

Phillips

THE CHIHUAHUA DESERT PEREGRINE
FALCON SURVEY, 1975

PREPARED FOR THE OFFICE OF NATURAL SCIENCES,
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by

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THE CHIHUAHUAN DESERT PEREGRINE FALCON SURVEY, 1975: A REPORT TO
THE U. S. NATIONAL PARK SERVICE

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The population of peregrine falcons (Falco peregrinus) occurring south of the boreal forests in North America experienced a precipitous decline beginning in about 1946 (Hickey 1969). An impressive body of evidence relates the phenomenon to the use of chlorinated hydrocarbon insecticides, principally DDT (e.g. Ratcliffe 1967; Porter and Wiemeyer 1969). Broadly speaking, some 600 known pairs (Hickey 1942; Bond 1946) were reduced to perhaps forty or fifty (Enderson and Craig 1974; Herma 1971; Hunt 1974b, in press), these being west of the Mississippi River. Productivity is poor at many of the remaining eyries where pairs of adults are still seen (Enderson and Craig, op. cit.). Although the use of DDT was banned in the United States in 1972, the peregrines and/or their prey may migrate to Latin America where DDT continues to be used in volume. Thus the survival of the peregrine after this decade is uncertain at best. It is important that the status of all populations be assessed so that if further declines begin to occur, their causes can be detected. Only then can steps be taken to help them.

PEREGRINES IN THE CHIHUAHUAN DESERT

The sparse literature concerning the occurrence of peregrines in the Chihuahuan Desert has been reviewed by Hunt (1974b, in press). In summary, the species has been known from the Big Bend region since the

early 1900's (Oberholser and Kincaid 1974; Van Tyne and Sutton 1937), but more recently Wauer (1973 and further unpublished observations) has affirmed the continued existence of nesting peregrines in the Big Bend and its vicinity. He has rightfully suggested that the Chihuahuan Desert may comprise one of the "last strongholds" of F. p. anatum.

FIELD WORK

To learn more of the Chihuahuan Desert population, I conducted a brief field survey in the Spring of 1974 under the support of the National Parks Service. I also participated in an extensive air survey of cliffs in western Texas during July of the same year in cooperation with the Texas Parks and Wildlife Department. On the basis of the field work and air survey, it was my conclusion that Wauer's estimate of at least 15 pairs was reasonable.

The field work was resumed on March 23, 1975, again with the support of the National Parks Service and the Chihuahuan Desert Research Institute, and continued through mid-July. I assembled a team of five student researchers whose names are acknowledged below. Our technique in finding eyries was to examine a large number of likely looking cliffs by trial and error. Examination of cliffs involved the use of 20- and 30-power Bausch and Lomb spotting scopes both at a distance and from very near the cliffs. Many of the cliffs were extremely large and considerable study did not rule out the possibility of active eyries where no birds were seen. Some pairs were extremely secretive and many hours of observation produced only occasional glimpses of the adults. During eight hours of observation at one site, the adult male was seen only twice, while the female and her chicks were detected only by their vocalizations.

RESULTS

Ten territories were found where pairs were present in 1975. An eleventh eyrie was active in 1974, but could not be located in 1975 (see River Eyries, below). Another (mountain) eyrie, reported active in 1969, could not be found in 1974 or 1975. In neither of these cases were the many nearby cliffs sufficiently examined to conclude that the territories had been abandoned. At another possible (river) eyrie cliff, a single adult was observed during a brief visit. Two (mountain) sites were found late in the 1975 season which appeared to have been recently occupied by peregrines.

River Eyries. Four eyries were located on the great cliffs of the canyons of the Rio Grande and Rio Conchos at altitudes of 2,000 to 3,000 feet. At three of these, pairs of adults were observed throughout the 1975 breeding season, defending particular areas of cliff with suitable nesting ledges or potholes. In one territory, the birds were almost certainly incubating, but at another, the female (in early June) was observed attending an empty scrape. One of the adults at this eyrie appeared to be having a territorial dispute with another peregrine which came from upstream in the canyon. A fourth river site was similarly occupied in 1974 and in some previous years, but could not be located in 1975, although an adult was seen nearby by J. C. Smith. At a fifth unconfirmed site, I saw an adult flying from a particularly likely looking cliff during a brief visit in late June, 1975.

