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**OLDMAN RIVER DAM
RAPTOR MITIGATION PROGRAM**

1992 Report Prepared For:

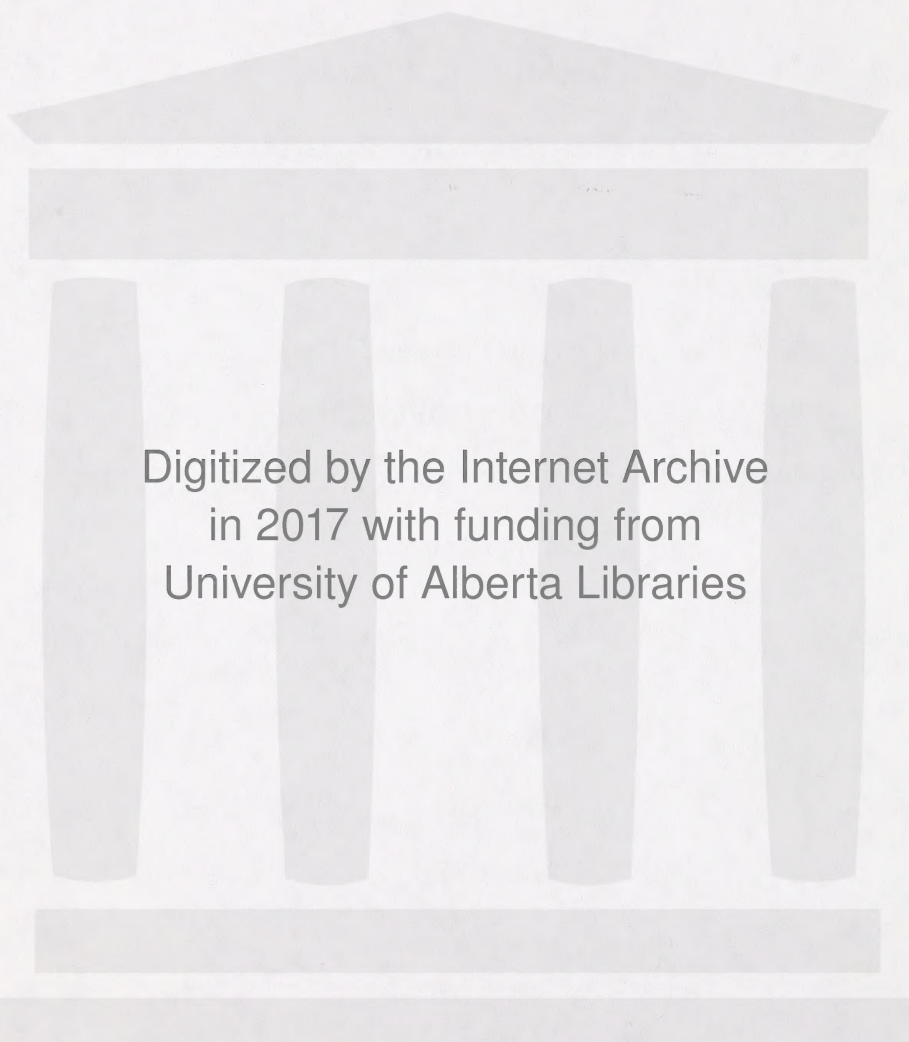
GOVERNMENT OF THE PROVINCE OF ALBERTA
DEPARTMENT OF PUBLIC WORKS, SUPPLY AND SERVICES

Edmonton, Alberta

Prepared by

R.W. FYFE

JUNE 30, 1992



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Executive Summary

This is the fourth report on the raptor mitigation project implemented in response to concerns relative to the impact of the Oldman River Dam on breeding populations of Prairie Falcons *Falco mexicanus* and Ferruginous Hawks *Buteo regalis*. Both species occur and nested in areas impacted by the construction and flooding of the dam.

In the current year approximately 500 hours were spent in the field observing these birds. Eleven Prairie Falcon and four Ferruginous Hawk breeding territories were occupied and monitored during the 1992 breeding season. Nine pair of Prairie Falcons nested, seven successfully fledged thirty one young, the four pair of Ferruginous Hawks fledged twelve young. Twenty six Prairie Falcons and twelve Ferruginous Hawks were caught and banded. In addition eighteen Red-tail Hawk *Buteo jamaicensis* nests were recorded within the study area.

As in 1991 severe disturbance was documented in two nesting territories in the 1992 breeding season. Both territories were in close proximity to the Dam and were subjected to intense human activity. No falcons have been observed at either site this year.

Six artificial holes were occupied during the 1992 breeding season, three by Prairie Falcons, and one each by Canada Geese *Branta canadensis*, Great Horned Owls *Bubo virginianus* and Ravens *Corvus corax*. Two nesting platforms were utilized by Red-tailed Hawks and nest boxes were occupied by American Kestrel *Falco spawerius*, Barrow's Goldeneye *Bucephala islandica*, Wood Duck *Aix sponsa*, Mountain Bluebirds *Sialia currucoides* and Tree Swallows *Tachycineta bicolor*.

Two additional raptor species, Golden Eagle *Aquila chrysaetos* and Richardson's Merlin *Falco columbarius richardsoni* nested in the study area on the banks of the Reservoir. Burrowing Owl *Athene cunicularia* and Sharp-shinned Hawks *Accipiter striatus* were observed near the reservoir but were not found nesting.

Concern expressed relative to the abundance of the Long-billed Curlew *Numenius americanus* resulted in a brief survey of the area for these birds. Thirteen pair were located, most in the adjacent grassland just outside of the study area.

1.0 INTRODUCTION

1.1 Background and Rationale

This is the fourth year of the project specifically developed to mitigate for breeding Prairie Falcons and Ferruginous Hawks impacted by the construction and/or flooding of the Oldman River Dam. The rationale remains unchanged from that outlined in the 1989 report with the Mitigation predicated on the necessity of understanding the affects of construction and the subsequent flooding on this population of birds of prey.

Since the two principal limiting factors for birds of prey are an adequate food supply and the availability of suitable nest sites, the initial investigations assessed the relative significance of these factors in relation to this population of birds. The results suggest that it is doubtful the dam will adversely impact on the availability of prey since both the Prairie Falcons and the Ferruginous Hawks primarily hunt in the upland at varying distances from the proposed reservoir. In contrast it was evident that suitable nest sites and nesting habitat in the study area were limited for Prairie Falcons. It was also noted that several of the available sites would be lost and the resident pairs displaced with the flooding of the dam. Initial mitigation therefore centered on providing suitable alternate nest sites in areas not currently occupied by territorial pairs of these species. Field studies have continued and every attempt has been made to initiate and maintain good public relations and to develop interest and awareness for the long term welfare of these birds.

2.0 OBJECTIVES

The principal objective of this project remains unchanged in that we have attempted to minimize possible adverse effects from the construction and subsequent flooding of the Oldman River Dam on the resident populations of Prairie Falcons and Ferruginous Hawks. To achieve this objective we have monitored the effects of disturbance on the two species for the past four years and have implemented mitigation procedures which we believe will minimize the impact on these populations.

Additional specific objectives were described in the original contract #Fyfe 89-01 and are as follows:

- a) To provide supervisory services relative to the construction of raptor nesting sites,
- b) To supervise the tagging and identification of raptors during the year,
- c) To observe and record the movement of raptors during the breeding season.

3.0 METHODS

3.1 Field Observations:

3.1.1 Inventory of Breeding Pairs of Prairie Falcon and Ferruginous Hawks

As detailed in my earlier reports the initial raptor inventories relative to the Oldman River Dam were carried out as part of the Oldman River Wildlife Investigations in the spring and summer of 1985. These inventories located four breeding pair of Prairie Falcons and one pair of Ferruginous Hawks within the proposed reservoir boundaries. Three additional pair of falcons and two pair of Ferruginous Hawks were located upstream and downstream of the proposed reservoir. (Young et al. March 86). Further inventories of breeding pairs within the proposed reservoir were carried out in 1986 and again in 1987. These inventories were somewhat cursory in that they were of short duration, their timing

precluded the collection of data on the establishment of territories and the surveys were restricted to nests located within 1.6 km of construction related activity (Young, 1988).

A more comprehensive inventory was required in order to determine the total population, the affects of construction and flooding of the dam, and to locate potential alternate breeding locations. Therefore raptor breeding inventories and behavioral studies have been carried out from March through July in 1989, 1990, 1991 and 1992. These field investigations were carried out specifically to locate breeding pairs, non breeding pairs and individuals occupying known breeding territories, or suitable nesting habitat within 16 km. of the proposed reservoir boundaries.

3.1.2 Inventory of Breeding Pairs of other raptors and Long-billed Curlew

Incidental to the monitoring of Prairie Falcons and Ferruginous Hawks other raptor species were inventoried and their nests plotted for future investigation. In addition as a result of concern expressed relative to the status of the Long-billed Curlew a limited survey was carried out in the current field season to locate pairs of these birds in and adjacent to the study area.

3.1.3 Banding

In order to verify the effects of construction and/or flooding of the dam on the resident Prairie Falcons and Ferruginous Hawks, it was deemed necessary to be able to distinguish residents from migrants or transients of the same species. Since most individuals of both species are virtually identical in size and colour, it was necessary to catch individuals and mark them with an external marking device which could be identified later. Since they were to be most directly affected by the construction and flooding, color marking was

restricted to Prairie Falcons. In 1989 and 1990 Falcons in the study area were banded with standard USF&W numbered aluminum bands together with combinations of red, blue and black coloured bands. In 1991 and 1992 following the two years of colour banding all young have been banded with the standard USF&W aluminum bands. The single pair of Ferruginous Hawks identified in the area of the proposed reservoir were found to have relocated outside of the area and none of the Ferruginous pairs currently nesting in the study area will be displaced by activities related to the construction and/or flooding of the dam.

3.1.4 Disturbance

One of the objectives of the current study has been to determine the effects of disturbance resulting from the construction and flooding of the dam on both Prairie Falcons and Ferruginous Hawks. This is of particular relevance as earlier studies have documented adverse affects on these two species resulting from various types of disturbance (Fyfe and Olendorff 1976, Call 1978, White and Thurow 1985, Grier and Fyfe 1987). From the beginning it has been evident that since several of the Prairie Falcon and Ferruginous Hawk nesting territories encompass areas that are impacted by or adjacent to the dam, it is inevitable that resident birds will be disturbed to a greater or lesser degree by activities associated with construction and/or flooding. Therefore all observed instances of disturbance and the subsequent behaviour were documented during the 1989, 1990, 1991 and 1992 breeding seasons.

3.1.5 Artificial Nest Construction

As indicated in the 1990 report one Ferruginous and eight Prairie Falcon nesting territories have been adversely impacted as a result of dam construction and/or flooding. Following the flooding of the reservoir, seven of the eight pair of falcons will be displaced permanently since the nesting habitat previously utilized will no longer be available. It is expected that the remaining pair of falcons which formerly nested at the dam site will return to nest in its original territory following construction when human activity immediately beneath and adjacent to the site has abated.

Field observations and the good production in each of the past three years suggest that foraging areas and the availability of an adequate prey base is not a concern at present. Therefore as outlined in earlier reports our mitigation has been directed towards providing suitable alternate nesting sites. In 1989 and 1990 following the breeding season an ambitious program of nest site construction and modification was undertaken in and adjacent to the proposed reservoir. For the most part, these sites are situated near existing territories and will not be directly impacted by the flooding of the reservoir. As a result of this mitigative action, I believe the availability of suitable nest sites should no longer be a limiting factor. As a consequence birds displaced as a result of construction and/or flooding have alternate unused nesting sites available for occupancy.

Although surveys indicated that there would be no shortage of trees to provide suitable nest sites for the relocation of Red-tailed Hawks or other stick nesting raptors, it was decided to provide artificial nest platforms as potential alternate nest sites adjacent to the reservoir. We believe that these platforms will not only provide sites for surplus buteos

in the area, but may also be used by Canada Geese and at the same time may attract Osprey *Pandion haliaetus* and Bald Eagle *Haliaeetus leucocephalus* to the reservoir. The decision was also made to provide suitable nest boxes for displaced American Kestrels *Falco sparverius* and other hole nesting species, including tree nesting waterfowl such as Wood Duck *Aix sponsa*, Hooded Merganser *Lophodytes cucullatus*, Bufflehead *Bucephala albeola* and Barrow's Goldeneye *Bucephala islandica* observed in the study area.

4.0 RESULTS

4.1 Population Inventory

Prairie Falcons were observed in twelve of seventeen documented nesting territories during the 1992 breeding season with one new nesting territory identified just outside the study area. One site was again occupied by a single male with two females utilizing separate nest sites within that male's territory. Prairie falcons did not attempt to nest in two known territories and were not observed near these territories during the 1992 breeding season.

The initial flooding of the dam in 1991 eliminated six nesting sites and nesting habitat that had been used one or more times during the past three years. Four of these sites were again available following the lowering of the reservoir in the winter of 1991-92. All four were occupied by lone females in the spring of 1992, two of these attracted mates and nested, however only one fledged young.

Ferruginous Hawks were observed in four nesting territories outside of limits of the proposed reservoir but within the study area. All four pair occupied territories and produced young during the current year. It should also be noted that Ferruginous hawks have not been observed at any time during this study in the area of (Fer #17) as described by Young et al. (1986).

4.1.1 Prairie Falcon Production

Thirty one young Prairie Falcons were produced by seven productive pair (Table 1.) for an average of 4.42 young per productive pair, or an average of 2.58 young for twelve nesting attempts. One nest site failed possibly due to predation or slumping, and at a second site four of five young were killed by a racoon. The remains of one of the young was

TABLE 1. PRAIRIE FALCON BREEDING TERRITORIES

1989, 1990, 1991, 1992

| NEST SITE | PRS | | | | IND | | | | COURT | | | | COP | | | | EGGS | | | | YNG FL | | | |
|----------------------------|-----|----|----|----|-----|----|----|----|-------|----|----|----|-----|----|----|----|------|----|----------------|----|--------|----|----|----|
| | 89 | 90 | 91 | 92 | 89 | 90 | 91 | 92 | 89 | 90 | 91 | 92 | 89 | 90 | 91 | 92 | 89 | 90 | 91 | 92 | 88 | 90 | 91 | 92 |
| Old Bridge | Y | Y | Y | Y | | | | | Y | Y | Y | Y | Y | Y | Y | | 5 | 5 | | | 4 | 4 | 5 | |
| Mercury | Y | Y | Y | | | | | | Y | Y | | | | | | | 4 | 4 | | | 4 | 3 | | |
| Dam ¹ | Y | | | | | | | | Y | | | | | | | | | | | | | | | |
| Buffalo Jump E. | Y | Y | Y | Y | | | | | Y | Y | Y | | Y | | Y | | 5 | | | | 4 | 5 | 4 | 5 |
| Buffalo Jump W. | Y | Y | Y | Y | | | | | Y | Y | Y | Y | Y | Y | Y | Y | 3 | 3 | | | | | | |
| Fairbrother | Y | Y | Y | Y | | | | | Y | | Y | | | | | | 5 | 5 | | | 3 | 3 | 3 | 5 |
| Bitango Eagle | | Y | | | | | | | Y | | | | | | | | | | | | 4 | | | |
| Bitango Bridge | Y | Y | | | | | | | Y | | | | | | | | | | | | 5 | | | |
| Tennessee Creek | | Y | Y | Y | Y | | | | | | | | | | | | 4 | | | | 4 | 4 | | |
| Lang | Y | Y | Y | | Y | Y | | | Y | Y | Y | | Y | | Y | | 3 | | | | 1 | 5 | | |
| Welsch | Y | Y | Y | | Y | | | | Y | | Y | | | | | | 4 | | | | 4 | 4 | | |
| Days | Y | Y | | | | | | | Y | | | | Y | | | | 5 | | | | 2 | | | |
| 1st Porcupine ^a | | Y | Y | Y | | | | | Y | Y | Y | | Y | | | | | | | | 5 | 4 | 5 | |
| Double Ox-bow | Y | | Y | Y | Y | | | | Y | | | | | | | | | | Y ¹ | | | | | |
| Horseshoe Canyon | Y | Y | Y | Y | | | | | Y | | | | Y | | | | 5 | 4 | | | 4 | 4 | 3 | 5 |
| Horseshoe#2 | | Y | | | | | | | | | | | | | | | | | | | 2 | 2 | | |
| Maloff | Y | Y | Y | Y | | | | | Y | Y | | | Y | | | | 4 | | | | 3 | 4 | 1 | |
| Stevick | | | Y | | Y | Y | Y | | | | | | | | | | 5 | | | | 5 | | | |
| Castle Dairy | Y | Y | Y | | | | | | Y | | | | Y | | | | 5 | 5 | 5 | | 4 | 4 | 4 | |
| | | | | | | | | | | | | | | | | | | | | | | | | |

¹ suspected relocation from former #42² second nest site within an established territory^a pair relocated from Days¹ female observed incubating

NEST SITE = Names given to known breeding territories

PRS = pairs observed on territory

IND = individual birds observed to remain in a territory

COURT = courtship behaviour observed

COP = copulation observed

EGGS = number observed, most nests not climbed in incubation

YNG FL = number of young known to have fledged

found at the site. In 1992 only one territory was documented where a single male was observed mating with two females which resulted in two nesting attempts, only one of which was successful in fledging young. As in the two previous years in this territory the second female deserted during incubation.

4.1.2 Ferruginous Hawk Production

Twelve young were produced at the four nest sites located outside of the proposed reservoir (Table 2.). The light phased pairs produced eight light phase young whereas the mixed pair at the edge of the Porcupine Hills (a dark phase male and light phase female) produced one dark phase and three light phase young.

