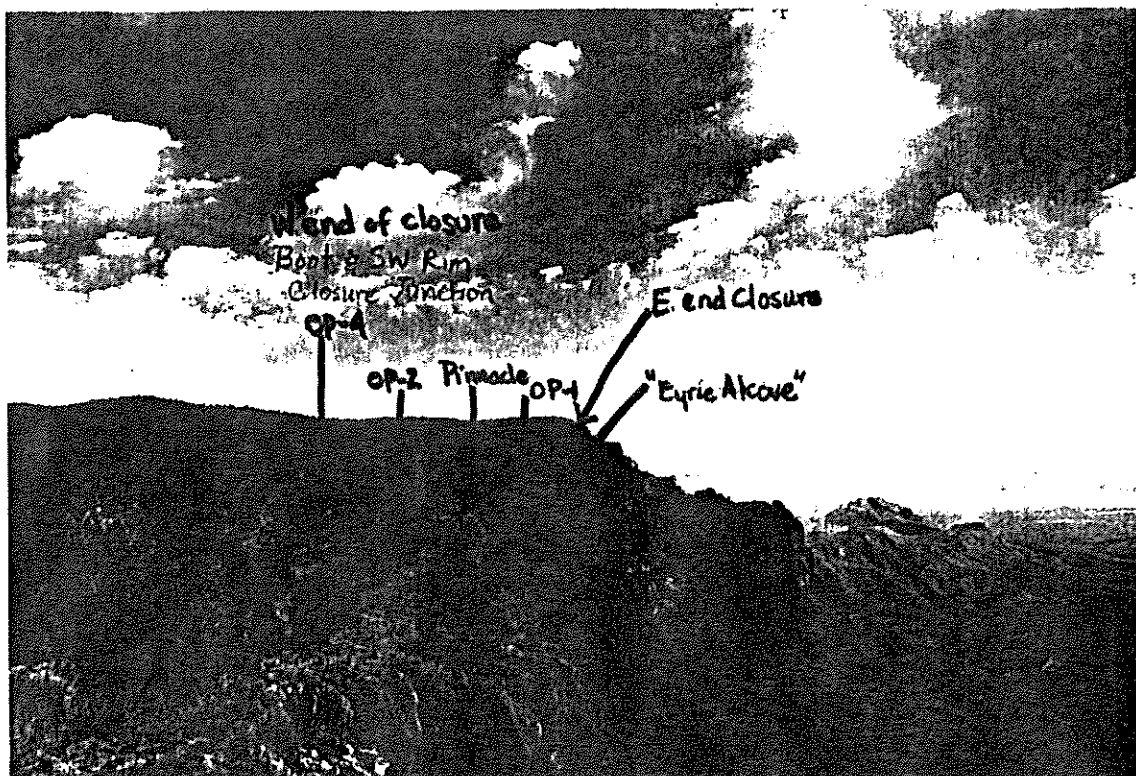
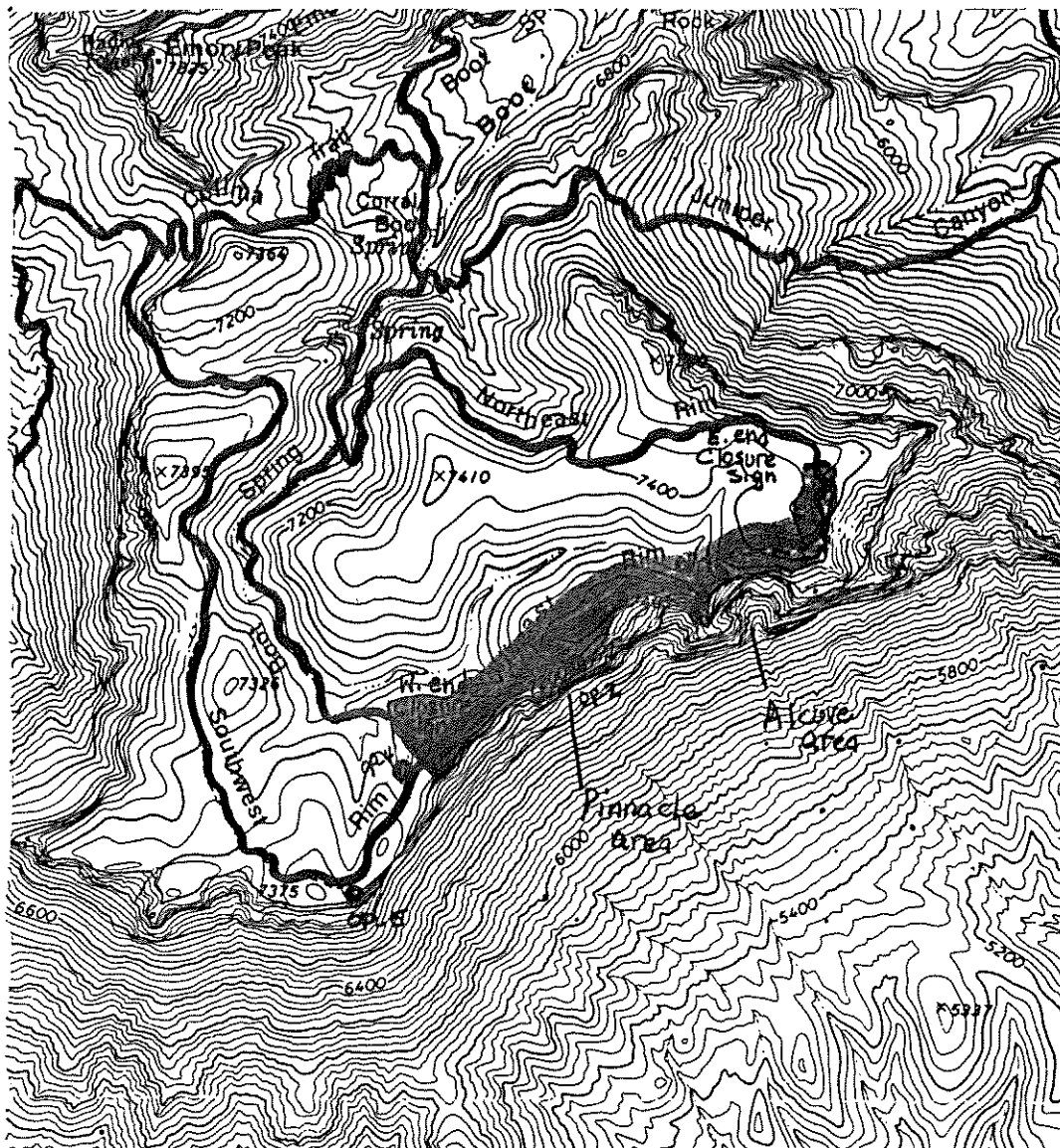
TABLE K