No young peregrines were seen anywhere along the Rio Grande or Rio Conchos. Furthermore, I am unaware of any observations by anyone in recent years who has observed young fledged along Chihuahuan Desert rivers. The possible causes of the failures of the river eyries are

discussed later in this report.

Mountain Eyries. Two mountain eyries in western Texas outside of the Big Bend National Park were located, and both fledged young. One was visited twice, once on June 6, 1975 when three eyasses (two females one male) were observed standing on the edge of the nesting ledge exercising their wings in preparation for their first flight. This eyrie was visited again a week later and was noted to be vacant. During most of the day we observed the parents and their young flying from 400 to 1500 feet overhead and witnessed several prey transfers amid a considerable amount of vocalization. One of the adults would disappear for half an hour or so and reappear with what seemed to be a small bird. One or more youngsters would then assail the parent and, after a display of aerial acrobatics, one would appear to have seized the food. This one would be pursued by others, but eventually would disappear over a hill to the west of the eyrie cliff, apparently losing altitude as if to go to the ground.

The other West Texas mountain eyrie had already fledged young when we visited it, but at least one young was still soliciting food from the parents. The eyrie had been observed by another person for several weeks prior to our visit.

Five eyries were located in the mountains of eastern Mexico and all were at altitudes of above 8000 feet. Young were seen flying at three of the sites in June (first located in April) and young from the fourth eyrie could be heard in May, calling from the nesting pot-hole. The fifth nest, discovered in April, was revisited briefly at the end of June but no peregrines were in evidence. There is no reason to believe however, that young were not raised at this site. Further discussion of the ecology of these pairs appears below.

The survey team spent a rather considerable amount of time searching for a possible peregrine eyrie in the Chisos Mountains, Big Bend National Park. Nesting pairs have been recorded in the Chisos since the turn of the century (see Hunt 1974 for review) and pairs of adults and their young have been seen as recently as 1967 (see Wauer 1973). In my judgement there are several excellent sites along with a suitable abundance and array of "safe to eat" prey species.

There are several possible explanations that come to mind as to why peregrines have abandoned the Chisos Mountains, if indeed they have. One is that there is a tremendous amount of "people traffic," especially around Easter Vacation and many of these individuals are climbers and backpackers. Moreover, the numbers of such people have greatly increased during the past ten years. S. Cowles (citing the U.S. Parks Service Report) informed me that in March and April of 1968 there were 2726 individuals with permission to enter Big Bend's back-country, while in those same months in 1975 the number was 7660, a nearly three-fold increase. The timing of influx of the hikers is such as to coincide with the peregrines' courtship and incubation. We must remember that peregrines are among the most vigorously territorial of all bird species. While they are known to even nest in cities and accept much commotion below their eyries, they are extremely intolerant of people present at the tops of their nesting cliffs. It is not difficult to imagine a situation of a long established pair losing its attachment to a site when rocks are clattering over their cliff during the early weeks of the breeding season. Another possibility is that water is not as available to peregrines and their prey as it once was (e.g. Boot Springs) in the Chisos range.

ECOLOGY

As reported above, there are two distinct ecological circumstances where peregrines have been found nesting in the Chihuahuan Desert. The river canyon eyries are situated at low elevations (ca. 2500 feet) while mountain nests occur above 7000 feet. There is an evident and marked difference in productivity between the two types of eyries. The river nests are currently non-productive while the majority of those in the mountains are successful. Let us examine the two ecological regimes to search for possible causes of the disparity of nesting success.

Rio Grande and Rio Conchos Rivers. The Rio Conchos originates in the Sierra Madre Occidental and flows through several hundred miles of irrigated farmland to its junction with the Rio Grande at Presidio, Texas. Because of extensive withdrawal of water for irrigation in the El Paso region, there is virtually no water in the Rio Grande before it joins the Rio Conchos. Thus, the Rio Grande in Texas is essentially a Mexican river and DDT is the principal insecticide used in Mexico. It is therefore reasonable to suspect that the Rio Conchos is contaminated with chlorinated hydrocarbons. If bats and/or cliff swallows are important foods to the river falcons, then this places the peregrine in the position of at least a tertiary consumer. Moreover, other potential prey species such as waterfowl and shorebirds whose food base resides in the river, may augment the levels of contaminants in peregrines.