TABLE 2. FERRUGINOUS HAWK BREEDING TERRITORIES 1989, 1990, 1991, 1992

| NEST SITE | PRS | IND | COURT | COP | EGGS | YNG FL |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 89 90 91 92 | 89 90 91 92 | 89 90 91 92 | 89 90 91 92 | 89 90 91 92 | 88 90 91 92 |
| Feedlot | Y | Y | | Y | | |
| Highway | Y Y Y Y | | Y Y Y | | | 3 2 2 3 |
| 1st Porcupine | Y Y Y | | Y Y | Y Y | | 3 |
| Porcupine #2 | Y Y Y | | Y Y | Y | | 3 4 4 |
| Porcupine #3 | Y | | | | | 2 |

NEST SITE = Names given to known breeding territories
 PRS = pairs observed on territory
 IND = individual birds observed to remain in a territory
 COURT = courtship behaviour observed
 COP = copulation observed
 EGGS = number observed, most nests not climbed in incubation
 YNG FL = number of young known to have fledged

4.2 Banding and Colour Marking

| TABLE 3. 1992 IMMATURE PRAIRIE FALCON BANDING | | | |
|---|-----------|-----------|----------|
| Location | Male | Female | Date |
| Fairbrothers | 816-34436 | 987-24336 | 06-11-92 |
| | 816-34437 | 987-24337 | |
| | 816-34438 | | |
| 1st Porcupine | 816-34439 | 987-24338 | 06-11-92 |
| Buffalo Jump East | 816-34440 | 987-24339 | 06-11-92 |
| | 816-34441 | 987-24340 | |
| | 816-34442 | | |
| Stevick | 816-34443 | 987-24341 | 06-11-92 |
| | 816-34444 | 987-24342 | |
| | 816-34445 | | |
| Old Bridge | 816-34446 | 987-24343 | 06-11-92 |
| | | 987-34344 | |
| | | 987-34345 | |
| Horseshoe Canyon | 816-34447 | 987-24346 | 06-11-92 |
| | 816-34448 | 987-24347 | |
| | 816-34449 | | |

As this project ends this year it was felt that the young should only be banded with regular aluminum bands. Twenty six nestling Prairie Falcons were captured and banded using regular USF&W lock on bands (Table 3.). This brings the total to one hundred fifty

four Prairie Falcons that have been banded in the past three years with ninety seven colour marked (Table 4.). The total includes the nineteen adults caught and individually marked. All were banded with numbered USF&W bands and those that were colour marked were also given one or more coloured anodized aluminum bands. Young birds in the first two years were banded with a single colour band coded as to the year of production.

| Table 4. PRAIRIE FALCON BANDING SUMMARY 1989 - 1992 | | | | | | |
|---|-----------------|-------|-----------------|-------|-------|------------------|
| | Adults | | Immatures | | Total | Field Identified |
| | Color and USF&W | USF&W | Color and USF&W | USF&W | | |
| 1989 | 13 | | 31 | | 44 | |
| 1990 | 6 | | 47 | | 53 | 5 |
| 1991 | | | | 31 | 31 | 8 |
| 1992 | | | | 26 | 26 | 5 |
| Total | 19 | | 78 | 31 | 154 | 18 |

Since the young will not be part of the breeding cohort prior to the flooding of the dam they are marked only so that at some later date it is possible to determine if recruitment is

from this population unit. The primary objective of the banding is to help us to locate and identify individuals that move or are displaced. However, since it is not always possible to catch the breeding birds, each adult bird that we have caught has been specifically colour marked so that individuals can be identified in the field by the use of a spotting scope. Incidental to our regular field observations this year we were able to identify five of the breeding adults by reading the band colour combinations.

TABLE 5. 1992 IMMATURE FERRUGINOUS HAWK BANDING

| Location | Male | Female | Date |
|---------------------------|-------------------------------------|------------------------|----------|
| Porcupine Ferruginous | 608-90008 608-90010 608-90011 | 608-90009 | 06-18-92 |
| Highway Ferruginous | 608-90012 608-90013 | 608-90014 | 06-18-92 |
| 1st Porcupine Ferruginous | 608-90017 | 608-90015 608-90016 | 06-28-92 |
| Porcupine Ferruginous #2 | 608-90018 608-90019 | | 06-28-92 |

It should be noted that it was originally proposed that Ferruginous Hawks nesting within the boundaries of the proposed reservoir would also be individually marked. Unfortunately no Ferruginous have been color marked as none have nested within the boundries of the reservoir in the past four years. However, each year they have nested in the study area and

in both 1991 and 1992 (Table 5.) the young in the study area were banded for future reference.

4.3 Disturbance

Each year in the study area all of the breeding pairs of both species were subject to a wide range of natural disturbance and varying degrees of human related disturbance. During the current breeding season, human disturbance was greatly decreased at most of the nesting territories. With the completion of the dam, construction or recreation related disturbance was pretty much limited to those nest sites near the reservoir and to one area on the upper end of the flooded area of the dam on the Castle River (Table 6.).

In general, in comparison to the previous two years the incidence of disturbance to breeding pairs of Prairie Falcons was greatly reduced. Our observations suggest moderate to severe disturbance was restricted to two nesting territories. However, both territories were subjected to disturbance for extended periods of time throughout the breeding season and no birds were observed in either territory.

As in 1991 severe disturbance was documented the two sites in close association with the final construction at the Dam site. Unfortunately at one of these sites in 1991 we recorded the third nest desertion associated with the construction of the Dam and directly related to human disturbance. This occurred at the Mercury Nest Site on May 10, 1991 as a direct result of human activity. The pair subsequently deserted the area and have not been observed in the territory to date.

The territory immediately to the south of the Dam was the second area where a high level of disturbance was recorded. As in the past four years intense activity was observed

TABLE 6. PRODUCTIVITY AND DISTURBANCE AT KNOWN PRAIRIE FALCON BREEDING TERRITORIES
FOR 1992

| NEST SITE | 1985 NEST # (Young et al. 1986 | PRODUCTIVE IN 1992 | DISTURBANCE |
|-------------------------------|------------------------------------|--------------------|-------------|
| Old Bridge | #48 | Y | Minimal |
| Mercury | #45 | not occupied | Severe |
| Dam ¹ | #42 | not occupied | Severe |
| Buffalo Jump E. | #40 | Y | Minimal |
| Buffalo Jump W. ² | | N | Minimal |
| Fairbrother | | Y | Minimal |
| Bitango Eagle | | not occupied | Minimal |
| Bitango Bridge | #37 | not occupied | Minimal |
| Tennessee Creek | | N | Minimal |
| Lang | | N | Minimal |
| Welsch | #22 | N | Minimal |
| Days | | not occupied | Minimal |
| 1st Porcupine ^a | | Y | Minimal |
| Double Ox-bow | #18 | N | Minimal |
| Horseshoe Canyon | #15 | Y | Minimal |
| Horseshoe Canyon ² | | not occupied | Minimal |
| Maloff | #12 | Y | Minimal |
| Stevick | | Y | Moderate |
| Castle Dairy | | Y | Minimal |

¹ suspected relocation from former #42

² second nest site within an established territory

^a pair relocated from Days

NEST SITE = Names given to known breeding territories

= Corresponds to nest numbers given in earlier reports by Young

PRODUCTIVE = Indicates whether a nest site was productive or not in the 1990 breeding season.

DISTURBANCE = relative level of documented disturbance

almost daily in and near this territory. This activity during the past four years appears to have resulted in at least the temporary desertion of this site by the Prairie Falcons.

Four pair of Falcons failed in 1992. The first two resulted as two females occupied territories and were unsuccessful in attracting males. Both females maintained the

territories but appear to spend increasingly less time at the nesting cliffs. We believe the third failed as a result of predation as the pair defended aggressively a couple of days earlier and simply flew off silently on our banding visit. The fourth failed as a result of the desertion during incubation of the second female in the triangle in the Buffalo Jump Territory.

Ferruginous Hawks were observed at three previously occupied territories and also in one new territory in the study area. Pairs were observed at nests in all four territories early in the season and all four pair in the study area were successful during the 1992 breeding season. As in the past three years the Ferruginous in the study area have been subjected to little human interference and our observations suggest that their production has not been influenced by disturbance.

4.4 Artificial Nest Utilization

Table 7. summarizes the utilization of the artificial cliff nesting sites since 1989. Six artificial holes were occupied during the 1992 breeding season, three by Prairie Falcons, and one each by Canada Geese, Great Horned Owls and Ravens. All nested successfully.

Prior to the 1991 breeding season nineteen nest platforms were constructed and placed on tree stumps in selected sites along the banks of the reservoir or on areas that will become newly created islands with the flooding of the reservoir. In 1992 two platforms were used successfully by a breeding pair of Red-tailed Hawks and others were utilized as hunting perches. In addition two Osprey were observed on the platforms in late May.

| Table 7. ARTIFICIAL AND IMPROVED CLIFF NESTING SITES 1989 -1992 | | | | |
|---|---------------------|--------------------------------|---|-------------------|
| | Artificial holes | Utilized by Prairie Falcons | Utilized by other species | Total Occupied |
| Available in 1989 | 15 | 1 | 1 Raven 1 Canada Goose | 3 |
| Available in 1990 | +32 = 47 | 3 | 1 Canada Goose 1 G.H.Owl | 5 |
| Available in 1991 | +3 = 50 | 4 | 2 Canada Geese 1 G.H. Owl | 7 |
| Available in 1992 | | 3 | 1 Canada Goose 1 G.H. Owl 1 Raven | 6 |
| Total | 50 | 11 | 10 | 23 |

Although we were not able to make a serious attempt at monitoring all of the nest boxes we did document Kestrel pairs using four boxes, and Wood Ducks and Barrow's Goldeneye in individuals boxes. Lone drake Barrow's Goldeneye were also observed resting adjacent to three nest boxes on successive days. This suggests that at least three additional boxes were used in 1992.

5.0 DISCUSSION

5.1 Prairie Falcons

Prairie Falcons were observed in twelve territories in the 1992 breeding season. All territories were occupied by mid March, seven by pairs, four by lone females and one by a single bird that was not identified as to sex. During the next month the lone females were observed attempting to attract males into the territories. Two were successful. The resulting nine breeding pairs nested successfully but only seven succeeded in fledging young. Production was excellent for the productive pairs. The resulting fledging success of 4.4 young (Table 8.) per successful pair of Prairie Falcons is actually up from previous years and well above what is normally considered good fledging success (3.1 or 3.2 per successful pair as reported in Idaho by Ogden and Hornocker (1977) and the Pawnee Grassland in Colorado by Olendorff (1973)).

In contrast to previous years the large number single female birds holding territories suggests either a decline in the normally extensive ground squirrel prey base or a loss of attachment to the nesting territory by the resident male as a result of the flooding of these sites in 1991. Our subjective field observations for mid March through mid-April support a general absence of ground squirrels at this time, however with the appearance of young ground squirrels in mid-May and June there is a large prey base available for those pairs that did breed successfully.

5.2 Ferruginous Hawks

In 1985 a single pair of Ferruginous hawks was recorded nesting in the area to be impacted by construction activity. After relocating twice, this pair has nested successfully

each year since 1989 at a site approximately four kilometers from the dam. Ferruginous have also been recorded at two other locations within the study area.

In the 1992 field season Ferruginous Hawks were observed in four nesting territories outside of limits of the proposed reservoir but within the study area. The four pair nested successfully and produced twelve young during the current year.

| Table 8. Prairie Falcon and Ferruginous Hawk Nesting | | | | | | | | |
|--|----------------|------|----------------|------|------------------|------|------|------|
| Summary 1989 - 1992 | | | | | | | | |
| | Prairie Falcon | | | | Ferruginous Hawk | | | |
| | Nest Success | | | | Nest Success | | | |
| | 1989 | 1990 | 1991 | 1992 | 1989 | 1990 | 1991 | 1992 |
| Occupied Territories | 15 | 15 | 13 | 12 | 3 | 3 | 3 | 4 |
| Nest Attempts | 12 | 15 | 12 | 11 | 1 | 3 | 2 | 4 |
| Failures | 3 ^a | 2 | 4 ^b | 4 | 1 | 1 | | |
| Successful nests | 9 | 13 | 8 | 7 | 1 | 2 | 2 | 4 |
| Young Fledged | 31 | 47 | 31 | 31 | 3 | 5 | 6 | 12 |
| Production per nest attempts | 2.58 | 3.33 | 2.58 | 2.81 | 1.5 | 1.66 | 3 | 3 |
| Production per successful pair ^c | 3.44 | 3.85 | | 4.4 | 3 | 2.5 | 3 | 3 |

^a Two of these failures were attributed to human disturbance.

^b One of these failures was attributed directly to human disturbance.

^c Good Prairie Falcon nesting success as per studies in Idaho and Colorado = 3.1 to 3.2 per successful pair.

As in the previous three years our observations during this study indicate that the four pair of Ferruginous Hawks within the study area have been subjected to a minimum of human disturbance. We have found no evidence to suggest that human interference has in any way affected the production of these birds during the past three years.

TABLE 9. PRODUCTIVITY AND DISTURBANCE AT KNOWN FERRUGINOUS BREEDING TERRITORIES
1989, 1990, 1991, 1992

| NEST SITE | 1985 NEST # | NEST SUCCESS | | | | DISTURBANCE |
|----------------------|-------------|--------------|------|------|------|-------------|
| | | 1989 | 1990 | 1991 | 1992 | |
| Feedlot | | not occupied | | | | Minimal |
| Highway ¹ | #47 | Y | Y | Y | Y | Minimal |
| Porcupine Hill | | N | N | | Y | Minimal |
| Porcupine #2 | | Y | Y | Y | Y | Minimal |
| Porcupine #3 | | | | | Y | Minimal |

¹ suspected relocation from former #42

² second nest site within an established territory

NEST SITE = Names given to known breeding territories

= Corresponds to nest numbers given in earlier reports by Young et al 1986

NEST SUCCESS = Indicates whether a nest site was productive or not

DISTURBANCE = relative level of documented disturbance

5.3 Disturbance

In the 1989 report I suggested that next to the actual destruction of nest sites by flooding, the most serious problem for both the Prairie Falcon and the Ferruginous Hawks would probably be disturbance resulting from the construction of the dam and roads, as well as from clearing and other habitat modification.

During the past four years we have taken every opportunity to document any disturbance that could be associated with the development of the Dam. We did not attempt

to stop such disturbance when encountered nor to interfere with ongoing construction or activities. Our observations of the activities and the subsequent results were simply documented and reported. As stated in the 1991 report, in general our observations demonstrate that the Prairie Falcons observed in this study are remarkably adaptable and tolerant to some types of disturbance. Indeed the most remarkable aspect of the field study has been the tolerance of the Prairie Falcons to many types of disturbance.

Two observations were made this summer which highlight the problems related to disturbance. For the most part intensive human activity was limited to road construction, and the construction of recreation areas. As a direct result of this and the low water levels, human disturbance was greatly restricted and the only areas of conflict with nesting sites were those immediately downstream of the Dam. Daily activity was noted close to the two deserted prairie falcon sites in this area and no falcons were observed in the area at any time during the breeding season. In sharp contrast in those areas removed from the dam site and the activity, the falcons forced from their nests in 1991 by the flooding of the reservoir returned to occupy all of these territories in 1992. Of even greater significance however, is the increase from two to four pair of nesting Ferruginous Hawks and the arrival and successful nesting of Golden Eagles on the banks of the reservoir in 1992. Both of these species are notoriously shy of human activity and have been documented as readily deserting nest sites as a result of disturbance.

As stated in earlier reports, we have documented the three desertions during the past three years. In my opinion these came about directly as a result of people and/or heavy equipment approaching to within 20 meters of the nest sites and remaining in the area

for extended periods of time. I believe that with suitable guidelines and coordination with contractors such losses could be avoided. Just such an example occurred in 1990 with the successful intervention and cooperation at the Welsch site. Following a meeting with the contractor the work was carried out, meeting specific timing concerns relative to the welfare of this particular pair of birds. The construction work was completed successfully and the birds returned to mate and nest successfully. I believe that realistic guidelines must be in place in the future if such desertions are to be avoided. As indicated in my 1990 report these observations parallel those made in the recent study in Idaho by Holthuijzen (1989). On the strength of the data I think that realistic recommendations can and should be drafted relative to the potential effects of construction activities on breeding Prairie Falcons.

5.4 Artificial Nest Sites

Since the existing nesting territories were still intact at the beginning of the breeding season the majority of the breeding pairs including those utilizing artificial holes remained in their original territories. No new pairs were located in new nesting territories in the study area in 1992. A total of six artificial holes were occupied during the current breeding season, three by Prairie Falcons, one by a pair of Canada Geese, one by a Great Horned Owl and one by a Raven.

As noted in the 1990 report, suitable alternate nest sites are now available for most of the breeding pairs. The exception being the Bitango and Tennessee Creek nesting territories. As there were no alternatives, marginal habitat was selected and with permission from the land owners, two new sites were created near Tennessee Creek and two, south of the highway on a cliff adjacent to Pincher Creek. Unfortunately this means that good

alternate nest sites are limited within reasonable proximity of three sites flooded in 1991. Nineteen nest platforms were constructed and placed on tree stumps 1991, a small number of additional poles were erected in the fall of 1991 in selected sites along the banks of the reservoir or on what will be newly created islands (Appendix. 4). These were put out to provide suitable nest sites for the relocation of Red-tailed Hawks or other stick nesting raptors or Canada Geese. At the same time we believe they may serve to attract Osprey and Bald Eagle to the reservoir. Two of the platforms were utilized for nesting in 1992, several others were utilized as feeding platforms and hunting perches. Ospreys were observed on two of the sites in mid-May of the current year.

Wooden nest boxes were also put out adjacent to the reservoir to provide suitable nest boxes for displaced American Kestrels and other hole nesting species, including tree nesting waterfowl. As in 1991 we did not make a serious attempt in the 1992 breeding season to monitor all of the nest boxes that were put up. We did document Kestrel pairs at four boxes and we flushed Wood Duck and Barrow's Goldeneye from others. It is very probable that several pair of Barrow's Goldeneye nested in others as lone drakes were observed sitting near nest boxes late in the season.

5.5 Multiple Use Potential

The opportunity for multiple use of the area is quite incredible. In particular aside from water sports and fishing there is a very real potential for the development of Eco-Tourism. There are few places on the prairies where you can in a single day observe such species as Long-billed Curlew, Wood Duck, Barrow's Goldeneye and up to ten species of

birds of prey including Prairie Falcon, Ferruginous Hawks, Golden Eagle, Richardson's Merlin. The area is an excellent showplace for prairie wildflowers, and wildlife. Several species of mammals are found in the area including a large ungulate population with both Mule and White-tailed Deer, three species of ground squirrel and three carnivores including a healthy badger population. With good management and planning I believe there is an excellent potential for tourism both by the general city dwelling public but also from the increasing nature and environmentally aware naturalists and birdwatchers. The relative inaccessibility of the river valleys prior to the flooding is undoubtedly one of the primary reasons the area has maintained a good population of sensitive and uncommon raptors. Incredibly, just one year after construction the abundant food supply and lack of disturbance, has allowed both the Golden Eagles, Ferruginous Hawks and a large number of Waterfowl to come into the area and nest successfully. In addition loons were observed late in the nesting season and a wide range of colonial waterbirds were present through much of the season both on the reservoir and adjacent ponds.

However it is my opinion the most serious impact on not only the raptors but on any colonial nesting waterfowl or other sensitive colonial nesting birds is yet to come. I believe this impact will come from human disturbance resulting from unrestricted recreational activities on the reservoir. During this past field season we observed fishermen and/or recreational boaters in the reservoir daily since mid-May. Due to the low water levels they were restricted primarily to the reservoir proper and were unable to come into the more isolated river valleys. However as the water levels increased they immediately moved into the valleys to the edge of the flowing water. If these people stay in their boats and away

from sensitive areas they do not pose a threat, however with few exceptions they frequently came ashore for one reason or another.

