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USE OF EXPLOSIVES TO ENHANCE A PEREGRINE FALCON EYRIE

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ABSTRACT.—Explosives were used effectively to increase the size and nesting potential of a traditional Peregrine Falcon (*Falco peregrinus anatum*) eyrie in northern California. Ledge dimensions were increased from 15 cm deep × 31 cm wide to 41 cm deep × 152 cm wide by removal of blast loosened rock. Prior to this enhancement (1982, 1983), nesting attempts were unsuccessful due to the displacement of eyases and eggs from the small eyrie. From April 1984–June 1988, 13 Peregrine eyases (2.6/yr) have successfully fledged from the enhanced eyrie, with no further fatalities induced by ledge dimensions.

Nesting sites for many raptors may be artificially produced or altered to increase reproductive potential. Bohm (1977) noted that artificial nesting platforms could be used to excise Great Horned Owls (*Bubo virginianus*) from natal areas by placing structures in locations where adequate nests were lacking. Fyfe and Armbruster (1977) described the physical excavation of sandstone cliffs for the creation of artificial ledges for Prairie Falcons (*Falco mexicanus*) which resulted in an increase of the resident breeding population. Boyce et al. (1980) discussed an artificial nesting structure that had been erected on a historic Prairie Falcon ledge with productive results.

Peregrine Falcons (*F. peregrinus*) show high fidelity to established nest sites (Hickey and Anderson 1969; Ratcliffe 1980), an aspect of their nesting biology which makes it practical to enhance traditional and/or alternate nest ledges. Boyce et al. (1982) reported a nesting pair of Peregrines that deserted a historical nest site for an alternate ledge enhanced through excavation.

Attempts to create nesting platforms in rock faces with explosives have been documented for falcons. Becker (1981) used Kinepeck explosives to create nesting cavities for Prairie Falcons. Smith (1985) reported the use of Detaprime WG (pentaerythritioltetranitrate or PETN) to blast potential Prairie Falcon eyries in rock exposed by a large surface coal mine.

Investigations of the nesting chronology and reproductive success of a Peregrine Falcon eyrie in California were completed in 1982 and 1983 (Ledig 1982; Lehman 1983) and revealed that eyases and eggs, respectively, had been displaced from a small nest ledge in both years. Herein, I report and describe the successful use of explosives to enhance this traditional Peregrine eyrie in northern California.

MATERIALS AND METHODS

During September-December 1983, approximately 120 person-hr were devoted to the enhancement of a Peregrine Falcon ledge in the Klamath National Forest (KNF) of northwestern California.

The eyrie was located 23 m above the base of a 36 m dolomitic limestone cliff. The nesting ledge prior to enhancement measured 15 cm deep × 31 cm wide and was created by a natural horizontal fracture.

Personnel entered the existing eyrie following reproductive failure in 1983 to assess the potential for enlargement of the eyrie (Lehman 1983). Hand tools proved ineffective to enhance the nest ledge, and explosives were believed to be necessary to enlarge the existing falcon ledge to dimensions regarded as typical (50 × 50 cm) (Ratcliffe 1980).

The base of the cliff was located 1.1 km from the nearest road and was situated above a 60–70% slope. Consequently, all materials had to be hand-carried to the site. The cliff top and base were easily accessible to climbers. Access to the ledge was gained by rapelling. A drill and explosives were hoisted to the ledge by a z-drag hauling system backed up by reverse jumars (May 1972). Climbers placed 1 piton and 4 Star climbing bolts (9.5 mm × 50 mm) with normal hangers 1–2 m above the ledge to allow greater mobility during preparation procedures.

A gasoline powered Cobra percussion rock drill was used to bore 4 holes 60 cm into the rock. A 1.9 cm rotating hardened steel drill bit was used with good results. Holes were placed 25-30 cm apart directly above the largest portion of the existing ledge. A staggered pattern of drilling facilitated a rhomboidal area of concentrated blast zone (USFS 1980) similar in principal to shaped charges (Smith 1985). High ambient air temp resulted in frequent pauses to prevent the drill bit and engine from overheating.

A civilian licensed blaster was contracted to prepare and detonate the charges. The type of explosive charges to be used was decided by the blaster. Ditching dynamite (60% nitroglycerin) in 2.5 × 46 cm cartridges was used in combination with electrically initiated, instantaneous blasting caps; 1.5 cartridges per bore hole were used. Thirty m of electric lead line was attached to the blasting cap leg wires and strung up the cliff face to a protected location. Logging roads beneath the blast zone were blocked and unnecessary personnel vacated the site during actual blasting. The charges were detonated by touching the ends of the electric lead line to the battery pack of a hand-held 1.5 volt portable radio.

RESULTS AND DISCUSSION

Following detonation of charges, the ledge was examined and excess debris was removed. Upon descent to the ledge we noted that 2 charges with blasting caps attached had not detonated. These charges were removed and examined manually. We believe that these charges did not explode due to the age of the ditching compound (estimated to be 15+ years old). Though only 2 of 4 charges (1.5 sticks/charge/bore hole) had exploded, the ledge was enlarged to a sufficient size.

Ditching dynamite is a high energy explosive agent which detonates at 5791 m/sec (Du Pont, Inc. 1977). This explosive was not the best to use in dolomitic limestone due to the proximity of the bore holes. If all charges had detonated as intended, the existing ledge may have been destroyed. As ditching dynamite progresses in age, it becomes more unstable and dangerous to use. Most licensed blasters are cognizant of this fact. Extreme caution is advised in determining the type and condition of explosives used on similar projects to prevent elimination or destruction of ledge or eyrie.

Access to the cliff was an important consideration in the application of explosives on this ledge. This facet makes wilderness or remote enhancements with explosives difficult at best.

Bolts affixed to the rock above the eyrie proved crucial in securing climbers, necessary equipment and to serve as placement for suspension of the rock drill during use, or rest breaks. The bolts have been subsequently helpful to climbers entering the eyrie to band young. No rust streaks have occurred to date despite precipitation runoff down the cliff face, and the bolts are invisible to observers from the base of the cliff.

Portions of the ledge were loosened to such a degree that 34 kg of masonry mortar was required to re-affix some blast debris to the main portion of the ledge. Dimensions of the ledge were found to have been increased to 41 cm × 152 cm. Mortar was allowed to cure, and 45 kg of sifted sand and gravel was spread on the ledge to form adequate substrate for nesting falcons. The eyrie has been examined yearly (1984–1988), with no further work required to replace or repair the mortared rock.

The enhanced ledge has been occupied by Peregrine Falcons yearly since the enhancement with 13 eyases (2.6/year) having fledged between 1984 and 1988 (Pagel 1988). Total investment in this project was $2000. Rough breakdown of these costs is as follows: $300, explosives and blaster's services; $400, ropes, bolts, ascenders and slings; and $1300 for 120 person-hr of labor.

CONCLUSIONS

Explosives offer an effective means to enhance existing nest ledges of cliff dwelling raptors when hand tools are not effective. Extreme care and forethought should be considered at active nest sites. Any work, including preliminary examinations, should not be conducted during the nesting period. Improvement of alternate nest ledges should be considered before the time and expense of explosive enhancement is utilized. Blasts more forceful than necessary may decrease the dimensions of the nesting platform or remove the existing nest ledge entirely.

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