There have been several studies of pesticide levels in plants, wildlife and soils in the area from the Presidio Basin to the Big Bend Park. Applegate (1970) analyzed breast muscle tissue (wet weight) of various bird species collected in the summer at eight localities in

Big Bend Park and Lajitas. He found as much as 10.8 ppm DDE in a cliff swallow (Petrochelidon pyrrhonota) at Lajitas, 10.89 ppm TDE in a Scott's oriole (Icterus parisorum) at Maverick, 4.64 ppm DDE in two olive sided flycatchers (Nuttallornis borealis) at Boquillas, and 4.44 ppm DDE in a warbler (Dentrocia sps.) at Boquillas. Moreover, Culley and Applegate (1967a) found a high of 16.2 ppm DDE (wet weight) in the breast muscle of house sparrows (Passer domesticus) at Presidio. Further information on pesticides in the Presidio Basin is given by Applegate (1966a, b; 1967), Applegate, Hanselka and Culley (1971), Culley and Applegate (1967b), Lahser and Applegate (1966), and Hanselka (1968).

Failure of the river nests is therefore perfectly understandable. The amazing aspect is that these eyries continue to be occupied year after year, evidently making no contribution to recruitment. A reasonable explanation is that successful mountain eyries in Mexico and elsewhere are filling those vacancies as they occur. This suggests the existence of a comparatively healthy mountain population - as has indeed been verified during the survey.

Mercury (Hg+) occurs as a trace element in some parts of the Chihuahuan Desert. Cinnebar (mercury ore) has been mined at numerous sites in the Big Bend, and erosion from these sites and weathering of other mercury-containing rock results in the deposition of mercury in the silt and soils of the Rio Grande (Dumas 1974). Moreover, mercury has entered the aquatic ecosystem as evidenced by its detection in algae (Chang 1972) and in fish (Kettle 1972). Channel catfish in the Rio Grande in and above Big Bend National Park have a mean of 0.42 ppm mercury in their tissues.

Food of Peregrines. Direct information on the food habits of Chihuahuan Desert peregrines is not yet available. At only one of the eyries did we actually climb the cliff and enter the nest, and this was done after the reproductive season. A few bones and feathers of prey were obtained but these have not yet been identified. On several occasions we observed peregrines pursuing prey near their eyries.

Table 1 lists some of the probable prey species of peregrines in the Chihuahuan Desert as evidenced by their occurrence near eyries. I have indicated whether each type is present near river or mountain eyries and whether there is a likelihood of pesticide contamination. A more detailed discussion of some of these species is given below.

Columbiform birds are known worldwide to be a favorite prey of peregrines (Hickey and Anderson 1969). Three species are commonly available to the Chihuahuan Desert peregrines, these being mourning doves (Zenaidura macroura), white winged doves (Zenaida asiatica) and band-tailed pigeons (Columba fasciata).

Mourning doves are abundant along the floodplains of the Rio Grande and Rio Conchos and in the desert scrub. Moreover, the rivers attract large flights of doves to drink in the evening. Hitchcock and Dunlop witnessed an impressive flight in which an adult female peregrine chased a dove into the downstream mouth of one of the river canyons. The peregrine appeared to "close the gap at will" making stoops from side to side at the dove which was isolated over the water. The dove appeared to be flying at an abnormally slow pace, effectively dodging the peregrine's attacks. Finally, the dove reached cover on the river bank.

Whitewinged doves are common in heavy stands of mesquite along the rivers and in the washes joining the river from the higher elevations

(see Wauer 1973). My guess is that these birds are frequently preyed upon by peregrines.

Band-tailed pigeons are found commonly in stands of oak and pine throughout the mountains of the Chihuahuan Desert. We have found them near several peregrine eyries, and under one peregrine cliff in Mexico they were so abundant to suggest that they were probably the major prey for that pair. Evidently, they were once more common in the Chisos Mountains around 1920 than they are there today (Wauer 1973).

Acorn woodpeckers (Melanerpes formicivorus) are likely to be an important food of peregrines in the mountains. They are very common in some areas and they often fly high and away from cover. In the Sierra del Carmen range I observed this species on many occasions to cross steep canyons from ridge to ridge or "sky up" hundreds of feet above the timber. There can be no doubt that these woodpeckers are thus vulnerable to predation by peregrines.