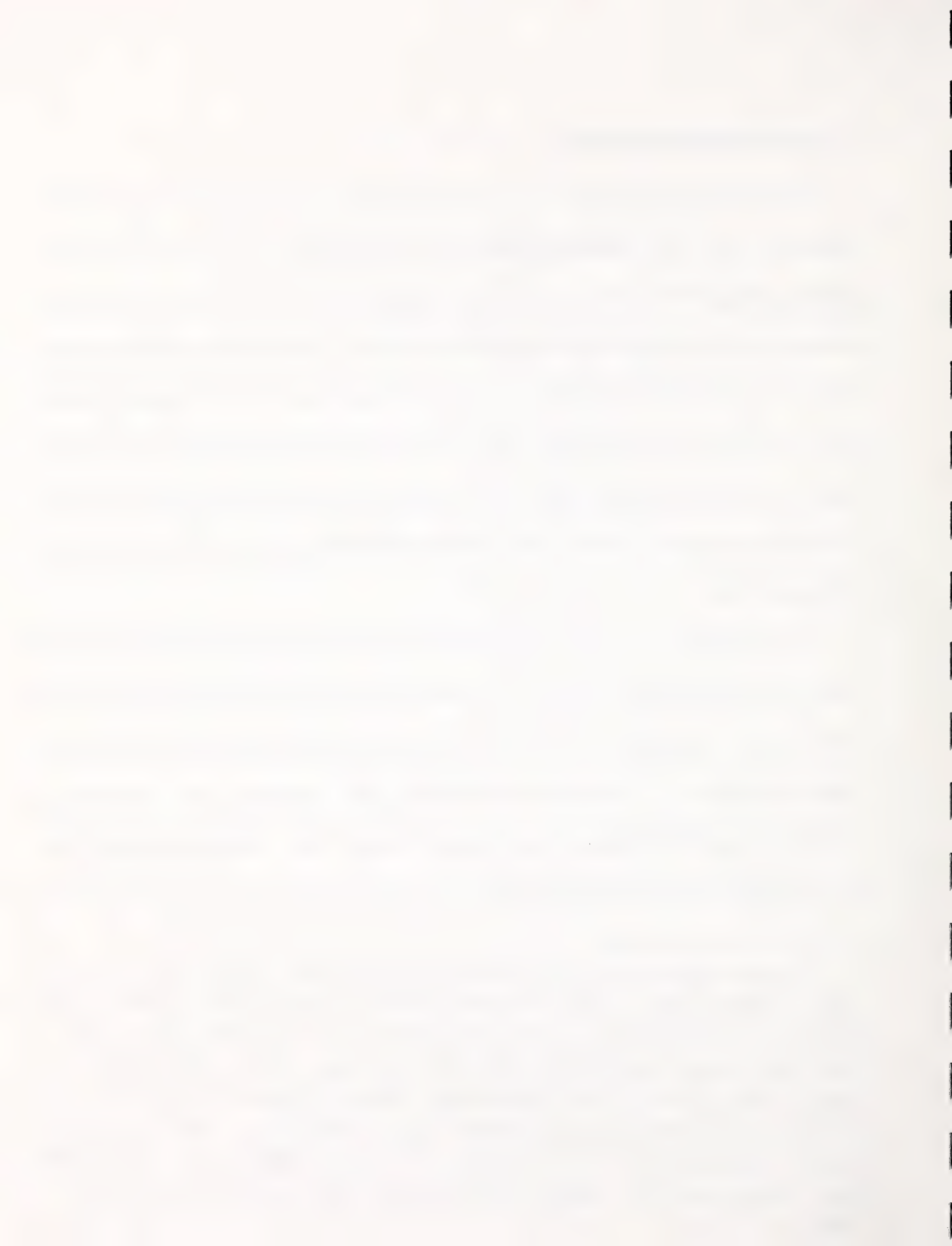
I believe that it is essential that specific regulations and restrictions to access are put in place for at least the Castle River arm for the majority of the breeding season. I am convinced that if unlimited public access is permitted in this area and throughout the reservoir there is a very real possibility that the majority of the more sensitive species will abandon the area. This would to some extent nullify the mitigation work and would result in the loss of the breeding pair of Golden Eagle, several pair of Prairie Falcons, Ferruginous Hawks and Long-billed Curlew and would eliminate the potential for establishing several of the colonial species.

6.0 RECOMMENDATIONS

1. I recommend that serious consideration be given to closing and /or regulating the Castle River arm of the Three Rivers Reservoir to boating and general public access from January through June 30th each year. It is imperative that this should be done in full consultation with the other Govt. Departments, the local Committee and in cooperation with the local residents. This arm of the reservoir has unique potential for the development of eco tourism and the maintenance of the most threatened avifauna of the entire reservoir. This area presently provides nesting sites for eight species of raptors and with the flooding of the reservoir and the creation of the several islands will serve to attract several species of colonial birds.¹

2. It is apparent that following flooding of the reservoir the majority of the breeding pairs of prairie falcons and several other species will be subjected to increased interaction with humans. Continued monitoring for three to five years following the completion reservoir is essential to determine a) the results of the mitigation and b) the effect of recreational activities on birds of prey, colonial birds and other designated species such as the Long-billed Curlew. It is possible that the very species which were mitigated for will be

¹ In 1992 nesting birds of prey in this arm alone included: 3 pair of Prairie Falcons, 1 pair of Golden Eagle, 4 pair of Red-tailed Hawks, 2 pair of Swainson's Hawks, 1 pair of Richardsons Merlins, 3 pair of American Kestrel, 3 pair of Northern Harrier, 1 pair of Long-eared Owl, and 1 pair of Great Horned Owl. The following colonial species have been observed on the reservoir and if left undisturbed could set up breeding colonies.: Western Grebe, Eared Grebe, Double Crested Cormorant, White Pelican, California Gull, Ring-billed Gull, Common Tern, and Black Tern. In addition some of the more interesting species observed in the area this year included 3 pair of Long-billed Curlew, 1 pair of Common Loon, several pair of breeding Barrows Golden-eye Ducks, 200+ Canada Geese, 400+ Mallard Ducks, and several sightings of Osprey and Bald Eagle.



lost as a direct consequence of increased human disturbance resulting from recreational activities on the reservoir. I would also like to suggest that the department should capitalize on the 19 years of accumulated data on this population of birds. These data provide the basis to:

- a) evaluate the effects of disturbance,
- b) to better understand the significance of habituation, and
- c) to contribute to realistic guidelines for future construction and recreational projects.

In the light of the increased environmental concern by the public and environmental groups I believe that this is a unique opportunity to develop realistic guidelines for mitigating problems associated with future projects which have the potential for adversely affecting the environment.

3. Where possible, it would be desirable to coordinate planned recreational activities to minimize disturbance and maximize the recreation and educational potential of the breeding raptors and colonial species.

4. Consideration should be given to drafting guidelines and realistic recommendations relative to the effects of construction and related disturbance on Prairie Falcons and other raptors. Our observations indicate that with a few exceptions, Prairie Falcons in particular are very tolerant of a wide variety of disturbances. Our findings support and parallel those made in the recent study in Idaho by Holthuijzen (1989). On the strength of these data, I think that realistic recommendations can be drafted relative to the

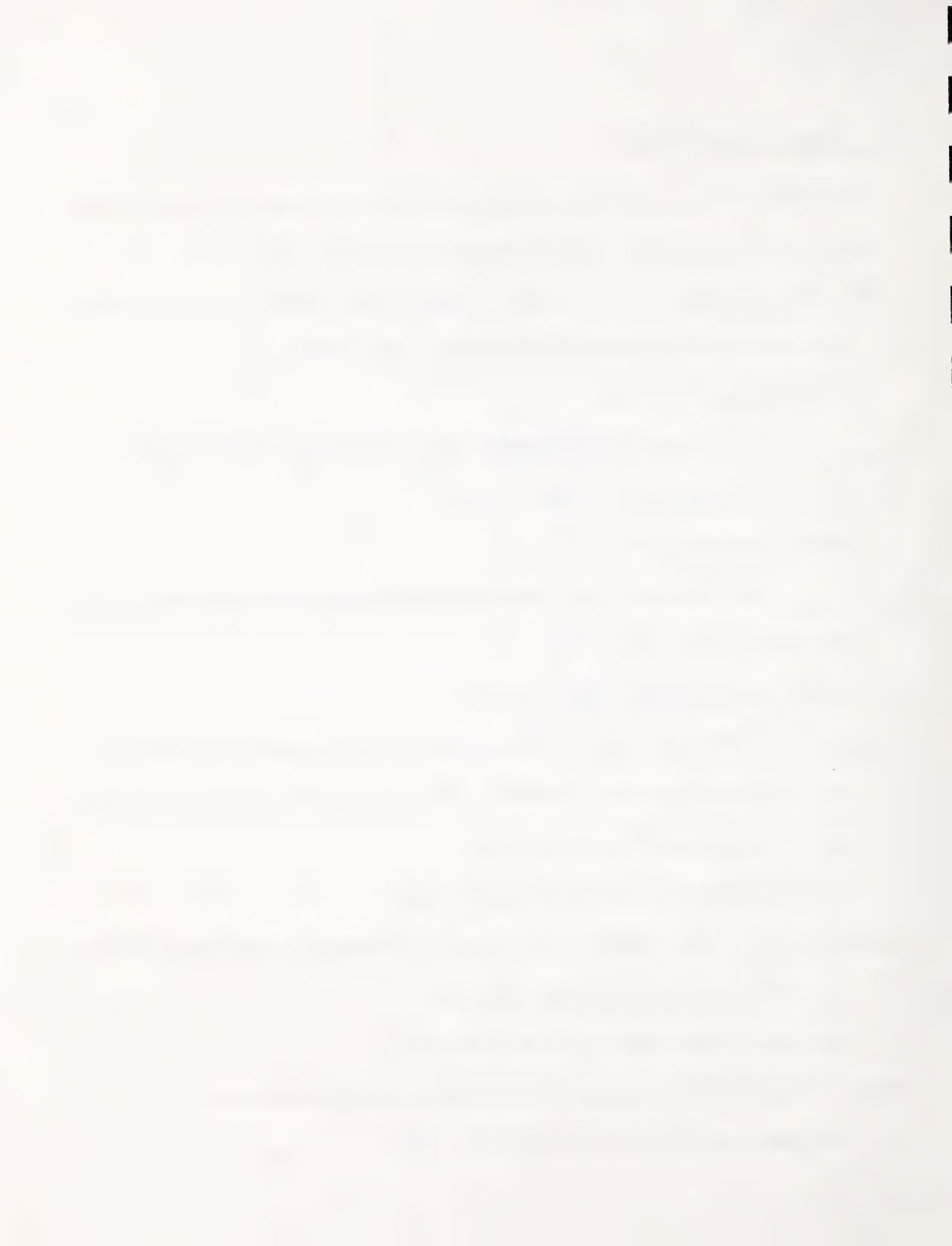
potential effects of construction activities on breeding Prairie Falcons and other raptor species.

5. I recommend the establishment of an observation shelter and information board in one of the recreational areas, where the public can observe the Prairie Falcons, Osprey or Red-tailed Hawks through spotting scopes. This should be manned by a summer student or retired biologist.

6. I recommend the establishment of information centres and/or displays in Pincher Creek, Cowley, and Public Lookout to inform the public of the raptor and wildlife mitigation work that is being carried out in association with the dam.

7.0 LITERATURE CITED

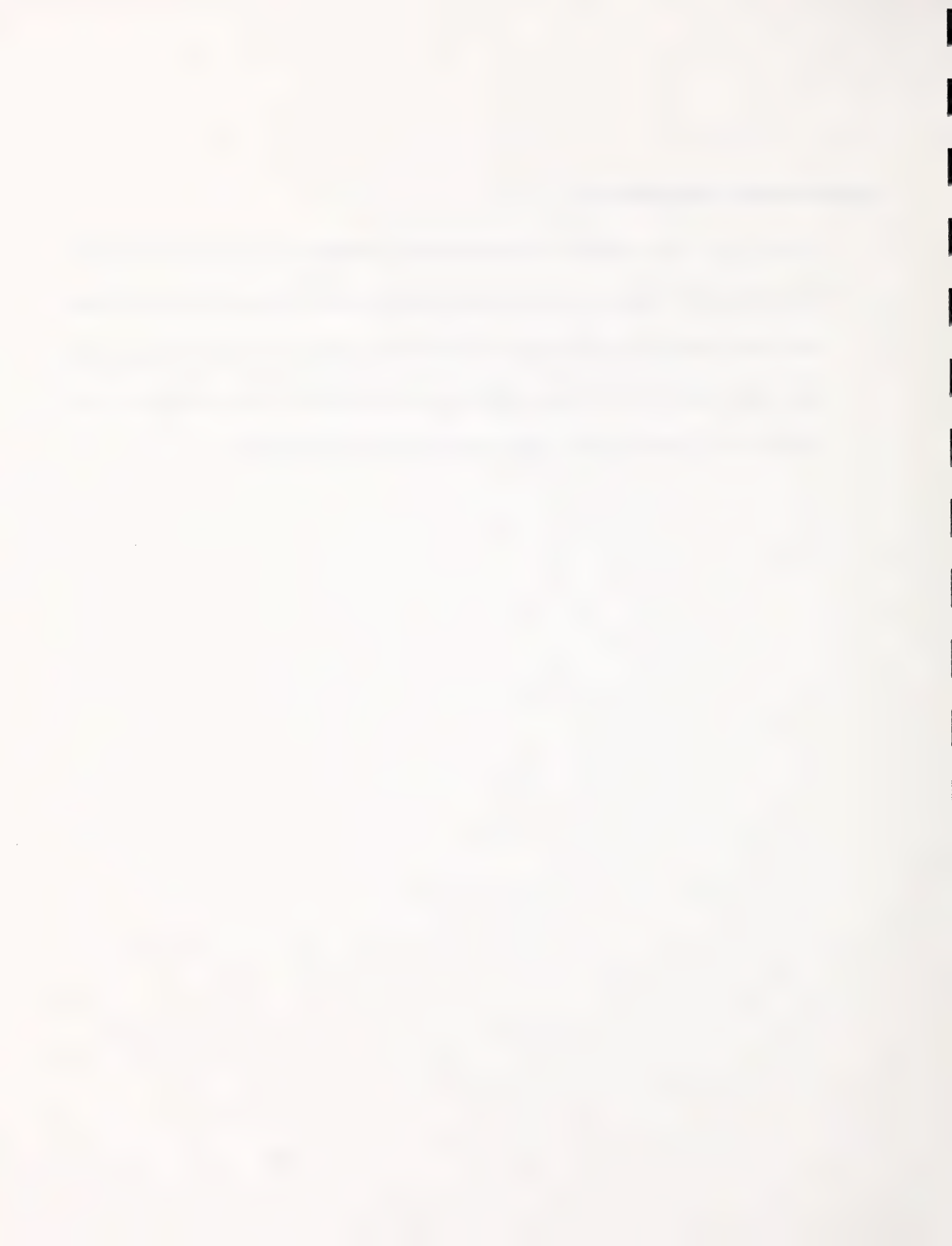
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8.0 **ACKNOWLEDGEMENTS**

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Appendix 1. Summary of Oldman Prairie Falcon Nest Data

| OLDMAN RIVER NEST OCCUPANCY 1968 - 1992 | | | | | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 80 | 85 | 86 | 87 | 89 | 90 | 91 | 92 |
| OB | F | F | O | F | F | F | | | | | | | F | F | F | S | F | F | F |
| ME | F | F | F | S | | F | | F | F | F | F | F | F | F | F | F | F | F | |
| DAM | | | F | F | | | F | | | | F | F | S | S | | F | | O | |
| BJE | F | F | | | | | F | | F | F | F | S | F | F | F | F | F | F | F |
| BJW | | | | | | | | | | | | | | U | U | F | F | F | F |
| BBR | | | | | | | | | | | | | F | F | F | F | F | O | |
| BEA | | | | | | | | | | | | | | U | U | | F | | |
| TEN | | | | | | | | | | | | | | U | U | S | F | F | F |
| LAN | F | F | O | O | O | O | O | O | O | O | O | | | U | U | F | F | F | S |
| WEL | | | | | F | F | O | F | O | F | F | | F | U | U | F | F | F | S |
| HO1 | | | | | | | F | F | F | F | S | | F | U | U | F | F | F | F |
| HO2 | | | | | | | | | | | | | | | | | F | | |
| MAL | | | | | | | F | F | F | F | | | F | U | U | F | F | F | F |
| CD | | | | | | | | | | | | | | | | F | F | F | O |
| STE | | | | | | | | | | | | | | | | | S | S | F |
| DAY | | | | | | | | | | | | | | | | F | | | |
| 1P | | | | | | | | | | | | | | | | | F | F | F |
| DOX | | | | | | | | | | | | | F | | | F | | F | S |
| FA | | F | F | F | F | F | F | F | F | F | F | F | U | | | F | F | F | F |

| | | | | | | | | | | | | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| # F | 4 | 5 | 3 | 4 | 2 | 4 | 5 | 5 | 5 | 6 | 6 | 4 | 8 | 5? | 4? | 15 | 13 | 13 | 12 |
| #S | | | | | | 1 | | | | | 1 | 1 | 1 | 1 | | | 3 | 1 | 3 |
| # O | | | 2 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 1 | | | | | | | 2 | 1 |

F - Pair of Prairie Falcons on territory

S - A single Prairie Falcon on territory

O - Pair of Great Horned Owls nesting in the territory



Old Bridge Nest Site. #48(Young et al.,1986)

History

This is one of the original nest sites documented in the late 1960's and monitored by CWS through the early 1980's. The nest was reported to be occupied in 1986 and 1987 (Young, 1988)

1989 Breeding Season

April 7, - A female was first observed doing courtship flying on April 7. One week later a pair were present and copulation was observed opposite the most easterly nest hole. From April 14 through May 22, falcons were observed on several occasions but there was no evidence of a nest attempt. When we attempted to trap the birds they were totally indifferent and simply left the area.

Disturbance

Trucks and men walking at the river edge were observed April 1 roughly 100m from the nest site and on the opposite side of the river. The back hoe arrived the next day and intensive activity was still ongoing April 7 with men active and clearly visible around the pumping station that had been set up. When I returned on April 14 the intensive activity appeared to have ceased and the pump house apparently is now only visited for short periods, apparently on a daily basis.

Results

No serious attempt was made to nest in 1989, possibly as a result of unacceptable disturbance during the initiation of the breeding cycle.

1990 Breeding Season

The female was first observed sitting in a tree opposite the cliff on March 6 and was observed at each visit to the site in March. On April 24 both birds were observed the male perched in the trees opposite the cliffs and the female in one of the improved nest ledges. She appears to be incubating. One or more birds were observed at pretty well every visit in May and one was always on the nest. June 5 the female was perched opposite and at least three 3wk-old young were observed in the nest. On seeing me the female flew over and cacked. On June 18 four young were banded and both adults were trapped. The female was unbanded and the male was found to be the male that nested at Mercury in 1989.

Disturbance

Trucks and men walking at the river edge were observed early in March roughly 100m from the nest site and on the opposite side of the river. The activity apparently was limited to a couple of days merely setting up the pumping station. I did not observe the back-hoe. Men were observed rotovating straw into silt in the trees about 200M from the nest after the female was already incubating. They were there for three or four days and the female appeared to ignore them. Except for brief daily visits to check the pump there was little or no disturbance for the rest of the breeding season.

Results - 4 young fledged, both adults trapped

| OLD BRIDGE 1968 - 1992 | | | | | | | |
|------------------------|------|-------|------|-----|--------|---------|----------|
| YEAR | PAIR | INDIV | EGGS | YNG | FLEDGE | BAND AD | BAND YNG |
| 1968 | YES | | 3 | | | | |
| 1969 | YES | | 2 | | | | |
| 1970 | GHO | | | | | | |
| 1971 | YES | | 5 | 5 | 5 | | |
| 1972 | YES | | 5 | | | | 5 |
| 1973 | YES | | 5 | 4 | 4 | | 4 |
| 1974 | | | | | | | |
| 1975 | | | | | | | |
| 1976 | | | | | | | |
| 1977 | | | | | | | |
| 1985 | YES | | | | | | |
| 1986 | YES | | | | | | |
| 1987 | YES | | | | | | |
| 1989 | | YES | | | | | |
| 1990 | YES | | | 4 | 4 | mTr,fTr | 4 |
| 1991 | YES | | | 5 | 5 | | 5 |
| 1992 | YES | | 5 | 5 | 5 | | 4 |

1991 Breeding Season

The female was first observed on March 18, and again on April 8th. On both occasions she was observed on one of the tree perches used in previous years. On April 12 the female was already on the nest laying or incubating. One week later the female was definitely incubating and the male was perched in one of the favourite perch points in the trees opposite the nest site. A few days later the female was observed incubating and was later identified as the last year's female by her bands. On May 20 when the female flushed, five two week old young were observed in the nest. Nine days later the pair were cacking aggressively even though we were on the opposite side of the river from the nest. The five young appear to be about three weeks of age. Both adults were present on each of five visits to the territory in June. On June 12 the five young were banded. The young fledged on June 20.

