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Cover: Peregrine falcon chick nestles in a friendly hand as National Park personnel join on its side in the battle for survival. Stories beginning on page 3.

Distribution of Peregrine Falcon In Zion National Park

By Larry L. Hays and Timothy J. Tibbitts

The existence of peregrine falcons, *Falco peregrinus anatum*, in Zion NP has been documented as far back as the 1920s, when peregrines apparently were recognized as residents but were not regularly seen. C.C. Presnall's 1935 checklist, *The Birds of Zion National Park*, failed to list the bird. One of the earliest naturalists, Russell K. Grater, observed nesting activity in 1939; Dennis Carter and Roland Wauer identified peregrines in the park in 1963 and 1964, and other random sightings were reported over the years following.

In 1982, the authors saw peregrines in both the upper and lower canyon areas and determined these were two separate reproducing pairs. No eyrie was located for the lower canyon pair, which were not found until August. One male juvenile was present with the adults at both locations. In 1983 the upper canyon site was active but no peregrines were observed in the lower Zion canyon.

Zion NP is located on the western edge of the Colorado Plateau in Southern Utah. The park, covering 59,551.1 ha, is composed of deeply eroded canyons with high, timber-covered plateaus and mesas. Elevations range from 2,652 m in the northwest corner to 1,128 m in the southeast. Rainfall ranges from about 56 cm on the plateaus to 35 cm at lower elevations. Habitat for peregrines is excellent, with cliffs up to 762 m in height, framing riparian corridors with productive pinyon-juniper woodlands. Upper elevations contain oak brush, manzanita, and ponderosa pine.

Objectives of the study here described were to determine the number of nesting peregrines in Zion, their distribution, and their reproductive success. The roots of the formal study go back to 1984, when a survey was made in Zion by the Peregrine Fund under contract with NPS. Dr. James H. Enderson of Colorado College coordinated the survey. Four two-person teams looked for peregrines over a four-day period; 19 sites were selected by looking at habitat from a fixed wing overflight. Each team was placed by helicopter and remained approximately 24 hours. Two new territories were found and verified. All territories were monitored during the summer and six juveniles were fledged.

Second Survey Mounted

In 1985, the Peregrine Fund conducted a second survey. Again, four two-person teams were deployed over a four-day period. Territories found in 1984 were rechecked and new areas were surveyed. Two more new territories were found and the two from the previous year reconfirmed. The lower Zion canyon eyrie was not located, but juveniles appeared within the territory at the appropriate time. Active territories in 1985 now numbered six. All six were monitored throughout the summer and 11 juveniles were fledged.

In July 1985, Dr. Enderson returned to the park with a helicopter and climbing team to enter sites and gather prey remains and eggshell fragments. Zion's resource staff provided assistance in directing the climbers into the eyries. Seven eyries in four territories from 1984 and 1985 were entered and shell fragments and prey remains were removed. Eggshell measurements revealed a thinning problem of 21 percent – a thinning degree that did not support an optimistic prediction for

the future of Zion's falcon population.

In 1986 no funds were available to conduct helicopter surveys. The authors monitored all known territories and active eyries were located in all six territories occupied the previous year. Further habitat surveys stemmed from the observation that distances between known eyries were extremely uniform – suggesting a population of sufficient density for territorial interactions to be determining distribution.

To test this hypothesis, the average inter-eyrie distance was projected into unsurveyed habitat from nearest-neighbor eyries. The areas then were entered on foot; suitable cliffs at the "standard" distance were examined. On the first test, a female passage bird was observed loosely on the territory. The second test found an adult pair on territory. Flying young were present on the next visit to this site. The third test of the spacing hypothesis yielded another active eyrie, which later fledged young successfully.

Eyrie Count Increases

This brought the 1986 census to eight active eyries, with evidence of a floating subadult population in peripheral habitat. All eight territories were monitored throughout the summer; 14 juveniles were fledged.

Funds were available again in 1987 to provide for two people for a week in late May and a helicopter count of juveniles in June. The authors had entered and confirmed most of the eyries from previous years before the Peregrine Fund team arrived. Dr. Enderson again coordinated the operation.

Weather was bad – high winds and rain throughout the week. The spacing technique was used to place the team in areas that were unsurveyed. A new eyrie was confirmed the morning of the first day. Rain and snow at higher elevations precluded good examination of several excellent possibilities and the team was forced to leave the park without surveying some of the sites the park had hoped to evaluate.

Finding of the new eyrie brought the number of active eyries to nine. The new eyrie contained three juveniles. All nine eyries were monitored all summer. A helicopter flight in late June counted 22 juveniles. One site showed incubation behavior into mid-June, leading to the belief that the nesting attempt had failed. However, continued monitoring revealed the pair had recycled and eventually produced three young late in the season, bringing the reproductive success to 25 young in 9 eyries for a ratio of 2.77 juveniles fledged per eyrie.

This breeding season produced the first four-juvenile eyrie ever seen in Zion. The final tally showed one four-juvenile eyrie, five eyries with three juveniles each, and three eyries with two juveniles each. Reproductive success of this magnitude has not been seen before and with the eggshell thinning problems we are faced with the question "How is this level of reproduction possible?"

A Computer-based Product?

The "population explosion" of peregrines in Zion NP is almost certainly an artifact of data generation, reflecting an explosion of monitoring activity more than actual peregrine numbers. The increase from one known eyrie in 1982 to nine in 1987 parallels a period of increasingly intensive study of the species in the park.

The Zion population is significant in several aspects. Nine known eyries within the park confines represent one of the densest concentrations of breeding peregrine falcons known in North America. Further, evidence suggests this population is wholly natural in origin and maintenance. Particular care has been given to examine adults for legbands. A banded peregrine has not been seen in Zion during the current survey period nor do any park records report bands. In 1985, 9 of 12 adults were definitely unbanded; in 1986, 13 of 16 were known to have worn no bands. The remaining individuals were not observed long enough or repeatedly enough to verify the presence or absence of bands on both legs.

Unbanded peregrines may be assumed to be a natural population or at least one generation removed from captive-bred ancestry. Unbanded birds also are not

Continued on page 4



Prime habitat for peregrine falcons is this vast stretch of cliffs (for perching and nesting) and air (for swooping and soaring) at Zion National Park.

derived from manipulated eyries, where banding is routine. Furthermore, evidence suggests the Zion population is avoiding en masse major migration routes where banding often is intensive. This, coupled with sighting from March to October, has led to speculation that the population is non-migratory or disperses locally during winter months. However, no peregrine sightings have taken place this winter in or around Zion.

It is impossible to say whether the Zion population is reproductively stable. Data for the majority of the eyries exist only for three or four breeding seasons. Initial results are encouraging: reproduction for the past four breeding seasons has been 1.5 fledged/eyrie in 1984; 1.83 in 1985, 1.75 in 1986, and 2.77 in 1987. That this level of reproduction has been maintained in the face of eggshell thinning in excess of 20 percent may be due to the configuration of Zion's eyries. These are typically deep solution holes in the fine-grained sandstone so common in the park. Such sites offer excellent protection from intense sunlight and desiccating winds, and eyrie floors are usually a deep bed of floury sand. A thin-shelled egg may have increased survival chances under these conditions.

In sum, this monitoring program has found the peregrine population to be significant and unique. It will continue to be monitored on a non-interventive basis. Fortunately, it is isolated from most human disturbance by its distribution throughout very rugged and remote terrain. Also, it is contained within a national park mandated to protect natural resources; therefore it enjoys protection during the breeding season.

Hays is a Resource Management Specialist and Tibbitts is a Park Ranger at Zion NP.

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