Either Mexican jays (Aphelocoma ultramarina) or scrub jays (A. coerulescens) are quite common near every mountain eyrie known to me. Peregrines have been reported to prey regularly on jays in other parts of their range (e.g. Herbert and Herbert 1965), and the great abundance of jays in Chihuahuan Desert mountains make them suspect as a major food. I observed an immature peregrine at one of the mountain eyries awkwardly chasing a jay around some tree trunks near and on the ground in comic fashion.

I have observed peregrines in Mexico vigorously chasing flocks of Red-crowned parrots (Amazona viridigenalis). In areas where they are common, these large birds may be a favorite prey of peregrines since they often fly high above the mountain slopes and are very conspicuous. C. M. White (pers. comm.) tells me that peregrines in Australia

regularly feed on large parrots. He says that fumbling a parrot can mean death for a peregrine through being bitten!

Meadowlarks (Sternella sps.) and horned larks (Aremophila alpestris) are common at lower elevations and these and other passerines are natural peregrine food. Passerines ordinarily make up 20 to 60 percent of the diets of peregrines in North America (e.g. Cade 1960; Herbert and Herbert 1965; Porter and White 1973). Flycatchers, particularly the black phoebe (Sayornis nigricans), western kingbird (Tyrannus verticalis), and Say's phoebe (Sayornis saya) are probably regularly taken by peregrines in the Chihuahuan Desert since they are numerous and vulnerable.

Cliff swallows (Petrochelidon pyrrhonota) are abundant in the river canyons. Peregrines and prairie falcons (F. mexicanus) may nest near large colonies and I have seen both species take them. Enderson and Berger (1968) found several ppm DDE (wet weight, whole animal) in cliff swallows in the arctic. They argue that these concentrations are sufficient to build up rapidly in the peregrine. As mentioned above, Applegate (1970) found 10.8 ppm DDE in the breast muscle of a cliff swallow at Lajitas, approximately 10 miles from one of the river peregrine eyries.

Bats are a favorite prey of peregrines in some parts of the world (Stager 1941; Porter and White 1973; Dementiev 1957; Clunie 1972) and are abundant in the canyons of the Rio Grande. It is safe to assume that bats, like cliff swallows, are contaminated with pesticides.

Interactions With Other Raptors. There is a prairie falcon nest on the Mesa de Anguila within one mile of the peregrine eyrie at the mouth of Santa Elena Canyon. In early June 1975, Hitchcock observed

one of the prairie falcons carrying a bird near its eyrie. An adult peregrine was seen to stoop at the prairie falcon, seize the prey, and make off with it. In Mexico (1975), a pair of prairie falcons and a pair of peregrines nested within one half mile of one another on the same side of a mountain, the prairie falcon at a lower, less commanding site. No interactions were noted. A prairie falcon pair occupied an old peregrine site in the Davis Mountains in 1974 and 1975 (see Wauer 1973; Hunt 1974). The prairie falcon nests throughout the Chihuahuan Desert but more commonly above four thousand feet. I would estimate that a minimum of forty pairs nest in the Davis Mountains.

Red-tailed hawks (Buteo jamaicensis) were observed on a number of occasions to be vigorously attacked by both adult and immature peregrines in the vicinities of the falcons' eyries. These incidents occurred at both river and mountain territories. So earnest were the attacks that at times it looked to us as if the peregrines were actually attempting to kill the trespassing red-tails. Red-tailed hawks have been known to prey on post-fledging prairie falcons (Tom Smylie, pers. comm.) and other young falcons (Hunt, unpublished), so it is probable that the high aggression toward red-tails by peregrines is adaptive.

Great Horned Owls (Bubo virginianus), are known to be despised by peregrines. None were observed near peregrine eyries. Their absence is likely an "after the fact" phenomenon. Perhaps any owl venturing within a peregrine's territory is a "dead owl."