Disturbance

Disturbance was minimal in 1991. Other than our visits to the opposite side of the river and our one visit to the nest site for banding I am not aware of any other human interference or disturbance.

Results - five young fledged and banded

1992 Breeding Season

Three prairie falcons observed flying in the area on April 5. A single bird then flew upriver to one of the modified nest sites. The female was next observed sitting on a cliff ledge to the west of the nest site. She was observed incubating April 16, at the same time the male perched in a tree opposite the cliff. One or more birds were observed at pretty well every visit and one was always on the nest. May 19 the female was off the nest and defended aggressively. On June 11 four of five young were banded. These young were ready to fly and were banded by going in at night. One of the young flew safely across the river and remained unbanded.

Disturbance

Disturbance was minimal throughout the breeding season.

Results - 5 young fledged, both adults identified.

Mercury Nest Site - #45 (Young et al.,1986)

History

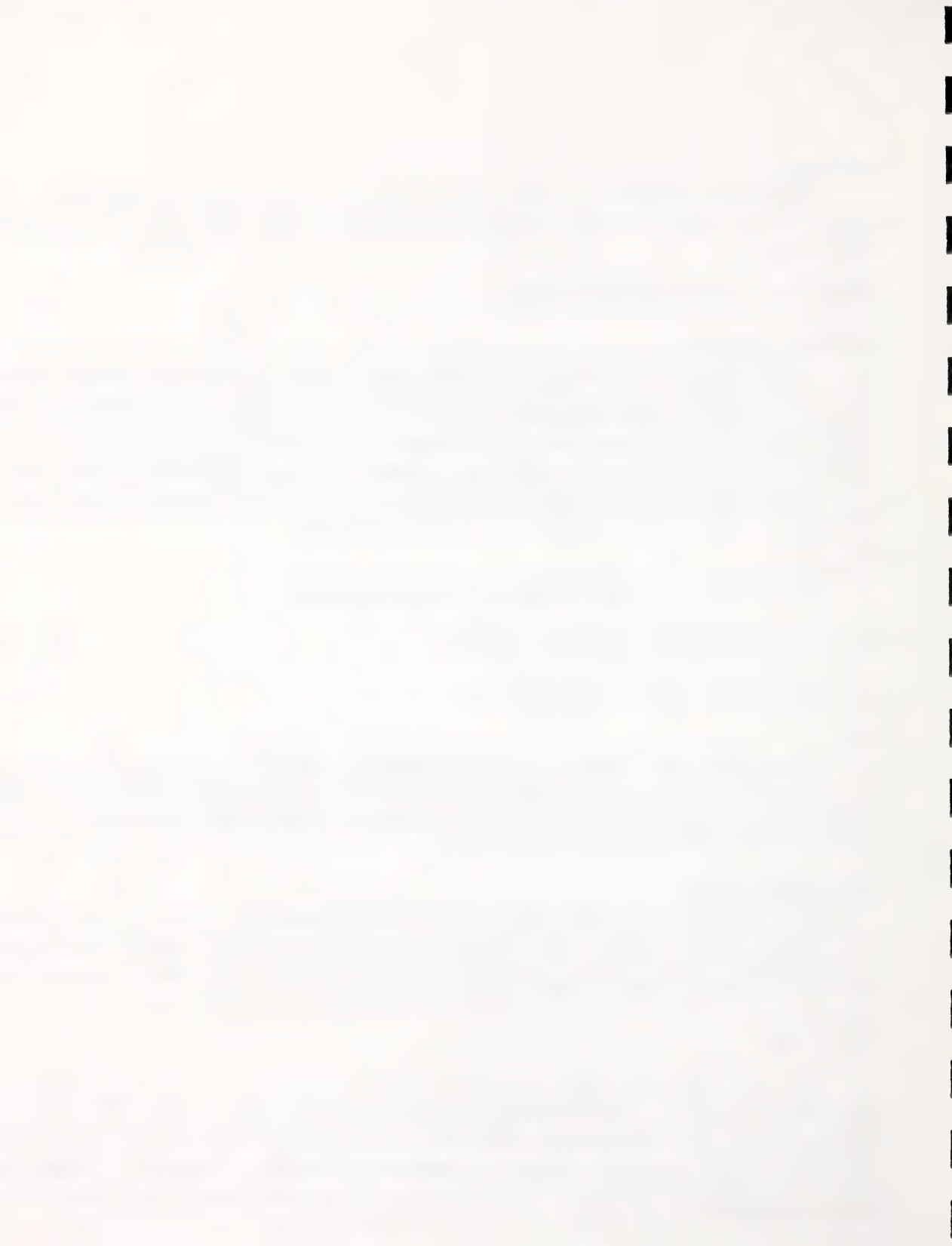
This is one of the original nest sites documented in 1968 and monitored by CWS through the early 1980's. It is named "Mercury" because this nest had the highest level of mercury contamination of any Prairie Falcon nest sites sampled in Alberta in 1968. The nest was reported to be occupied in 1986 and 1987 (Young, 1988).

1989 Breeding Season

A pair of birds on territory March 9 and observed repeatedly throughout the remainder of the breeding season. The female was first observed incubating on April 14 and the first small young observed May 22. Both adults were trapped and banded on that day. Four young were banded June 19 and all four were fledged and observed perched near the site on July 6.

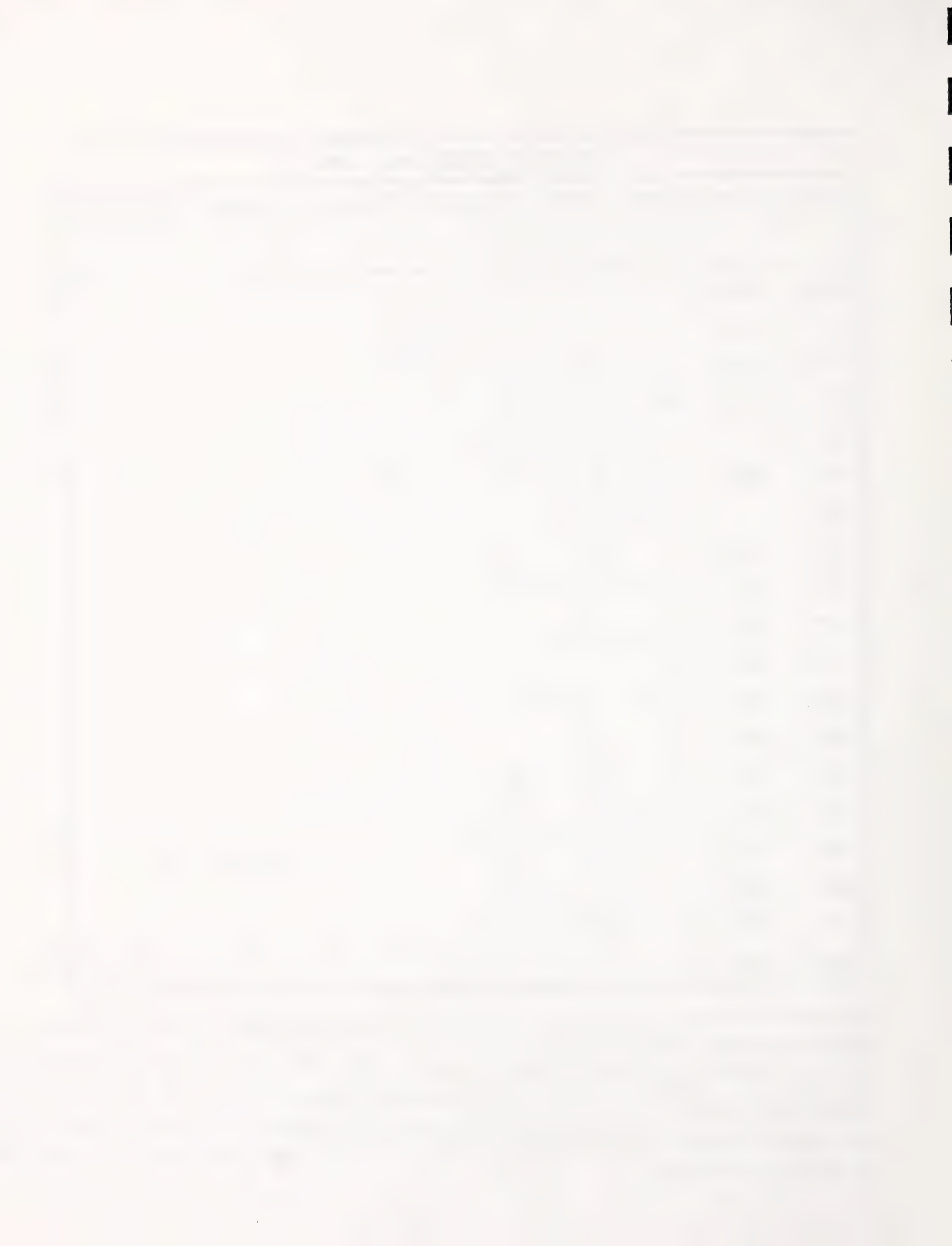
Disturbance

This pair is clearly habituated to the activity associated with the camp which is approximately 1km to the north on the opposite side of the river. They do not pay any attention to moving vehicles on the road a mere 150m away on the opposite side of the river, nor do they react to the presence or activity of the heavy equipment moving on or in association with the rock pile that is adjacent to the nest site. The first indication of disturbance was observed in April when fisheries biologists began working on the river in front of the nest.



| MERCURY EYRIE 1968 - 1992 | | | | | | | |
|---------------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1968 | YES | | 5 | 1 | | | |
| 1969 | YES | | | | | | |
| 1970 | YES | | 5 | 3 | 3 | | 3 |
| 1971 | | YES | | | | | |
| 1972 | | | | | | | |
| 1973 | YES | | 5 | 5 | 5 | | 5 |
| 1974 | | | | | | | |
| 1975 | YES | | 5 | 5 | 5 | | 5 |
| 1976 | YES | | 5 | 5 | 5 | | 5 |
| 1977 | YES | | | | | | |
| 1978 | YES | | | | | | |
| 1980 | YES | | | | | | |
| 1985 | YES | | | | | | |
| 1986 | YES | | | 4 | 4 | | |
| 1987 | YES | | | 3 | 3 | | |
| 1989 | YES | | | 4 | 4 | mTR,fTr | 4 |
| 1990 | YES | | | 3 | 3 | | 3 |
| 1991 | YES | | 3? | | | | |
| 1992 | NO | | | | | | |

The birds were clearly agitated and flew overhead cacking continuously. However, the pair did not desert even though this activity continued for a few hours most days. My last observation of the fisheries biologists was made on May 2 with the female incubating. The only other major disturbance that was observed was on May 22 when some heavy equipment became stuck on the riverbank opposite the nest. Several additional pieces of equipment came to assist and several men were observed walking around the equipment. The birds appeared to have little concern other than to watch the proceedings.



Results - 4 young were fledged

1990 Breeding Season

A pair of birds on territory March 6 and observed repeatedly throughout the remainder of the breeding season. The female was first observed incubating on April 24 and still appeared to be brooding on June 11. Three young were banded June 21 and two were observed sitting in trees on July 11. The male was seldom observed at this site during the entire breeding season yet was present at banding and the young were successfully fledged.

Disturbance

As in previous years this pair is clearly habituated to the activity associated with the camp which is approximately 1km to the north on the opposite side of the river. They do not pay any attention to moving vehicles on the road a mere 150m away on the opposite side of the river, nor do they react to the presence or activity of the heavy equipment moving on or in association with the rock pile that is adjacent to the nest site. As in 1989 the first indication of disturbance was observed in April when fisheries biologists began working on the river in front of the nest. The birds were clearly agitated and flew overhead cacking continuously. However, the pair did not desert. It is possible that the repeated absence of the male was due to his lack of tolerance for disturbance.

Results - 3 young fledged

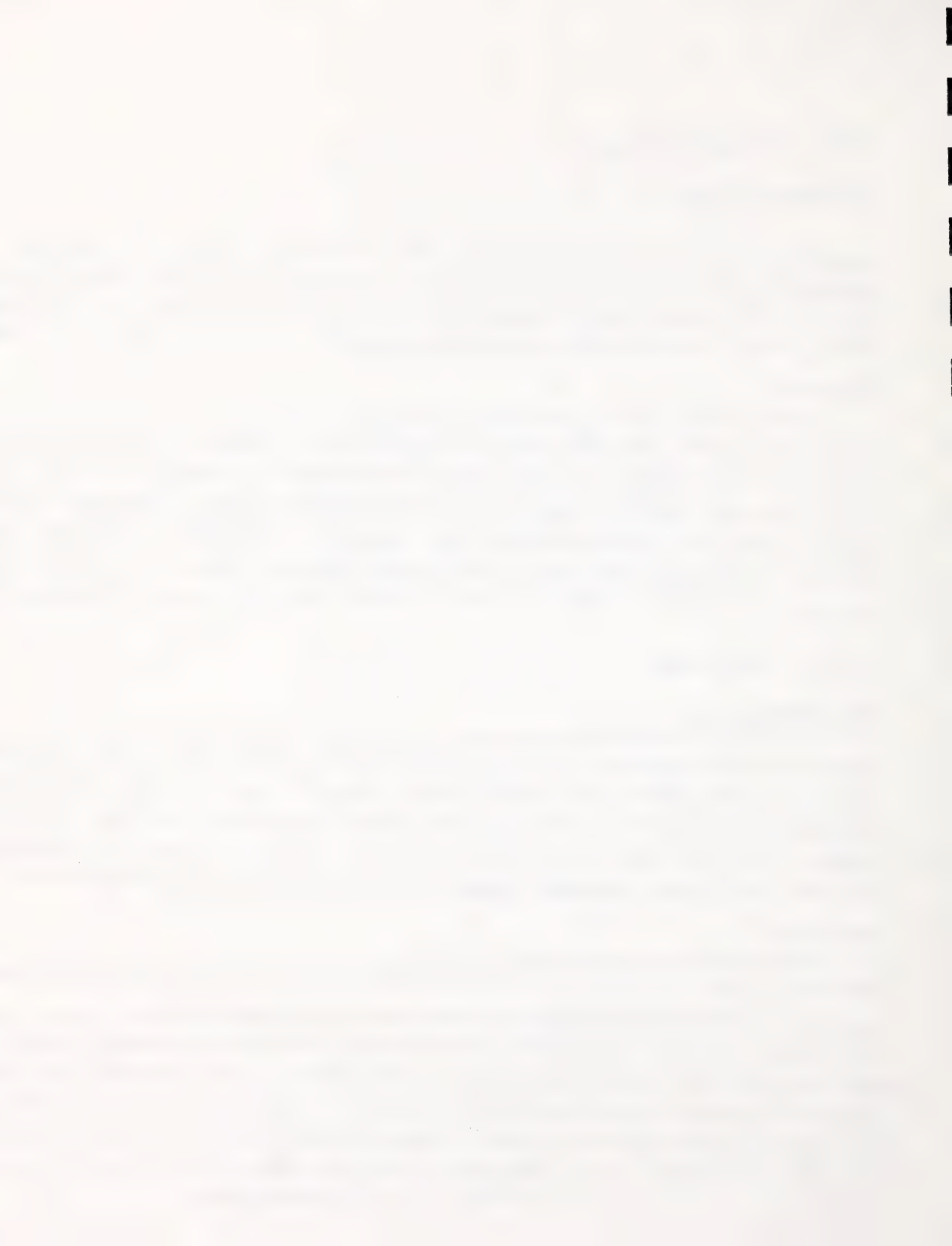
1991 Breeding Season

The female was observed perched about 15m away from the nest ledge on March 18th. She was also observed at the ledge on several occasions in early April. The male was observed only once perched some distance from the nest. Similar behaviour to 1990? By April 8 the female appeared to be either laying or incubating. Heavy equipment was working about 200m away and the fisheries biologists were on the river daily at this time. On April 21 the female was positively identified by her bands. She was observed incubating then and again on several occasions up to May 9. On May 10 severe disturbance resulted in the desertion of the nest site.

Disturbance:

As noted above severe disturbance apparently resulted in the desertion of this nest site. My notes are as follows:

At 09:10 a caterpillar with a blade was observed moving rocks and earth directly in front and below the nest. The female Prairie Falcon from the nest was circling and calling directly overhead. The operator was observed out of the cab for extended periods of time. I was advised that this activity continued for a period of approximately four hours. Apparently the female had been frightened from the nest and then remained in the vicinity for a couple of hours. By 09:45 she had departed from the area. When we returned the following morning the eggs were gone and there was no sign of the falcons. The pair subsequently deserted the area and we did not observe them at the site nor in the territory for the remainder of the 1991 breeding season.



Results - nest deserted

1992 Breeding Season

No birds observed throughout the breeding season. No birds have been observed at this site since they deserted as a result of disturbance in 1991.

Disturbance

Workmen were observed daily in front of the eyrie. As stated no birds were observed throughout the season.

Results - no nesting attempt

Dam Nest Site - Powerline Site (CWS files), #42 (Young et

History

This is one of the original nest sites documented in 1970 and monitored by CWS through the early 1980's. The territory was reported to be occupied by a single adult in 1986. (Young, 1986) al., 1986)

1989 Breeding season

On March 24 first a single female then the pair was observed perched on the cliff opposite the original nest site. The female was observed sitting briefly in the artificial hole on the northeast side of the cliff. Courtship activity and nest displays observed on March 30 on the same cliff. The birds were then observed departing from the cliff during a period of intense disturbance on March 30. They were present on the following two mornings only to depart when the workmen arrived. No birds were observed again until a single female was observed on the cliff April 14. No further observations were made of birds at this cliff.