Interaction With People - Pair 88

<u>Date</u>	<u>Time and Location</u>
2/22	P.Myers in open view near alcove when PF lands on rim 150' x alcove, vocalizations with 2nd PF
2/23	Observer approx. 250 ft from female in alcove, observer is in blind, but female wails intermittently for one hour Later same day - observer approaches alcove, PF sees and flies directly to observer and on by, no vocals
2/25	PF flies directly to group of people sitting outside closure swerves to side when 20 feet , no vocals
2/26	PF flies directly to observer sitting outside closure, PF swerves to side at 20 feet, no vocals PF s attack intruder PF in close proximity to observer (20')
2/27	R.Skyles (NPS) in open view near pinnacle are, no response noted Trail worker reports PF interaction with kite fliers at W. end of closure area, and an attack on RT hawk in same area
3/8	Male PF perches for 2hr25min- approx. 200 ft and at eye level x alcove from observer in open view, no vocals
3/9	same as above - for four hours (note- PF arrive at Obs Pt after)
3/10	2 hikers on SW rim. PF flies directly to hikers at eye level, swerves away at approx 10 feet, no vocals
3/13	Female PF perches approx. 50' below observer at rim, then flies back and forth in front of observer wailing.
3/15	Female wailing, 3 hikers within 1/8 mile of pinnacle
3/17	Illegal hiker through closure, interaction wi PFs unknown
3/19	8 illegal hikers thru closure, interaciton wi PFs unknown

TABLE K continuedInteraction with People - Pair 88

<u>Date</u>	<u>Time and Location</u>
	below observer and wails, observer departs
3/14	5 illegal hikers in closure area, approx. 1/8 mi from pinnacle area at rim, female PF wailing for 20 min while they are in area
3/15	see front
3/17	see front
3/19	see front
3/21	R. Skyles (NPS) seated in open view approx. 200 yds from pinnacle PFs circling in area



SITE 111 PERCHING SITES