Zone-tailed hawks (Buteo albonotus) nest in the vicinities of peregrine eyries in the river canyons but no interactions were observed. Perhaps the zone-tail's apparent mimicry of the turkey vulture (Cathartes aura) (see Willis 1963) in addition to permitting access to prey, relates also to fooling the large falcons in whose territories it thus becomes

possible to reside. A territory defended by a pair or peregrines is likely to be much more secure than one which can freely be entered by owls and other buteos. In the river canyons, it appears that the zone-tails have a greater latitude in their nest site requirements than do peregrines. Zone-tails sometimes nest on fairly low cliffs and tolerate more severe exposure to the sun.

Turkey vultures are often found within peregrine territories in the Chihuahuan Desert. Vultures, including black vultures (Coragyps atratus), are particularly abundant near one river eyrie in the Big Bend. The peregrines seem to ignore them most of the time, but occasionally stoop at them in play or perhaps because of displaced aggression. Common ravens (Corvus corax) nest within some of the peregrine territories and are occasionally harrassed. Peregrines and ravens have rather similar nesting habitat requirements as reflected by their occurring together throughout much of the world.

Water. The role of water in Chihuahuan Desert peregrine ecology is not understood. There are numerous references that a source of water is a requisite for a peregrine territory, but of the seven mountain eyries, only one was situated over water, this being a small creek. A tiny spring was located about 1/4 mile from another eyrie. The third eyrie was on the other side of a mountain from a small spring, an estimated 1 1/2 miles in straight distance. No water was in evidence near any of the other four nests, but perhaps there were seeps or small springs hidden from view. The particulate distribution of water may work to the peregrines' advantage in that this necessitates the long range movement of some prey species (e.g. doves) to drink during certain times of the day, and this of course contributes to their vulnerability to peregrines.

Physical Aspects of Eyries. All of the mountain eyries commanded

very large areas of terrain, both horizontally and vertically. Several instances were observed where hunting or territorial attacks were launched directly from the cliffs. Certainly, these sites are selected for their use as hunting posts and the vulnerability of prey lies in its being isolated in the vastness of air, far from cover. Every mountain nest site observed consisted of both a ledge and a recess (pothole) so that the presumed nesting scrapes were protected by rock from above. Porter and White (1973) found predominantly northern and eastern exposures in Utah eyries, but we observed no particular pattern of directional exposure.

RECOMMENDATIONS FOR PARK SERVICE MANAGERS:

On the basis of our knowledge to date, I offer the following recommendations concerning the peregrine population of the Big Bend National Park, its vicinity, and the other areas where peregrines nest in Texas and New Mexico.

1. The tops of cliffs overlooking known mountain eyries should be closed to the public between March 1 and June 30, the critical period being from about March 15 to April 30 when peregrines are courting and incubating.

Breeding peregrines are not ordinarily disturbed by hikers or observers so long as they do not go to the tops of the cliffs. Cliff climbing or pushing rocks off the cliffs is especially detrimental and should be discouraged. I have made arrangements for safeguarding at least one of the two known Texas mountain eyries. The other is located in a remote area.

There is no such problem in the case of the river nests as access is naturally difficult and the cliffs are very large. The river peregrines have never paid any attention whatsoever to our presence.

2. Casa Grande, Toll Mountain, Crown Mountain, and Emory Peak, in the

Chisos Range, are probably all suitable nesting areas for peregrines. If a pair is seen frequenting these cliffs or others in late February, March, or April, the particular cliff top should be immediately closed to the public and should remain so until the end of June even if no young are raised. If disturbance is thus minimized, especially during the early stages of the nesting cycle, the pair may accept the cliff and return year after year to breed.

Therefore, reports by visitors or park service personnel of Spring peregrine sightings in the mountain areas should be verified immediately.

3. Any channels for the reduction of the use of chlorinated hydrocarbon pesticides in the United States and Mexico should be pursued, especially in the case of DDT.

PLANS FOR FURTHER RESEARCH

The Chihuahuan Desert Research Institute will be involved in peregrine research in the Chihuahuan Desert through the Spring of 1977. We will make periodic observations throughout the nesting season of all known eyries to determine productivity or causes of failure. Particular emphasis will be placed upon determining the phenological extent of the reproductive cycle at the river eyries. For example: Do the peregrines lay eggs? If so, do the eggs hatch? A continued search will be made for new eyries in Texas and Mexico. It is important at this time to learn the full extent of the peregrine population and its productivity so that future changes, if any can be detected. The CDRI will keep the Park Service informed of progress in this research and we request reciprocal advisement of peregrine sightings in the National Parks. Please phone 915-837-2475 (CDRI) or 915-837-3829 (Hunt).