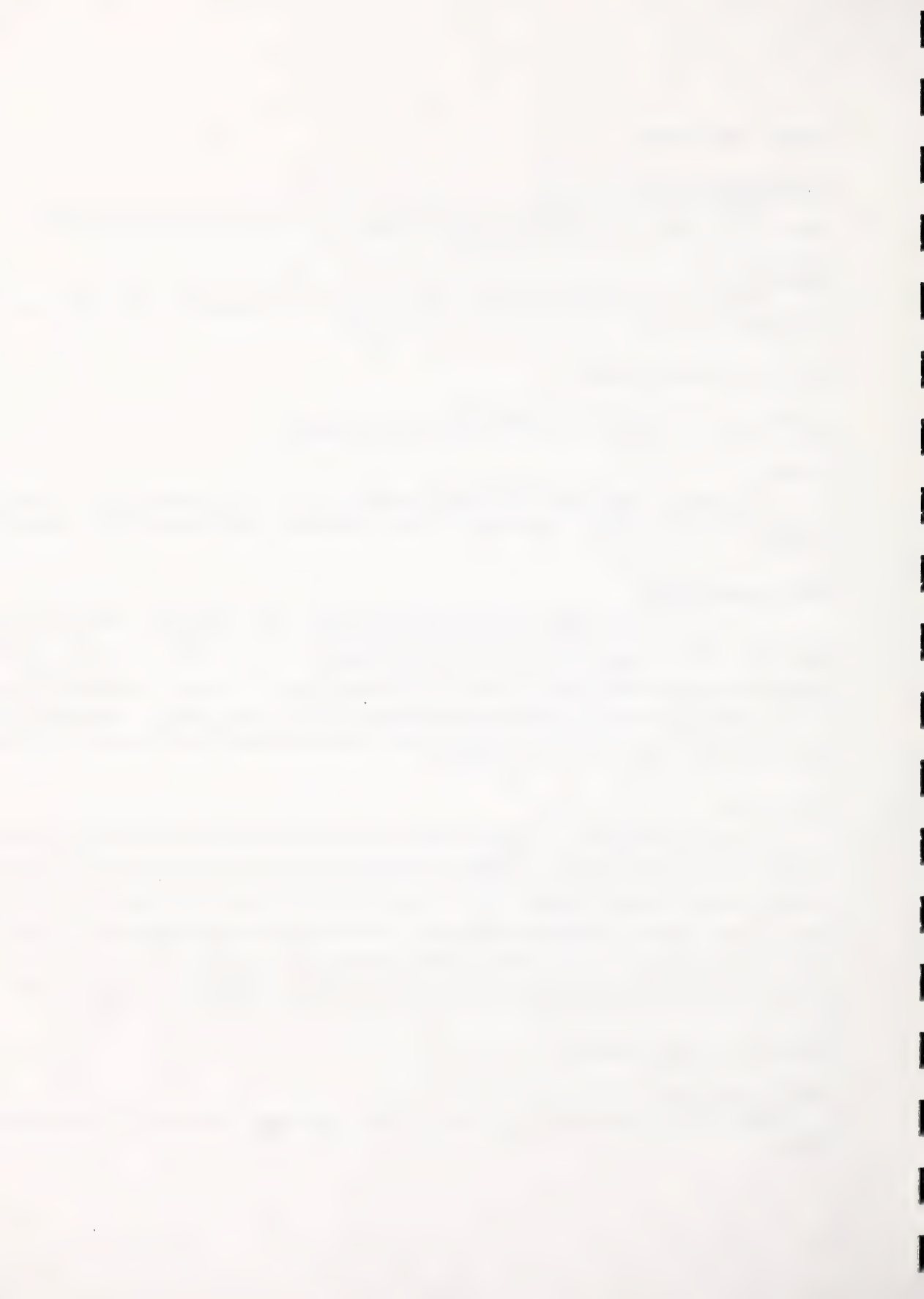
Disturbance

This pair of birds appear to be habituated to an incredible amount of disturbance including blasting less than 1km from the cliff, heavy equipment and trucks driving underneath the nest at a distance of about 50m and men walking around daily at about 1km from the nest site. Despite this they were not able to tolerate intense activity and the presence of human walking directly under the nest cliff at a distance of about 35m. At first the female did remain on the cliff and watch the activity but soon was forced to leave the area. For three days the birds returned each morning to the site but left when the workmen arrived. When I returned to the site three days later the pair had deserted the site but were observed in the territory briefly on 11 days later.

Result - No nesting attempted.

1990 Breeding season

Birds were not observed at or near this site at any time throughout the 1990 breeding season.



Disturbance

Although in 1989 this pair of birds appeared to be habituated to an incredible amount of disturbance including blasting less than 1km from the cliff, heavy equipment and trucks driving underneath the nest they were not observed at the site in 1990.

Result - No nesting attempted.

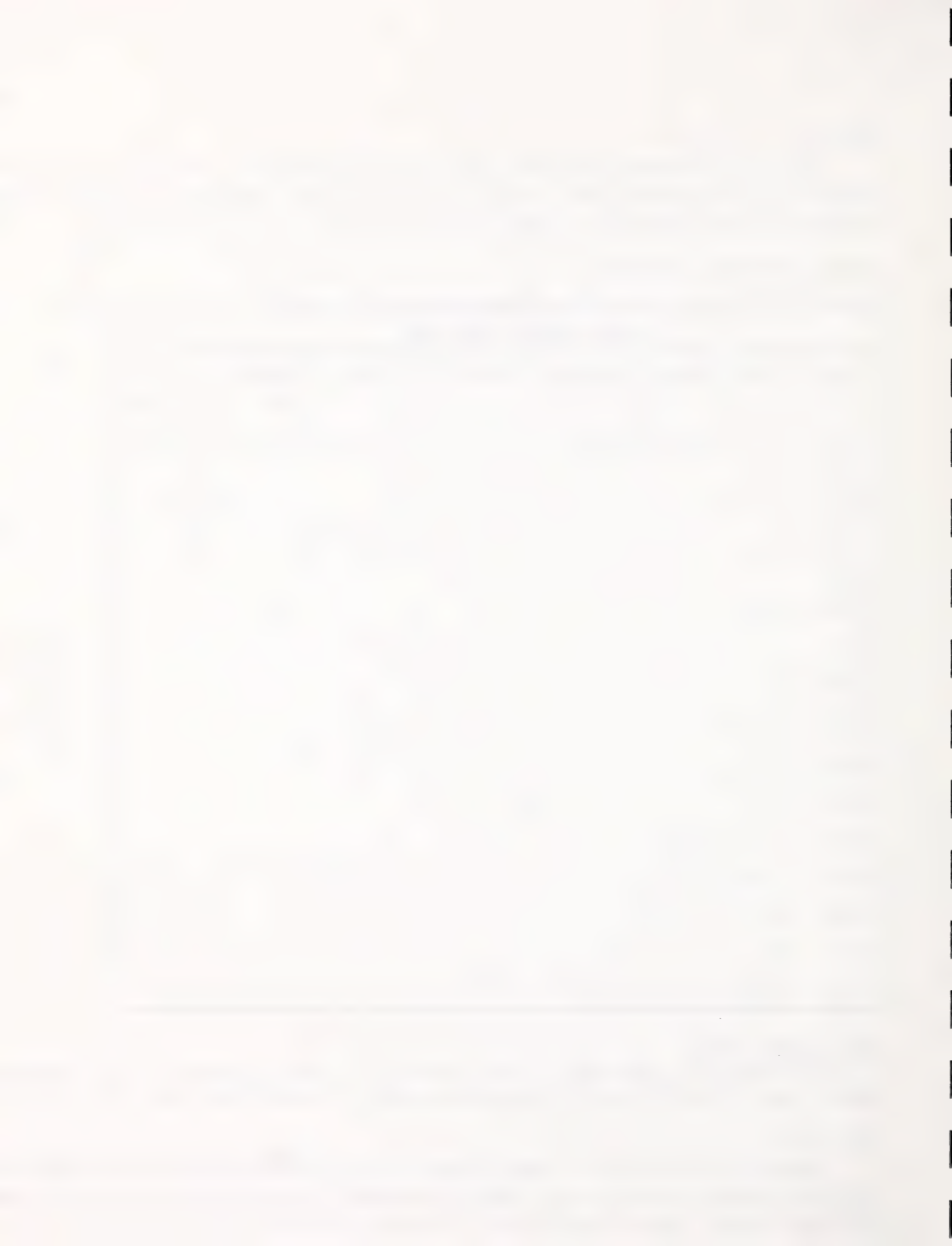
| DAM EYRIE 1970 -1992 | | | | | | | |
|----------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1970 | YES | | 2 | | | | |
| 1971 | YES | | 4 | 2 | 2 | | 2 |
| 1972 | | | | | | | |
| 1973 | | | | | | | |
| 1974 | YES | | 4 | 4 | 4 | fTR, | 4 |
| 1975 | | | | | | | |
| 1976 | | | | | | | |
| 1977 | | | | | | | |
| 1978 | YES | | 5 | 3 | 3 | | |
| 1980 | YES | | 5 | 5 | 5 | | 5 |
| 1985 | | YES | | | | | |
| 1989 | YES | | | | | | |
| 1990 | NO | | | | | | |
| 1991 | NO | | | | | | |
| 1992 | NO | | | | | | |

1991 Breeding season

No falcons were observed at or near this site at any time throughout the 1991 breeding season. A pair of Great Horned Owls did nest successfully in the old Raven nest on the cliff face.

Disturbance

Although in 1989 this pair of birds appeared to be habituated to an incredible amount of disturbance including blasting less than 1km from the cliff, heavy equipment and trucks driving underneath the nest they were not observed at the site in 1990 nor in 1991.



Result - No nesting attempted.

1992 Breeding season

Birds were not observed at or near this site at any time throughout the 1992 breeding season.

Disturbance

Although in 1989 this pair of birds appeared to be habituated to an incredible amount of disturbance including blasting less than 1km from the cliff, heavy equipment and trucks driving underneath the nest. No birds were observed at the site in 1990, 1991 or 1992.

Result - No nesting attempted.

Buffalo Jump East Nest Site - Raven site(CWS files), #40(Young et al. 1986)

History

This is one of the original nest sites documented in 1968 and monitored by CWS through the early 1980's. The territory was reported to be occupied in 1986 and again in 1987.

1989 Breeding season

The pair were observed in close association at the east end of the Buffalo Jump Cliff on April 2. A third bird which appeared to be a female was also observed near the fence line. The following day two pair were observed, with the fence line the rough demarkation of the territories. On April 6 a single male was present and was observed going into nest holes with both females. On the 14th the three birds were again present but the male now appeared to be attached to the eastern territory. The female appeared to be incubating by May 10 and is noted to be very shy. The male was trapped and banded May 17th and the four young caught and banded on June 20th.

Disturbance

Disturbance to this pair was minimal and other than our visits it is doubtful that these birds had any contact with human. The nearest road is .7km to the southeast and the traffic does not seem to influence the pair at all.

Results - 4 young fledged

1990 Breeding season

The pair were observed at this site on Feb 27 at the east end of the Buffalo Jump Cliff. The male was positively identified as last year's male by the colour band combination, the pair was observed copulating on April 17. The female was observed incubating on 24 and at the same time the same male was observed with a second female near the fence line. Male observed bringing food to five young in the nest on May 31. A female was perched near the fence line.

| BUFFALO JUMP EAST 1968 - 1992 | | | | | | | |
|-------------------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1968 | YES | | 5 | 5 | | | |
| 1969 | YES | | 5 | 5 | 5 | | 5 |
| 1970 | YES | | 5 | 4 | 4 | | 4 |
| 1971 | | | | | | | |
| 1973 | | | | | | | |
| 1974 | YES | | 4 | | | | |
| 1975 | | | | | | | |
| 1976 | YES | | 5 | 4 | 4 | mTr,fTr | 3 |
| 1977 | YES | | | | | | |
| 1978 | YES | | 5 | 5 | 5 | | 5 |
| 1980 | | YES | | | | | |
| 1985 | YES | | | | | | |
| 1986 | YES | | | | | | |
| 1987 | YES | | | | | | |
| 1989 | YES | | | 4 | 4 | mTr, | 4 |
| 1990 | YES | | | 5 | 5 | | 4 |
| 1991 | YES | | | | 4 | | 4 |
| 1992 | YES | | | 5 | 5 | | 5 |

Disturbance

Disturbance to this pair was minimal and other than our visits it is doubtful that these birds had any contact with human. The nearest road is .7km to the southeast and the traffic does not seem to influence the pair at all.

Results - 5 young fledged

1991 Breeding Season

A lone falcon observed at the site on March 18. On April 9 two females observed at the cliff. One female at the BJE nest site the other near the fence-line. One April 9 a lone male was

observed at the cliff moving freely between the two females. The female in the east nest was either laying or incubating. She came from the nest when the male was near then went back into the hole after. This appears to be the same pair as in other years. The male was positively identified with his colour band and number, the female was just very shy as always. They raised and fledged four young. All banded

Results 4 young fledged

Disturbance - Minimal throughout 1991

1992 Breeding season

The female observed at this site on March 24. Copulation observed on March 26, the same day a third bird (a female) came into the area and was chased out of the territory by the male. The second female was also observed at Buffalo Jump West. Female appeared to be incubating on April 9. The same day the male was observed copulating with the female at Buffalo Jump West. The female was observed incubating on subsequent visits. Five young banded on June 11.

Disturbance

Disturbance to this pair was minimal and other than our visits it is doubtful that these birds had any contact with human. The nearest road is .7km to the southeast and the traffic does not seem to influence the pair at all.

Results - 5 young fledged

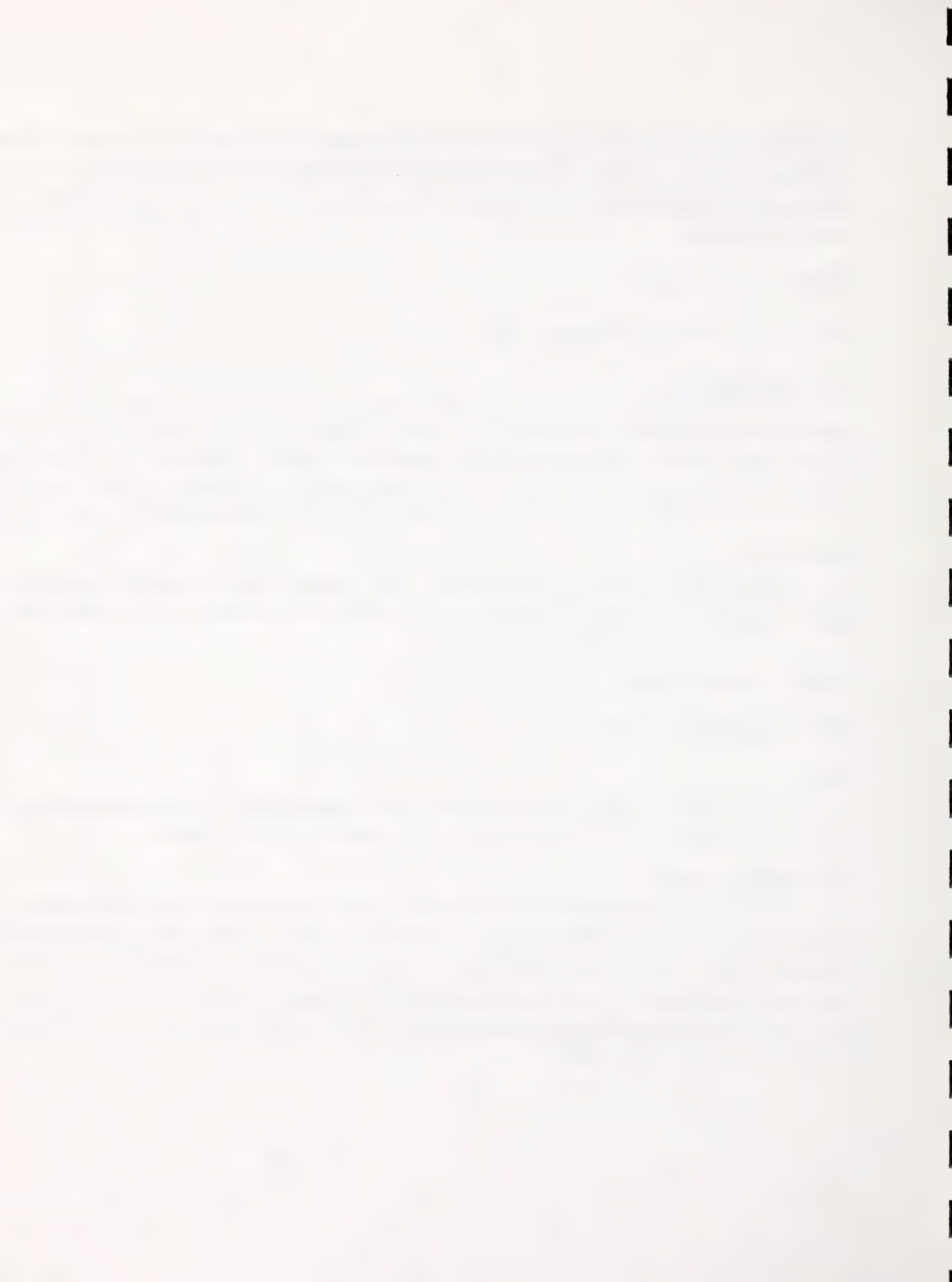
Buffalo Jump West Nest Site

History

This is a new nesting territory and results from the splitting of a long established territory at the Buffalo Jump Cliff. This male appears to be mating with two females.

1989 Breeding Season

A female was first observed here on April 1 at the same time as the pair were noted at the east end of the cliff. The situation was very confused as only three birds were observed on most visits. Courtship feeding, nest ledge behaviour and attempted copulation observed by the one male with both females. A second male was observed with this bird on April 3 and again on May 2. The female was flushed from the nest ledge where she was incubating three eggs on May 22. On June 19 no birds were present at the west end of the cliff. The three eggs remained in the nest but were cold and were found to be addled.



| BUFFALO JUMP WEST 1968 - 1992 | | | | | | | |
|-------------------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1989 | YES | | 3 | | | | |
| 1990 | YES | | | | | | |
| 1991 | YES | | | | | | |
| 1992 | YES | | 3 | | | | |

Disturbance

Disturbance to this pair was minimal and other than our visits it is doubtful that these birds had any contact with humans. The nearest road is .7km to the southeast and the traffic does not seem to influence the pair at all.

Results - infertile eggs resulting in nest failure.

1990 Breeding Season

A second female was first observed here on April 24. At the same time the other female was incubating at the east end of the cliff. The situation appeared to be the same as in 1989 except that we were able to identify the male as the same bird that had mated with the female in Buffalo Jump East. Courtship feeding, nest ledge behaviour and copulation were observed by the same male with both females. The female was flushed from the nest ledge on May 15 where she was apparently incubating. That was the last time she was observed and no eggs were found when the ledge was checked later.

Disturbance

Disturbance to this pair was minimal and other than our visits it is doubtful that these birds had any contact with humans. The nearest road is .7km to the southeast and the traffic does not seem to influence the pair at all.

Results - (no young produced)

1991 Breeding Season

The female was first observed here on April 8. The female at BJE was also present. On April 9 the lone male was observed to copulate with this female and then fly and perch near the Buffalo Jump West nest site. The male as positively identified by colour bands. The female remained sitting on the outcrop near the large hole. On April 23 this female was flushed from the large hole. The male and other female flew off to the east as we approached the cliff. The female from the west flew out with deep slow courtship flying. She went to perch near the west hole and

wailed occasionally. She was not seen again and when the nest was climbed there was a deep nest scrape but nothing else. This seems to be pretty much a repeat of the other three years.

Results - (no young produced)

Disturbance -

Minimal throughout the breeding season

1992 Breeding Season

This female observed courtship flying over the west end of the cliff. Heard wailing then observed her at the large hole on the west end. Frequently observed at the large hole and heard wailing for the male. The normal pattern early in the season was for the male to mate with the female at Buffalo Jump East then to fly and perch near the female at Buffalo Jump West. On April 9 copulation was observed with the male from BJE. Nest hole checked April 18, three eggs female sitting at the west end of the cliff. No aggression A second female was first observed here on April 24. At the same time the other female was incubating at the east end of the cliff. The situation appeared to be the same as in 1989 and 1990. We were able to identify the male as the same bird that had mated with the female in Buffalo Jump East. Courtship feeding, nest ledge behaviour and copulation were observed by the same male with both females.