OTHER PROJECTS UNDER CONSIDERATION

1. Pending funding and proper permits, we will collect samples of some of the prey species listed in Table 1 (a few individuals each). Their tissues will be examined by Dr. Steve Herman for pesticide levels and other contaminants. For direct information on the pollution status of the river, fish will be collected and similarly tested. Direct knowledge of the causes of failure of the river eyries is necessary before any solution for insuring their success can be reached.
2. If eggs are laid at the river nests it might be advisable to take the first clutch when complete and artificially incubate it. This procedure would likely reduce the rate of egg breakage due to thin shells (if that is the case). The falcons may be expected to lay another clutch (a well known phenomenon) and there is a possibility that these may hatch normally due to the possible mobilization of fat stores from a different seasonal period of deposition. The expectation of success of the second clutch is admittedly poor. Perhaps the technique could be applied at one nest in 1976 to determine the value of its future application. If the falcons fail to lay a second clutch and it looks as if the artificial incubating eggs have a chance of hatching, then dummy eggs could be supplied in the interim. The young could then be returned to the nest when old enough to make the trip (7-10 days).
3. There is a north-facing cliff overlooking Cat-tail Falls in the Chisos Mountains which I consider an excellent place for a pair of peregrines, both in terms of habitat and remoteness. There is, however, no suitable recess for an eyrie site. A hole might be made in the cliff about two-thirds of the way up the cliff, extending inward about two feet from a narrow horizontal ledge. The front dimensions of the hole might be two and a half feet wide by one and a half feet high. The floor should be somewhat level with a two inch layer of gravel. I consider it possible.

that if such a hole were constructed, a pair of peregrines might take up residence.

CRITICAL HABITAT

A current emphasis on the recovery of endangered bird species involves conservation of their habitat. For species which occur together in numbers such as the whooping crane (Grus americana), the delineation of their critical habitat is at least partly straightforward, that is, breeding and wintering areas can be defined and preserved. In contrast, a species such as the peregrine has widely scattered and diverse nesting places, each occupied by a single pair. A particular cliff for example, whose physiography is such as to provide an appropriate directional exposure, temperature regime, adequate substrate for the incubation of the eggs and activities of the nestlings, defendability, isolation from predators and parasites, and from which attacks can be made at chemically uncontaminated prey birds which are both numerous and vulnerable in the vicinity may be occupied for centuries by breeding peregrines. Remove one critical component of an otherwise serviceable breeding location and the cliff may be abandoned (Hunt 1974a).

Because of the wide variation in nesting requirements which have been exhibited by North American peregrines, no quantitative assessment of the breeding niche has yet appeared in the literature. Roughly, however, an ideal site in the Southwest is a prominent cliff facing north or east (Porter and White 1973) under which there is a great gulf of air in which prey birds may be isolated from cover (Enderson pers. comm.). Somewhere on the cliff is a ledge from which a hole extends inward (see p. 15), perhaps sheltered by an overhang. Adequate vegetation and water in the valley floor or canyon will insure a sufficiency of

prey birds.

A simpler solution to the recognition of a good peregrine cliff is to determine whether it has been occupied by peregrines in the past or is presently being used. If it was once, but is no longer occupied, then the question is whether the overall population has declined to the point where there are no longer adults available or that some critical component of the eyrie has deteriorated. Since these alternatives cannot practically be separated, the best approach is to assume the second is true and to take appropriate steps if possible to improve the situation.

DISCUSSION

I am of the opinion that our southwestern peregrine is a unique population, adapted to arid mountain life and that this form is not equivalent to the peregrine of the boreal forest, also called F.p. anatum. The mountain peregrine has a strongly rufous overwash, a heavy eye-ring and shorter, wider wings than its northern conspecifics. In addition, there are likely to be numerous behavioral and physiological adaptations among our southwestern peregrines which relate to arid and at the extreme, near-tropical circumstances.