Disturbance

Disturbance to this pair was minimal and other than our visits it is doubtful that these birds had any contact with humans. The nearest road is .7km to the southeast and the traffic does not seem to influence the pair at all.

Results - (no young produced)

Bitango Eagle Nest Site

| BITANGO EAGLE NEST EYRIE 1990 - 1992 | | | | | | | |
|--------------------------------------|------|-------|------|-------|------------|------------|---------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDG E | BAND AD | BAND YOUNG |
| 1990 | YES | | | | 4 | | 2 |
| 1991 | NO | | | | | | |
| 1992 | NO | | | | | | |

History

This is a new nesting territory not know to have been occupied prior to the 1990 nesting season. The nest site is an old Golden Eagle nest on the side of a cliff about 1km south of the Bitango Bridge nest site.

1990 Breeding Season

Birds were first observed during courtship on April 5. Thought to be an alternate site for Bitango pair and not observed further once the Bitango pair were on eggs. We were next advised of the presence of these birds on June 23 by a trucker who saw them as he hauled fill along the road under the nest. We visited the nest on June 25, the adults were present and the young were already fledged. Two were caught and banded.

Results - (four young fledged)

1991 Breeding Season

A single falcon was seen on the stick nest to the west of last year's nest site on March 1. On the next visit a Canada Goose was observed sitting on last year's nest and no falcons were observed in the area. That was the situation right up to the nest flooding.

Results - No birds observed.

Disturbance

Minimal disturbance prior to the flooding.

1991-92 Breeding Season

This nest site was flooded and no longer usable.

Bitango Bridge Nest Site - #37 (Young et al.,1986)

History

This is a new nesting territory not occupied in the 1960's. The territory is first described by Young (Young et al.,1986)

1989 Breeding Season

The pair were first observed on territory March 8 and were subsequently observed at every visit. Some courtship activity and a food transfer observed on March 23. The female was flushed from the nest on May 1st where she had apparently been incubating. The female was trapped and banded on May 1. Five young were caught and banded on June 18.

Disturbance

This pair were subjected to considerable disturbance and habitat alteration. Apparently the timing of the most severe disturbance was such that the birds were able to tolerate it. Tree removal took place prior to the breeding season and the bulk of the heavy equipment and gravel removal well into incubation and the rearing of young. In addition to this there was considerable human activity in the form of picnickers, and fishermen near the bridge and occasionally opposite the nest site itself. In general the pair were shy and nest success can best be attributed to the timing of the various activities.

| BITANGO EYRIE 1985 - 1992 | | | | | | | |
|---------------------------|------|-------|------|-------|------------|------------|---------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDG E | BAND AD | BAND YOUNG |
| 1985 | YES | | | | | | |
| 1989 | YES | | | 5 | 5 | fTr | 5 |
| 1990 | YES | | | | | | |
| 1991 | NO | | | | | | |
| 1992 | NO | | | | | | |

Results - 5 young fledged

Bitango Bridge Nest Site - #37 (Young et al.,1986)

1990 Breeding Season

The pair were first observed on territory Feb 27. Courtship and nest ledge behaviour observed on April 3 the female was identified as the same female as 1989 by observing the colour band combination. The female was observed incubating. On May 15, 17, and 23 the male was observed sitting at the east end on one occasion. The birds were gone on May 31. Clearly the nest was deserted, apparently due to the heavy rains of the previous few days. On later inspection, it was believed the nest was exposed and the eggs would have been sitting in water.

Disturbance

This pair were subjected to heavy equipment activity for most of the season, however there was no indication that the birds were disturbed. They courted, bred and nested despite the continuing long range disturbance. The pair did not appear to be affected by the activity or by the tremendous dust that was generated well into incubation.

Results - (nest desertion)

1991 Nesting Season

In April Great Horned Owls observed nesting in the 1989 nest hole. Two young were taken from this nest due to flooding and transferred to the rehabilitation centre in Coledale on May 9.

Disturbance

Minimal prior to flooding

1992 Breeding Season

The nest sites have remained flooded.

Tennessee Coulee Nest Site

| TENNESSEE COULEE EYRIE 1989 - 1992 | | | | | | | |
|------------------------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1989 | | YES | | | | | |
| 1990 | YES | | | 4 | 4 | fTr, | 4 |
| 1991 | YES | | 5 | 4 | 4 | | 4 |
| 1992 | YES | | | | | | |

History

This territory was first identified in 1989 when a female was flushed late in the breeding season. The condition of the nest site and the large accumulation of guano indicates that the territory is an old one with many years of occupancy. In 1990 the birds used a different site.

1990 Breeding Season

On April 5 a lone bird flew over the coulee at considerable height. I suspect this was the male. He was not aggressive and did not act territorial. When I returned on June 6th a female was heard cacking and was very territorial. This was an odd pair in that the female was very tame and the male exceedingly shy. The nest was not actually located until just prior to banding and was less than 100m from the Red-tail nest. The young could not be seen from below.

Disturbance

Disturbance at this site would be minimal.

Results- 4 young fledged, adult female caught and banded.

1991 Breeding Season

A lone bird observed flying over the coulee on April 8. Female observed incubating in last year's nest hole on April 19 of this year. The Prairie Falcon and Red-tail were observed incubating on several occasions as I visited the coulee to keep track of the water level. On May 20 we collected the eggs. They were pipping when we collected them. We were not able to find a suitable nest to foster the eggs so they had to be placed under a brooding chicken. The eggs were subsequently placed in Castle Dairy and four out of five hatched and were fledged.

Disturbance

Minimal prior to flooding. Following flooding a power boat was observed right in the coulee beside the nest. The eggs were collected the same day.

Results - 4 young fledged and banded at Castle Dairy.

1992 Breeding Season

On April 5 a lone bird flew over the coulee at considerable height. I suspect this was the male. He was not aggressive and did not act territorial. When I returned on June 6th a female was heard cacking and was very territorial. This was an odd pair in that the female was very tame and the male exceedingly shy. The nest was not actually located until just prior to banding and was less than 100m from the Red-tail nest. The young could not be seen from below. When we returned to band the young the adults left the area silently indicating that they were not successful.

Disturbance

Disturbance at this site would be minimal.

Results-unsuccessful

Lang Nest Site

History

This a new site first recorded in 1989 it is about 2km east of CWS Cowley site documented in 1968

1989 Breeding Season

Three birds were observed at the site on March 31 and again on April 1. Nest ledge displays and courtship flying observed, the third bird just seemed to be staying in the area. Copulation observed on April 7 and the female appeared to be incubating on May 1st. The female was trapped on May 21 . The nest was checked again on June 18 and it contained one egg, a broken egg and a two-week old youngster. This bird was later banded on July 1.

Disturbance

Disturbance at this site would have been only moderate with a few fishermen about .5km upstream in June and some woodcutting downstream in May.

Results - 1 young fledged

1990 Breeding Season

First observed on March 26 with the male bringing food to last year's nest ledge. As in 1989, a second female was also at the site. Three birds were again observed at the site on April 5, after a brief encounter the second female left and one female remained and perched on the ground to the west of last year's nest and began wailing. The Male flew by and lit in a small hole under the cliff edge. Nest ledge displays and courtship flying observed. On April 17 female observed incubating in the new nest hole. Young observed May 30. Five banded on June 21, adult male caught and banded on June 25.

| LANG'S EYRIE 1968 - 1992 | | | | | | | |
|--------------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1968 | YES | | 5 | 4 | | | |
| 1969 | YES | | 4 | | | | |
| 1970 | GHO | YES | | | | | |
| 1971 | GHO | | | | | | |
| 1972 | GHO | | | | | | |
| 1973 | GHO | | | | | | |
| 1974 | GHO | | | | | | |
| 1975 | GHO | | | | | | |
| 1976 | GHO | | | | | | |
| 1977 | GHO | | | | | | |
| 1978 | GHO | | | | | | |
| 1980 | GHO | | | | | | |
| 1989 | YES | | 3 | 1 | 1 | fTr, | 1 |
| 1990 | YES | | | 5 | 5 | mTr | 5 |
| 1991 | YES | | | | | | |
| 1992 | | YES | | | | | |

Disturbance

Disturbance at this site would have been only moderate early in the breeding season. No birds were observed in the area at this time. Once the reclamation was complete we observed no outside disturbance and any disturbance would have been minimal.

Results - 5 young fledged, adult male caught and banded.

1991 Breeding Season

A single prairie observed over the cliff on March 18. No birds were observed at the site again until April 19. Two birds observed on the cliff, the female wailing and the pair going from ledge to ledge. On the 22nd when we arrived the prairies were absent but returned shortly. The female went to last year's nest ledge. She appears to be heavy with eggs. No birds at the site on the 25 when we arrived. Heard wailing and a single bird flew by and perched at the east end of the

cliff area. Raven on the nest. 09:23 the male was observed chasing a Raven then flew to perch in a sheltered area near last year's nest hole.

Female observed on a perch near the fence line. the male may have a red band on right leg (???). The male remained perched out of the wind preening. 09:30 the female flew to the nest hole 09:33 the female flew above the cliff and lit on the grass, she was followed by the male and they copulated. 09:37 male flew above the cliff and the female remained perched. Two prairies came in very high from the west. A male and a female. The male made a couple of passes at the female. Both came down in front of the cliff. The original female flew into the nest hole and perched at the mouth and eechipped as the others flew by. The male attacked the other female and then both went off to the east at great height, The female headed north after a couple of attacks by the male at one point they actually grappled. The original female flew out of the nest and perched above the cliff 09:57 female moved off to the left right out of the area.

No falcons were seen at the site again until May 23 when a lone male was on the cliff. A lone bird was observed again on June 1.

Results - nesting failed.

1992 Breeding Season

A lone female first observed on March 24 and almost daily from that time through April 14. Courtship flying observed over and in front of the nest ledge on April 14. She was not observed again despite several visits and long observation periods after that date.

Disturbance

Disturbance at this site would have been minimal throughout the breeding season.

Results - No nesting occurred.

Welsch Nest Site - #22 (Young et al. 1986)

History

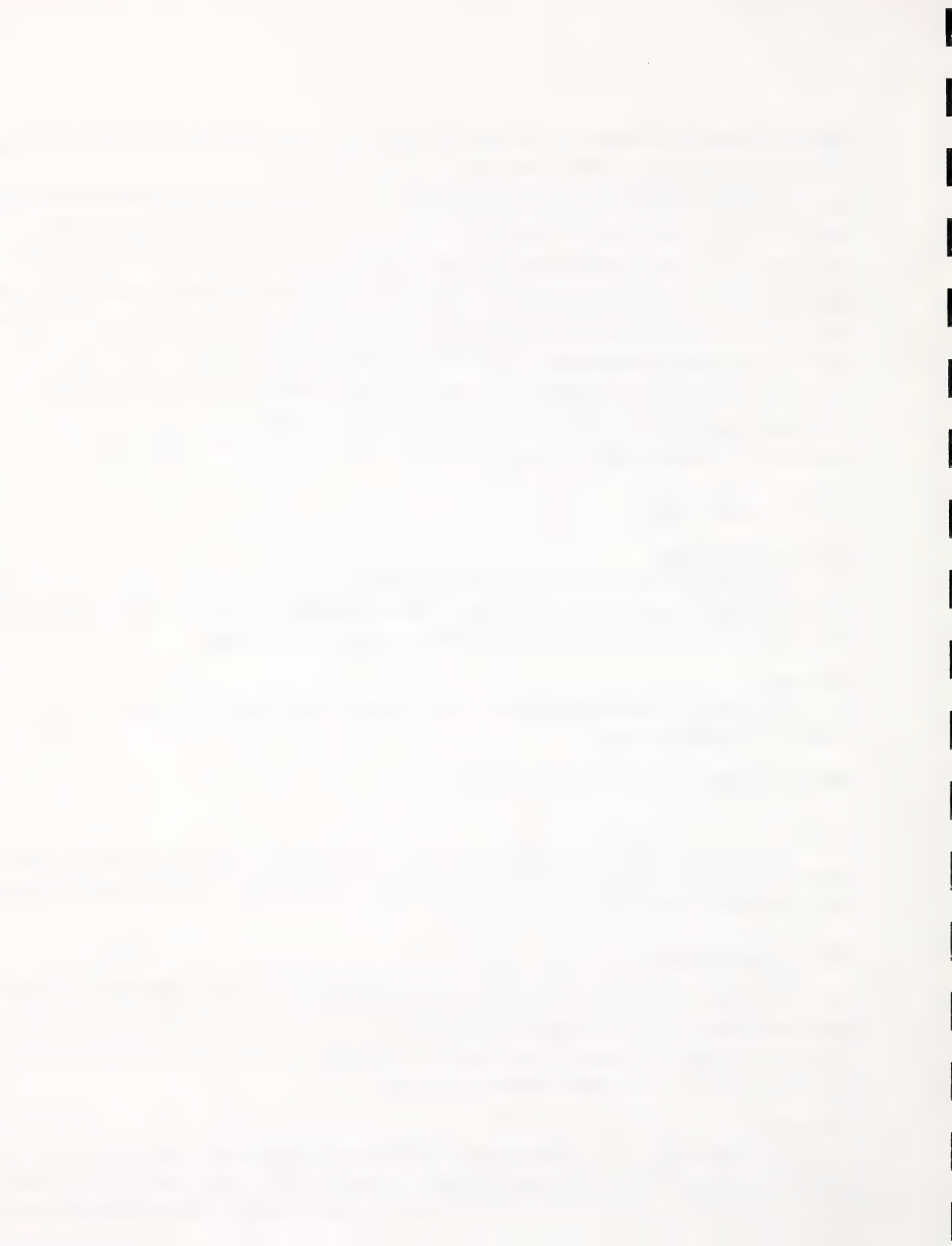
This appears to have been CWS Rapid Bend site, however, severe slumping along the cliff face have drastically changed the cliff. In its present condition it was first described by Young as #22 in his report (Young et al. 1986) in 1985.

1989 Breeding Season

The pair were first observed at the site March 9 and both birds were observed on most visits to the site. Other than a hint of courtship flying no other courtship activity was observed. The female was observed at the entrance of the nest hole on several occasions and appeared to be incubating on April 15. The pair were trapped and banded on May 21 and 4 young were caught and banded June 18. The young fledged successfully.

Disturbance

At the beginning of the breeding season disturbance was minimal. Although the main road was approximately 150m from the nest site the nest was on a cliff facing away from the road and the birds were largely unaffected by traffic. On April 5 heavy earthmoving equipment was observed



working about 2km. to the north and there was some evidence of activity on the hill above and behind the nest site. By April 7th the activity had accelerated and the earthmoving equipment was now dumping material above and behind the site. The activity was continuous, with the noisy earth moving equipment visible to the birds the majority of the time. When revisited on April 13 the activity was unabated and by the presence of the lights apparently was ongoing round the clock. The pair are still present and apparently incubating. The male was observed to fly in literally through the dust and land at the south end of the cliff. Some of the material that has been moved has actually been dumped so that it has come down the side of the cliff less than 50m to the north of the nest. The activity is very, very noisy and virtually continuous however, there are seldom people walking around and the birds do not seem to be overly concerned by the activity and noise. By May 1st construction work appeared to be completed. No additional activity was observed in direct association with the nest until July 7 when the earth moving equipment began to level an area directly opposite the nest site. The young fledged and moved off to the north.

Results - 4 young fledged

| WELSCH EYRIE 1972 - 1992 | | | | | | | |
|--------------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1972 | YES | | | | | | |
| 1973 | YES | | 5 | 4 | 4 | | 4 |
| 1974 | GHO | YES | | | | | |
| 1975 | YES | | 5 | 4 | 4 | fTr | 4 |
| 1976 | GHO | | | | | | |
| 1977 | YES | | 5 | | | fTr | |
| 1978 | YES | | 4 | | | | |
| 1980 | YES | | 4 | 2 | | | |
| 1985 | YES | | | | | | |
| 1989 | YES | | | 4 | 4 | mTr,fTr | 4 |
| 1990 | YES | | | 4 | 4 | | 4 |
| 1991 | YES | | | | | | |
| 1991 | | YES | | | | | |

1990 Breeding Season

The pair were first observed at the site March 6 and as in 1989 both birds were observed on most visits to the site. Nest ledge displays were observed in late March and early April. During the few days when the caterpillar was doing land reclamation opposite the site, at each visit the female was observed sitting at the extreme north end of the cliffs. The female apparently was incubating by April 16 so that the disturbance in no way affected normal courtship and nesting. April 15. Although we were not able to catch the pair in 1990 the female was identified as last year's female by her colour band combination. Four young were banded on June 19.

Disturbance

At the beginning of the breeding season, disturbance was minimal prior to the reclamation of the gravel area in front of the nest cliff. This was carried out during the first week of April and the birds simply perched at the north end of the cliffs. As soon as the reclamation was complete, the birds moved back to the nest area and normal nesting continued. Disturbance following the reclamation would have been minimal.

Results - 4 young fledged

1991 Breeding Season

The pair were observed on the cliff on March 18. On subsequent visits only a single bird was seen. On April 20 both birds were present and both were identified by their bands. On May 5 the female was observed incubating in a small hole about 15' to the left of the old nest site. Female incubating on subsequent visits, 5 eggs in the nest on May 20. June 9 small downy young in the nest. Large young in the nest on June 20. When visited by John Campbell a few days later the nest was empty. Predated??.

Disturbance - Minimal in 1991

Results - Nest failure

1992 Breeding Season

A pair first observed sitting on the cliff on March 21. We observed a bit of nest ledge display then copulation. That was the only time a pair was present. On several subsequent visits only the female was present and through April 17 we observed frequent courtship flights. On five separate occasions we observed her attract males to the ledges. She was not observed after April 17.

Disturbance

Disturbance was minimal at this site throughout the breeding season.

Results - No nesting attempt

Day Nest Site

History

This is a new territory apparently occupied for the first time in 1989. A single bird was observed in this territory in 1988 and the pair were first observed in 1989 investigating a new artificial nest site. They chose a ledge about 50m to the north of the artificial nest hole.

1989 Breeding Season

On March 31st three birds were observed flying over the cliffs, one bird believed to be the female was observed at several ledges and the artificial nest hole. Courtship flying and copulation was then observed on April 7th. However, following this no birds were in evidence for several days and it appeared that the birds had left the cliff. Finally the incubating female was observed on a very small ledge about 50m to the north of the hole. Male trapped and banded on May 22. They were incubating five eggs. Three young were hatched, one disappeared and the remaining two were caught, banded and fledged.

Disturbance

Disturbance at this site was minimal throughout the nesting season.

Results - 2 young fledged

| Day's Eyrie 1989 - 1992 | | | | | | | |
|-------------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1989 | YES | | 5 | 3 | 2 | mTr | 2 |
| 1990 | NO | | | | | | |
| 1991 | NO | | | | | | |
| 1992 | NO | | | | | | |

1990 Breeding Season

Courtship flying observed on March 6 and one bird seen at the modified artificial nest site. Again on March 26 a female was observed at the nest site and was observed flying out into the valley and returning to it frequently. On April 3 a lone Prairie was observed hunting in the area then flying directly up to cliffs on 1st Porcupine. On checking, no falcons were observed at 1st Porcupine. Other than incidental sightings there was no further indication of Prairie Falcon interest in the ledges at Day's in the 1990 breeding season.