If today we observe some peregrines nesting in the Colorado Rockies which resemble the Taiga peregrine, is it not possible that these are recent immigrants from a more northern region from which population pressure* is likely to emanate more strongly than from the south? Certainly the Taiga birds pass the Rocky Mountain area on their migrations while the southern birds would not. Also bear in

Healthy populations of peregrines probably include a substantial number of floaters, unable to secure serviceable breeding locations in any one year due to competition for a limited number of serviceable sites (Hunt 1974 a).

mind that the environmental conditions of high nests in Colorado are more similar to the Canadian forest than to the Sierra Madre. The alternative explanation is that the Rocky Mountain population has been self sustaining for the past twenty years. In view of present knowledge of reproductive success, I would regard this as highly unlikely.

I have belabored this point to emphasize that even if the population of peregrines which was once continuous along the Cordillera showed clinal variation in the characters I have mentioned, from Tamalipas, Mexico to the arctic tundra, this population is now disjunct at its center and the southern birds represent a nucleus of contemporarily irreplaceable genetic stock. If we are to have any hand in preserving the mountain peregrine, we must first secure some knowledge of its present status and distribution. I must argue that today we possess only a tiny fraction of information of the total distribution and productivity of the peregrines of Mexico.

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LITERATURE CITED

- Applegate, H.G. 1966a. Pesticides at Presidio I. General Survey. Texas Journal of Science 18 (2):171-178.
- Applegate, H.G. 1966b. Pesticides at Presidio II. Vegetation. Texas Journal of Science 18 (3):266-271.
- Applegate, H.G. 1967. Pesticides at Presidio V. Synopsis. Texas Journal of Science 19(4):353-361.

- Applegate, H.G. 1970. Residues in fish, wildlife, and estuaries: Insecticides in the Big Bend National Park. Pesticide Monitoring Journal: 4(1):2-7.
- Applegate, H.G., W. Hanselka and D.D. Culley. 1971. Effect of insecticides on an ecosystem in the Northern Chihuahuan Desert. In W.G. McGinnies, B.J. Goldman and P. Paylore (eds.) Food, Fiber and the Arid Lands. University of Arizona Press, Tucson.
- Bond, R.M. 1946. The peregrine population of western North America. Condor 48:101-116.
- Cade, T.J. 1960. Ecology of the peregrine and gyrfalcon populations in Alaska. Univ. California Publications in Zoology 63:151-290.
- Chang, C.C. 1972. A study of pollution of mercury in algae. Unpublished Master's Thesis, Sul Ross State University, Alpine, Texas.
- Clunie, F. 1972. A contribution to the natural history of the Fiji peregrine. Notornis 19:302-322.
- Culley, D.D. and H.G. Applegate. 1967a. Insecticide concentrations in wildlife at Presidio, Texas. Pesticides Monitoring Journal 1:21-28.
- Culley, D.D. and H.G. Applegate. 1967b. Pesticides at Presidio IV. Reptiles, birds and mammals. Texas Journal of Science 19:301-310.
- Dementiev, G.P. 1957. On the Shaheen Falco peregrinus babylonious, Ibis 99(3):477-482.
- Dumas, G.A. 1974. Determination of microgram quantities of mercury in the rough run-Terlingua Creek area of the Big Bend region of Texas. Unpublished Master's Thesis, Sul Ross State University, Alpine, Texas.
- Enderson, J. and D. Berger. 1968. Chlorinated hydrocarbon residues in peregrines and their prey species from northern Canada, Condor 70:149-153.
- Hanselka, W. 1968. Effects of pesticides on black-tailed jack rabbits in the Presidio Basin, Texas. Texas A & M University (m.s. thesis).
- Herbert, R.A. and K.G.S. Herbert. 1964. Behavior of peregrine falcons in the New York City region. Auk 82:62-94.
- Herman, S.G. 1971. The peregrine falcon decline in California II. Breeding status in 1970. American Birds 25:818-820.
- Hickey, J.J. 1942. Eastern population of the Duck Hawk. Auk 59:176-204.