Disturbance

Disturbance at this site was minimal throughout the nesting season.

Results - See 1st Porcupine.

1991 Breeding Season

No prairies observed on any visit in 1991. Pair at 1st Porcupine.

Disturbance

Disturbance minimal throughout the breeding season.

Results - no nesting attempt

1992 Breeding Season

No falcons observed near this cliff throughout the breeding season.

Disturbance

Disturbance at this site was minimal throughout the nesting season.

Results - See 1st Porcupine.

1st Porcupine

History

This site was first documented in 1990. Two artificial nest sites were created on the cliff and a third very accessible natural site was present.

| 1st Porcupine Eyrie 1990 - 1992 | | | | | | | |
|---------------------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1990 | YES | | | 5 | 5 | | 5 |
| 1991 | YES | | | 6 | 6 | | 6 |
| 1991 | YES | | | 5 | 5 | | 2 |

1990 Breeding Season

No Prairies were observed on these cliffs at our first visits in March and early April. Then following the observation of the male flying toward the cliff on April 3 and the desertion of the Day site a Prairie Falcon was observed patrolling the cliff. This bird was observed investigating one of the artificial sites and appeared to have chosen it as a site. On April 17th territorial behaviour was noted as a bird flew out from the natural nest site. At one point three prairies were in the air or investigating ledges on the cliff. Considerable aggression and the third bird was chased from the

area. For the remainder of the breeding season there was considerable interaction with other species on the hill. Young were first observed on June 2nd and appeared to be at least 3 weeks of age. Five young were banded on June 18 and both adults were trapped. The male was last year's male from Days and the female had been previously banded and may have been the female from Days as she was not caught in 1989.

Disturbance

Human related disturbance at this site would be minimal.

Results - 5 young fledged

1991 Breeding Season

A female prairie observed on the dead tree in front of the cliff on March 18. On April 5 between four and five prairies working the cliff face. Some courtship flying and one of the females examining nest ledges and eechipping. On the 6th a pair present the male observed attacking a Bald Eagle that flew near the cliff. The female sat on the cliff and remained perched. By the 8th of April the female appears to have decided on the P.C. hole. The female observed wailing at the male and he ignored her. A pair of prairies observed at the cliff then the male came in and there was a changeover. The female went out to perch on the dead tree. Birds observed fairly regularly at the site through May 20 when we climbed the nest to check the age of the young. On the 21st we gave them 2 young from Fairbrother's. On the 23 a second female was observed on the cliff at last year's nest site. She then flew out in a beautiful series of slow courtship undulations and flying. Birds at the cliff on every visit until we went in to band the young on June 18.

Disturbance

Human disturbance would be minimal all season

Results -6 Young fledged.

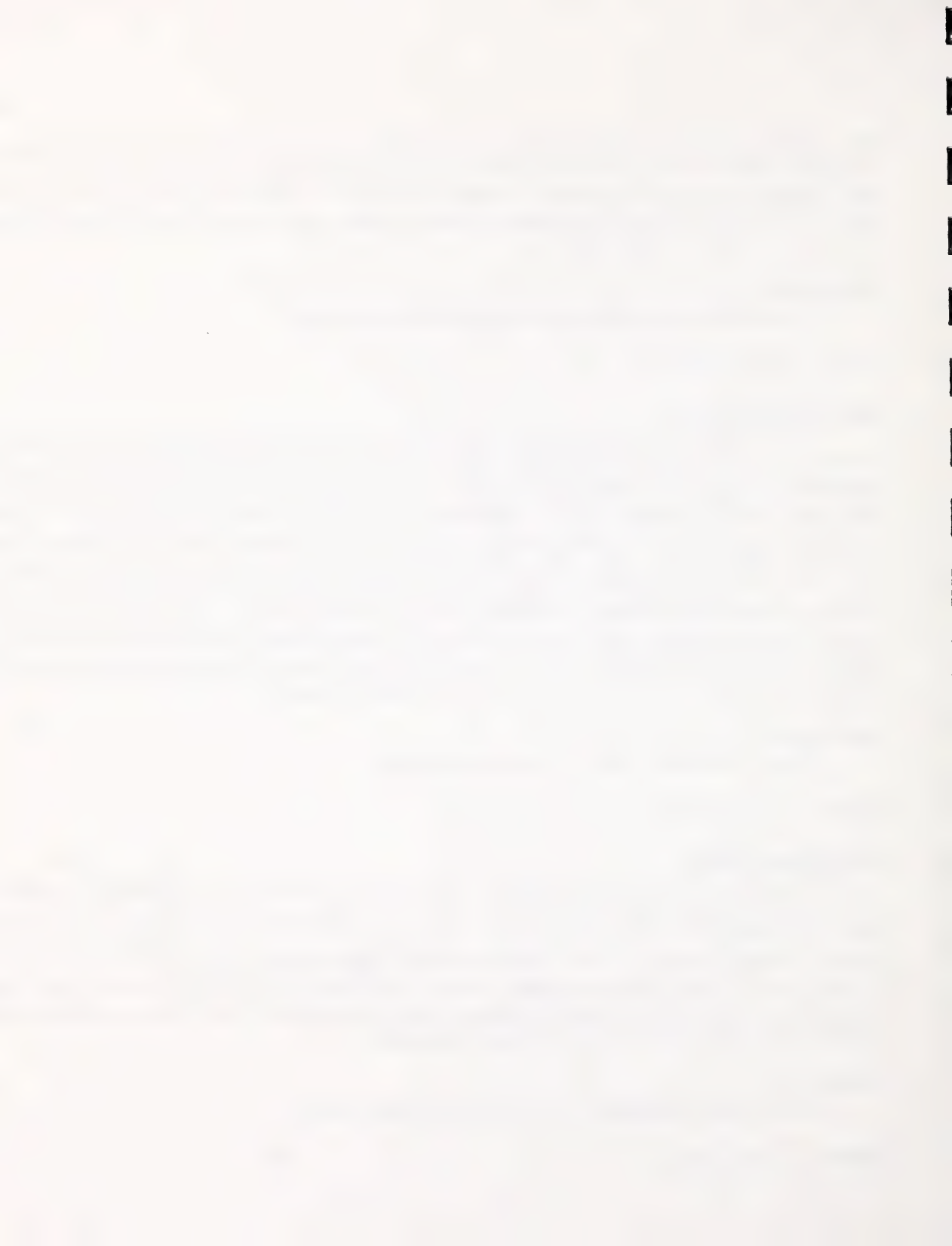
1992 Breeding Season

The pair were first observed perched on the dead tree on March 25. The male was identified as the same bird by his colour bands. On that day the Ferruginous arrived on March 31 and there was little aggression as the male appeared to be away a lot of the time and the female was spending time at the nest. By April 3rd the female was apparently incubating and was observed on the nest several times in the next month. On May 19 the female was observed feeding 2wk old young. When we attempted to band the young on June 11 all tried to fly out. Two were banded and the remaining three males flew well enough to get away.

Disturbance

Human related disturbance at this sight would be minimal.

Results - 5 young fledged



Double Ox-Bow Nest Site - # 18 (Young et al., 1986)

History

This territory was first described by Young (Young et al., 1986) and apparently was first located in 1985.

| DOUBLE OX-BOW EYRIE 1985 - 1992 | | | | | | | |
|---------------------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1985 | YES | | | | | | |
| 1989 | YES | | | | | fTr, | |
| 1990 | NO | | | | | | |
| 1991 | YES | | | | | | |
| 1992 | | YES | | | | | |

1989 Breeding Season

The pair was first observed on April 15th. They were very placid and I could not decide if there was any nesting activity. This behaviour was also observed on my next visit several weeks later. On May 22 the female was flushed from the nest where it appeared she had been incubating. The female was very aggressive and was trapped and banded. The male could not be caught. When we returned to band young the nest was empty and both adults flew off silently suggesting a nest failure.

Disturbance

Disturbance at this site would be minimal as it is very difficult to visit.

Results - nest failure.

1990 Breeding Season

The site was unoccupied. Despite frequent visits the only observation was of a single bird flying in front of the cliff and out of the valley on June 5.

Disturbance

Disturbance at this site would be minimal as it is very difficult to visit.

Results - not occupied

1991 Breeding Season

On May 7 a female was observed in the nest ledge. She appeared to be incubating and remained on the nest for the half hour+ that we remained there. On our return visit in June to band the young the nest was deserted and there was no sign of eggs or young in the nest ledge.

Results - nesting unsuccessful

1992 Breeding Season

The site was occupied by a single bird observed April 7. When checked the ledge had been scraped out but there was no indication of nesting.

Disturbance

Disturbance at this site would be minimal as it is very difficult to visit.

Results - no nesting attempt.

Horseshoe Canyon Nest Site - #15 (Young et al.,1989)

History

Either this territory or Maloff's was reported to have been a historical Peregrine Falcon nesting territory, however neither were occupied when checked in the 1960's and 1970's. It was first recorded by Young (Young et al.,1986) and apparently was occupied by Prairie Falcons in 1985.

1989 Breeding Season

A single bird was observed entering the Canyon on March 9 and a pair were observed on territory the following day. I was unable to visit the site until mid April however, no birds were observed from the opposite side of the river. On April 14 the female was flushed from the nest and was joined by the male. The pair remained nearby, they were relatively shy and silent. When we tried to trap the adults they ignored the owl and remained shy and relatively quiet. Four young were banded on June 18 and fledged young were observed in the area early in July.

Disturbance

Disturbance at this site would have been minimal.

Results - 4 young fledged

1990 Breeding Season

A single bird was observed flying out of the canyon and perching on the hill behind last year's eyrie. This year the birds selected the old original site recorded by CWS in 1974. The nest clearly has been improved apparently by the CWS crews. Female caught. A second female was flushed from a ledge about 100m to the south and was later found to be a second nesting female. The male was observed to be interacting with both females on two occasions and only one male was ever seen in the territory. On one visit, the female from the second nest was absent suggesting that she was perhaps out hunting.

| HORSESHOE CANYON 1974 - 1992 | | | | | | | |
|------------------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1974 | YES | | 4 | 4 | 4 | | 4 |
| 1975 | YES | | 5 | 4 | 4 | | 4 |
| 1976 | YES | | 5 | | | fTr, | |
| 1977 | YES | | 5 | 4 | 4 | | 4 |
| 1978 | | YES | | | | | |
| 1979 | YES | | | | | | |
| 1985 | YES | | | | | | |
| 1989 | YES | | | 4 | 4 | | 4 |
| 1990 | YES | | | 4 | 4 | fTr, | 4 |
| 1991 | YES | | | | | | |
| 1992 | YES | | | | 5 | | 5 |

Disturbance

Disturbance at this site would have been minimal.

Results - 4 young fledged from the north site. and 2 from the second site.

1991 Breeding Season

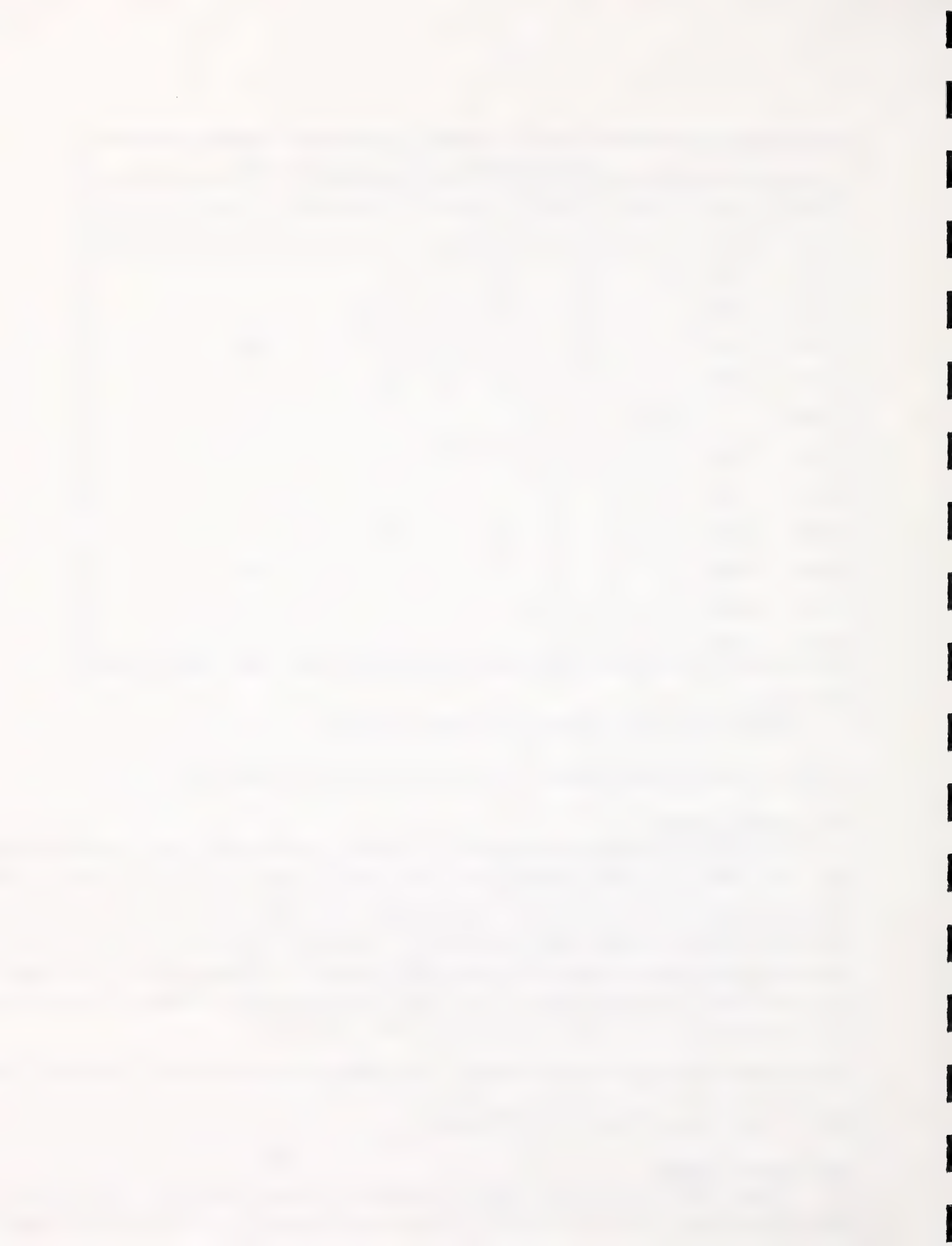
A single bird was observed on March 18. The pair was first observed on April 5th and again later in the month. On both occasions they were near the original nest site. The female flushed from the nest and then returned with us very near. She stood briefly and then walked in to incubate. Same procedure the next time we visited the female was very tame and flushed when we were right beneath the eyrie only to return shortly and walked straight in to incubate. On May 15 the male flushed when we entered the coulee. Both birds were present and the female flew back to the nest after flying around once or twice. Went to the nest on May 20 and pulled the three 4-5 day old young placed them first in Fairbrother's then 1st Porcupine.

Disturbance - minimal prior to the flooding. The flooding resulted in the loss of the nest site.

Results - three young fledged at 1st Porcupine.

1992 Breeding Season

A single bird was observed flying into then out of the canyon on April 2. The bird was next observed perching on the hill behind the alternate eyrie on the 7th of April and was frequently



observed on this point on several visits. On April 15 the single bird was observed to fly to the alternate nest hole and perch there for a period of time before going back to the dead tree above the eyrie. On subsequent visits one bird which I believe was observed perching above the site or flying over the valley. Frequently it was observed to chase the eagles. Five young were banded on June 19.

Disturbance

Disturbance at this site would have been minimal.

Results - 5 young fledged.

Horseshoe Canyon B Nest Site

History

This nest site was first located this year within 100m of the existing nest site.

1990 Breeding Season

A single bird was observed flying out of the canyon and perching on the hill behind last year's eyrie. This year the birds selected the old original site recorded by CWS in 1974. The nest clearly has been improved apparently by the CWS crews. A second female was flushed from a ledge about 100m to the south and was later found to be a second nesting female. The male was observed to be interacting with both females on two occasions and only one male was ever seen in the territory. On one visit, the female from the second nest was absent suggesting that she was perhaps out hunting.

Disturbance

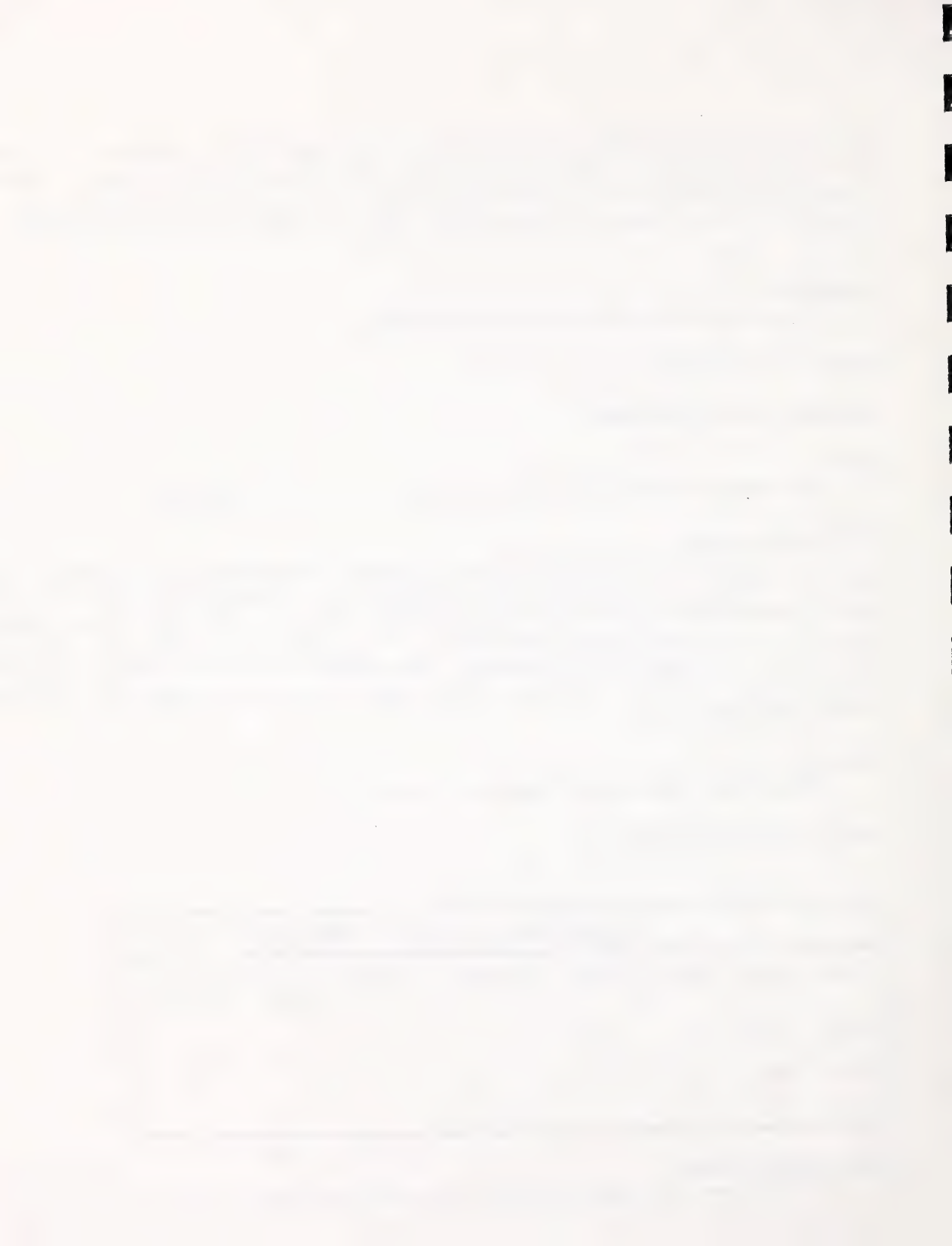
Disturbance at this site would have been minimal.