- Hickey, J.J. 1969. Peregrine falcon populations, their biology and decline. J.J. Hickey (ed.), Univ. Wisconsin Press, Madison XXII + 596 p.
- Hickey, J.J. and D.W. Anderson. 1969. The peregrine falcon: life history and population literature. pp. 3-42. in J.J. Hickey (ed.) Peregrine falcon populations, their biology and decline. University of Wisconsin Press, Madison.
- Hunt, W.G. 1974a. Speculations on the natural regulation of peregrine size. Paper presented to the Raptor Research Foundation Conference, Minneapolis, Minn., October, 1974.
- Hunt, W.G. 1974b. The significance of wilderness ecosystems in western Texas and adjacent regions in the ecology of the peregrine. In Wauer, R.H. and D. Riskind (eds.). Proceedings of the Symposium on the Biological Resources of the Chihuahuan Desert, U.S. National Park Service and Texas Parks and Wildlife Department, October 1974, in press.
- Kettle, K.E. 1972. Mercury concentrations in soil, sediment, fish and water along the Rio Grande from Alamo Creek to Terlingua Creek, Texas. Unpublished Master's Thesis. Sul Ross State University, Alpine, Texas.
- Lahser, C. and H.G. Applegate. 1966. Pesticides at Presidio III. Soil and Water. Texas Journal of Science 18:386-395.
- Oberholser, H.C. and E.B. Kincaid, Jr. 1974. Birdlife of Texas, vol. I. Univ. Texas Press.
- Porter, R.D. and C.M. White, 1973. The peregrine falcon in Utah, emphasizing ecology and competition with the prairie falcon. Brigham Young Univ. Biol. Series 18:1-71
- Porter, R.D. and S.N. Wiemeyer. 1969. Dieldrin and DDT: Effects on Sparrow Hawk eggshells and reproduction. Science 165:199-200.
- Ratcliffe, D.A. 1967. Decrease in eggshell weight in certain birds of prey. Nature 215:208-210.
- Stager, K.E. 1941. A group of bat-eating Duck Hawks. Condor 43(3): 137-139.
- U.S. Department of Interior, National Park Service, Monthly Public Use Report.
- Van Tyne, J. and G.M. Sutton. 1937. The birds of Brewster County, Texas. Univ. Michigan Press, Miscellaneous Publications No. 37.
- Wauer, R.H. 1973. Birds of Big Bend National Park and Vicinity. Austin: Univ. Texas Press.
- Willits, E.O. 1963. Is the zone-tailed hawk a mimic of the turkey vulture? The Condor 65:313-17.

Table 1. Some possible prey of Chihuahuan Desert Peregrines, their occurrence in mountain vs. river habitat, and their likelihood of pesticide contamination.

	<u>River Eyries</u>	<u>Mountain Eyries</u>	<u>Probable Pesticide Contamination</u>
Mourning Doves (<u>Zenaidura macroura</u>)	X	X	?
White-winged Doves (<u>Zenaida asiatica</u>)	X		-
Band-tailed Pigeons (<u>Columba fasciata</u>)		X	-
Acorn Woodpeckers (<u>Melanerpes formicivorus</u>)		X	-
Mexican or Scrub Jays (<u>Aphelocoma</u> sps.)		X	-
Red Crowned Parrots (<u>Amazona viridigenalis</u>)		X	-
Cliff Swallows (<u>Petrochelidon pyrrhonota</u>) ¹	X		X
Waterfowl (sps.)	X		X
Shorebirds (ecological category)	X		X
Goatsuckers (sps.)	X	X	?
Miscellaneous Small Birds ²	X	X	?
Bats (sps.)	X	X	X

¹Applegate (1970) found 10.8 ppm DDE (wet weight) in the breast muscle of a cliff swallow at Lajitas

²Applegate (1970) found 4.44 ppm DDE (wet weight) in Dendroica sps. at Boquillas, 4.64 ppm DDE in Nuttallornis borealis at Boquillas, and 9.37 ppm DDT in Icterus parisorum at Maverick.

THE CHIHUAHUAN DESERT PEREGRINE FALCON SURVEY, 1975: A REPORT TO
THE U. S. NATIONAL PARK SERVICE

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ABSTRACT

Wauer (1973) and Hunt (1974) have suggested that the Chihuahuan Desert is one of the "last strongholds" of the American Peregrine Falcon (Falco peregrinus anatum). A survey was conducted in the Spring of 1975, with supportive data from the previous year, to search for nests and determine productivity. Eleven sites where pairs were present were located in 1974 or 1975. Although four river eyries failed to produce young, it is believed that six of seven nests located in mountains were successful. Prey species available to peregrines in the two habitats are different somewhat and contamination of the food web through the aquatic ecosystem is suspected.