Results - 2 from the second site

| HORSESHOE CANYON B 1990 - 1992 | | | | | | | |
|--------------------------------|------|-------|------|-------|--------|------------|---------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1990 | YES | | | 3 | 3 | | 3 |
| 1991 | NO | | | | | | |
| 1992 | NO | | | | | | |

1991 Breeding Season

No birds were seen at this nest site nor apparently looking at the site.



Results - no occupancy.

1992 Breeding Season

No birds were observed at this site at any time during the breeding season.

Disturbance

Disturbance at this site would have been minimal.

Results - no breeding attempt.

Maloff Nest Site # 12 (Young et al.,1986)

History

This territory was reported to have been an historical Peregrine Falcon nesting territory, however, it was not occupied when checked in the 1960's and 1970's. This site was first recorded in 1974 by CWS and was monitored by them until the early 1980's. It was next described by Young (Young et.al.,1986) and apparently was occupied by Prairie Falcons in 1985.

| MALOFF EYRIE 1974-1992 | | | | | | | |
|------------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1974 | YES | | 3 | | | | |
| 1975 | YES | | | | | | |
| 1976 | YES | | 4 | 3 | 3 | | 3 |
| 1977 | YES | | 5 | 4 | 4 | fTr | 4 |
| 1978 | NO | | | | | | |
| 1980 | NO | | | | | | |
| 1985 | YES | | | | | | |
| 1989 | YES | | 4 | | | mTr | |
| 1990 | YES | | | 3 | 3 | mTr,fTr | 3 |
| 1991 | YES | | | | | | |
| 1992 | YES | | | 2? | 1 | | |

1989 Breeding Season

The pair were first observed on territory on March 9 and one or both were present on every subsequent visit to the site. The birds appeared to ignore the heavy equipment and men working about .5km to the west near the end of March. The female appeared to be incubating early in May. The male was trapped and banded on May 21st and an unsuccessful attempt was made to catch the female on the 24th. At the time there was one newly hatched chick and three unhatched eggs in the nest. It was a bitterly cold day and we gave up on our trapping attempt because we were concerned for the chick. Unfortunately the nestling subsequently died and the other eggs which failed to hatch appeared to be addled.

Disturbance

This pair of birds were habituated to a moderate amount of disturbance each breeding season just with the normal activity at the farm opposite the nest cliff. However, when this disturbance patten accelerated with the earth moving equipment they were apparently unconcerned and no unusual behaviour was observed.

Result - nest failure.

1990 Breeding Season

A falcon was observed defending the territory against a Golden Eagle on Feb 27. Then a single bird was observed at the nest ledge on March 6. The pair were first observed on territory on March 26. One or both were present on every subsequent visit to the site. The female appeared to be incubating on May 21. Three young were produced and were banded on June 21. The two adults were trapped on June 27. The female for the first time, the male was the same bird banded at the site in 1989.

Disturbance

In 1990 the disturbance throughout the nesting season would have been minimal.

Result - 3 young fledged

1991 Breeding Season

A pair of falcons over the cliff on March 18 observed attacking a Golden Eagle. Female observed going in to settle on the eggs on April 14. On April 23 two men were hunting "gophers" with rifles and a shotgun opposite the nest site. The female left the area when the shooting was going on and returned when they left. Female observed perched at the mouth of the nest occasionally going back inside. Suggests there are young in the nest. On June 4 three young were observed. Later 4 large young observed.

Disturbance

The female was frightened from the nest on April 23 by the two men hunting opposite the nest site. She did return after they left the area and fledged four young successfully.

Results - 4 young fledged.

1992 Breeding Season

A single falcon was observed perched on the cliff on March 21. The pair was then observed on April 2 and flew off defensively. The female was observed going into a new hole in a long crack in the rock face. On April 15 one of the birds flew out cacking as we drove by the cliff. One or the other or both cacked at us on every subsequent visit or as we drove by enroute Horseshoe Canyon. On June 10 two 3-4wk old young were visible in the long crack. When we climbed the cliff for banding it was deserted and then a single dead young was found eaten beneath the face. Apparently a racoon predated the nest. On June 19 a single young was observed on the cliff.

Disturbance

Disturbance throughout the nesting season would have been minimal.

Result - 1 young fledged

Castle Dairy Nest Site

History

This is a new site in an artificial nest hole which had been constructed earlier in the year.

| Castle Dairy 1989 - 1992 | | | | | | | |
|--------------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1989 | YES | | 5 | 4 | 4 | mTr | 4 |
| 1990 | YES | | | 4 | 4 | | 4 |
| 1991 | YES | | | 5 | 6 | | 6 |
| | | | | | FOSTER | | |
| 1992 | NO | | | | | | |

1989 Breeding Season

A female prairie that appeared to be in first year plumage was first observed on the cliff on May 1st. The bird acted territorial and was observed to perch near a hole just to the east of the raven nest. By May 10th the female appeared to be incubating and sat very close when I drove up to a point directly opposite the nest. We tried unsuccessfully to trap the female on May 21st however we were able to trap and band the male on the 24th and found the nest to contain 5 unhatched eggs. Four young were caught and banded on July 1st. They were observed again on July 7 and appeared ready to leave the nest.

Disturbance

This pair experienced minimal to moderate disturbance primarily from the activity of people on the opposite side of the river. There was some evidence of picnicking and fishermen were on the river for much of the month of June.

Results - 4 young fledged.

1990 Breeding Season

The pair were observed at the east end of the cliffs on March 6 and one or both birds was present on each subsequent visit to the area. By March 26 it was clear that they had selected a new nest hole at the east end. On April 16 the female appeared to be either laying or incubating. On May 30th the male was observed to bring food to the cliff, pluck it and then go to the nest hole and begin to feed small young. Four young were banded on June 20 and although we were not able to catch the adults we did get an opportunity to identify the male as the same bird as that banded in 1989.

Disturbance

This pair experienced minimal disturbance. There was much less activity than in 1989.

Results - 4 young fledged.

1991 Breeding Season

A male bird was observed examining nest holes on March 18. On April 6th a female was observed sitting in the central nest hole. Later a Canada Goose was observed examining the old raven nest and Horned Owls were found to be nesting in last year's prairie nest hole. On April 9 the female was observed incubating in the central nest hole. The female was observed incubating several on days. The male was seldom observed. Yet on April 17 the male was observed flying along the cliff face with food. Following the food transfer he was then observed flying to the nest wailing as he flew. The female was sitting on the fence-line feeding. Female observed incubating on every visit. On May 21 nest climbed , 5 eggs two just hatching. The two young taken to Fairbrother's and the eggs from Tennessee placed with this hen. On May 22nd county workmen were working at the gravel pile on the opposite side of the river(300m +). The female seemed to ignore this and no harm was done. 6 young banded.

Results - 6 young fledged

1992 Breeding Season

Falcons were not observed on these cliffs at any time during the current field season. However, a pair of Great Horned Owls was observed in the holes at the east end.

Disturbance

There was minimal disturbance at this site during the 1992 breeding season.

Results - no nesting attempt.

Stevick Nest Site

History

This is a new territory created when we put in artificial hole in 1988.

| Stevick 1989 - 1992 | | | | | | | |
|---------------------|------|-------|------|-------|--------|---------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | BAND AD | BAND YOUNG |
| 1989 | | YES | | | | | |
| 1990 | | YES | | | | | |
| 1991 | | YES | | | | | |
| 1992 | YES | | 5 | 5 | 5 | | 5 |

1992 Breeding Season

The pair first observed on March 22 and were seen frequently at the thereafter. The female appeared to be incubating on April 5 and was seen in the nest hole on each visit. She was flushed off 5 eggs on April 18 and was observed feeding 2 week old young on May 18. Five young banded June 11.

Results - 5 young fledged

Fairbrother Nest Site

History

This is one of the original nest sites documented in the late 1960's and monitored by CWS through the early 1980's. This site was not included by Young (Young et al.,1986) presumably because it is approximately 3km from the construction area and will not be affected by either the construction or flooding. I have included it because of its relative proximity and the fact that there is considerable interaction between these birds and those that will be affected by the dam.

1989 Breeding Season

A single bird was observed at the site on March 8th and 9th. The first observation of a second bird was made on the 23rd and then again on the 24th. Courtship activity was observed. The male was observed defending the territory against a Golden Eagle on April 6th. A single egg was found in the nest on April 15th. Five eggs were in the nest at the next visit when we trapped and

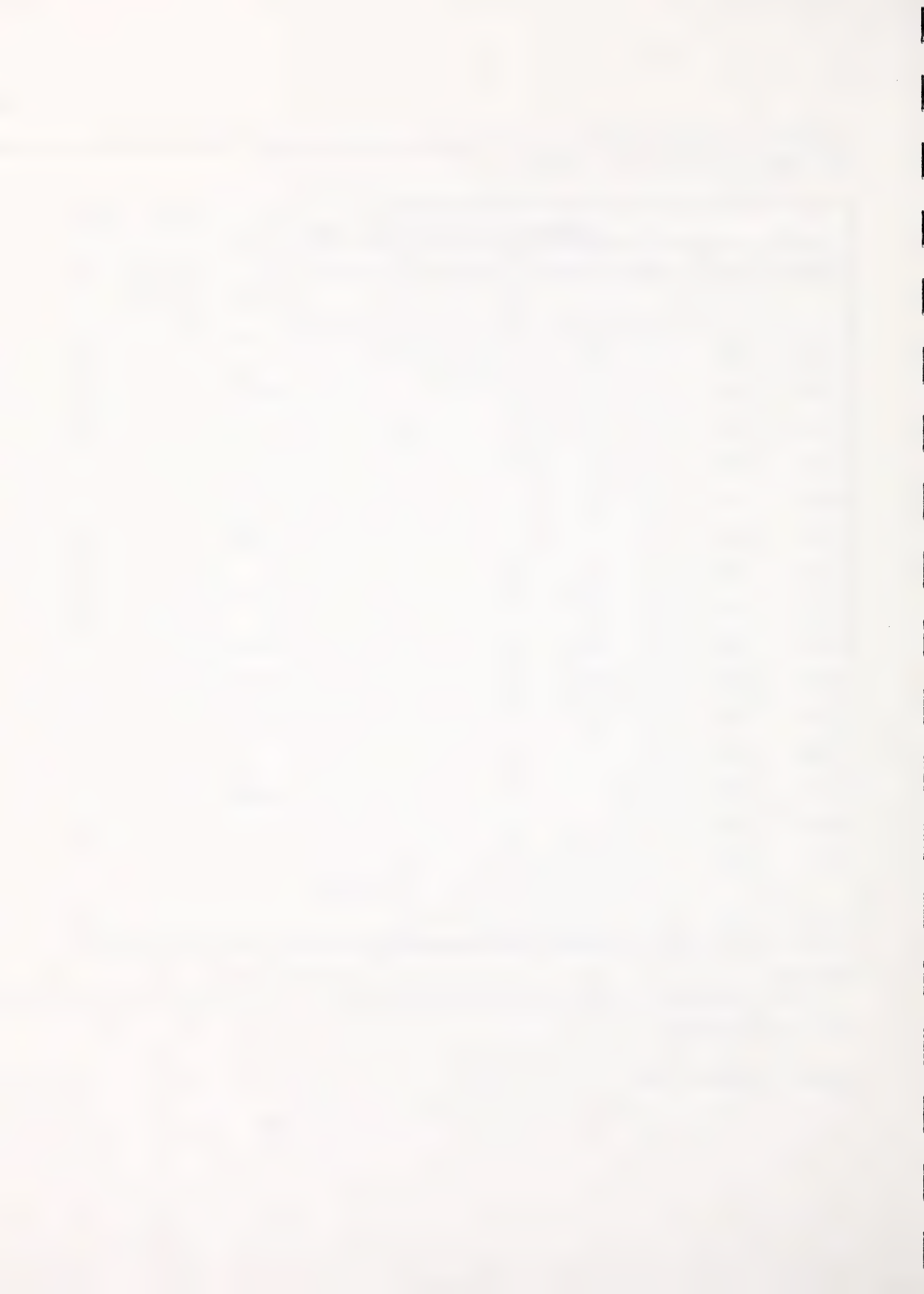
banded the adult birds. Three young were caught and banded on June 19th and were later observed fully fledged flying along the cliff face.

| FAIRBROTHER'S EYRIE 1968-1992 | | | | | | | |
|-------------------------------|------|-------|------|-------|--------|----------|------------|
| YEAR | PAIR | INDIV | EGGS | YOUNG | FLEDGE | AD BAND | YOUNG BAND |
| 1968 | YES | | 4 | 1 | | | |
| 1969 | YES | | 4 | 4 | 4 | mTr,fTr | |
| 1970 | YES | | 6 | 4 | 4 | | 4 |
| 1971 | YES | | 5 | | | | |
| 1972 | YES | | 5 | | 1 | | |
| 1973 | YES | | | 5 | 5 | mTr,fTr | 5 |
| 1974 | YES | | 5 | 3 | 3 | | 3 |
| 1975 | YES | | 5,4 | 2 | 2 | fTr | 2 |
| 1976 | YES | | 5,4 | 4 | 4 | mTr,fTr | 4 |
| 1977 | YES | | 3,4 | 4 | 4 | mTr,fTr | 4 |
| 1978 | YES | | 5 | 1 | 1 | | |
| 1980 | YES | | | 5 | | | |
| 1989 | YES | | | 3 | 3 | mTr,fTr, | 3 |
| 1990 | YES | | | 3 | 3 | | 3 |
| 1991 | YES | | | 3 | 6 | | 6 |
| | | | | | FOSTER | | |
| 1992 | YES | | | 5 | 5 | | 5 |

Disturbance

This pair would have be subjected to a minimal amount of disturbance by virtue of the sites relative inaccessibility.

Results - 3 young fledged.



1990 Breeding Season

The pair were observed at the site on Feb 27 and birds were only seen infrequently prior to our visit in June. We were unsuccessful in trapping the adults on June 6 but were able to band the three young later in the month.

Disturbance

This pair would have been subjected to a minimal amount of disturbance by virtue of the sites relative inaccessibility.

Results - 3 young fledged.

1991 Breeding Season

Pair first observed at the site on April 12. Female observed incubating on May 6. This pair are seldom seen from the road as we checked virtually every time we drove by and only rarely saw the female at the ledge. On May 20 we visited the nest and climbed it. Three newly hatched young and we added the three young from Horseshoe. On May 21 we returned, both adults present. All six young alive and healthy. Placed the two small young from Castle Dairy in with the others and took the two largest young out to place in 1st Porcupine. Several checks were made, both adults present and young fine. We then returned on June 18 and banded the six young.

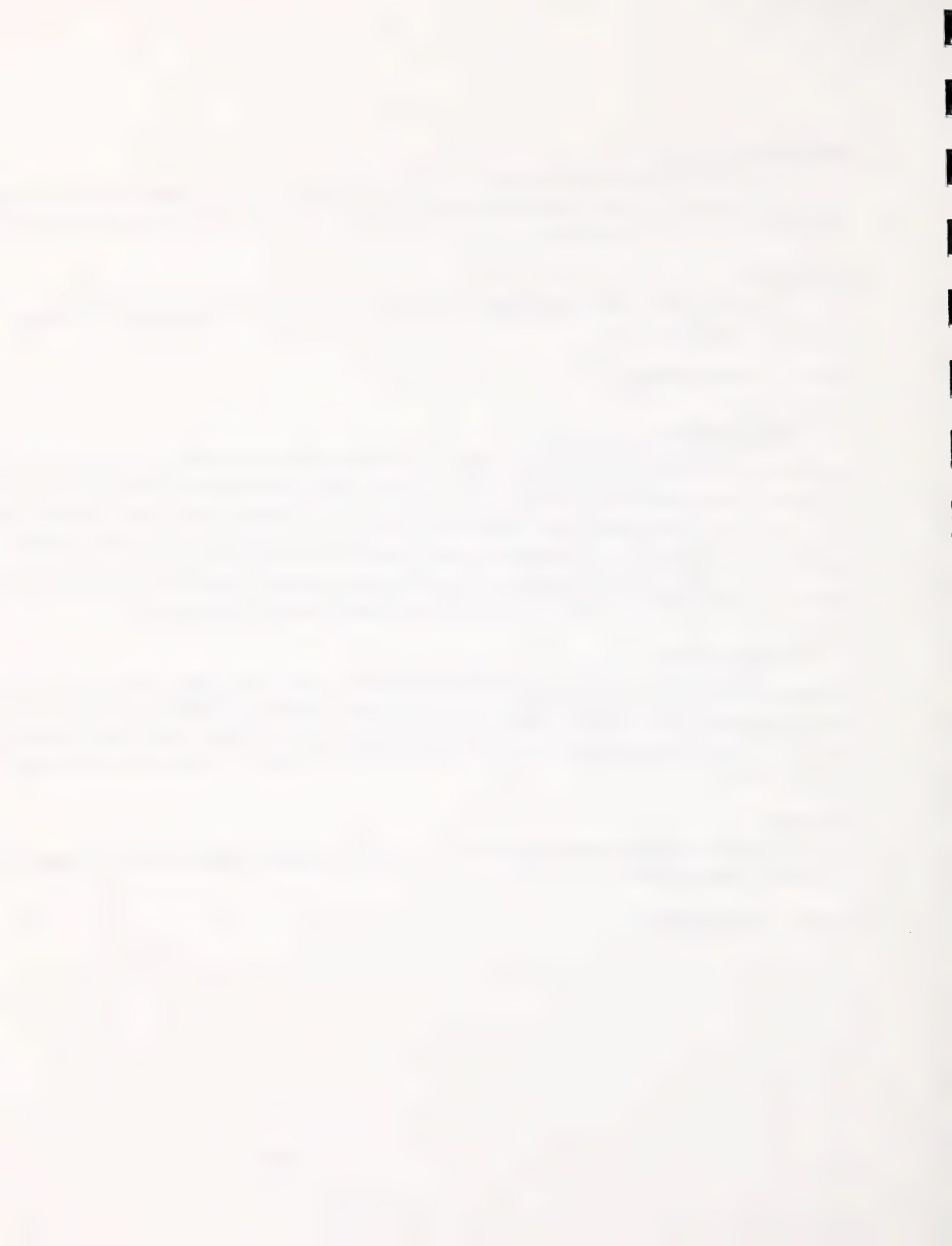
1992 Breeding Season

A single bird was observed on the site on March 30. The next sighting was on April 8 when a single bird flew from the old Raven nest at the west end of the cliffs. The birds were seen infrequently during the season and only at the west end of the cliffs. On April 18 we flushed the female from the Raven nest and found her to be incubating 5 eggs. We were able to band the five young on June 11.

Disturbance

This pair would have been subjected to a minimal amount of disturbance by virtue of the sites relative inaccessibility.

Results - 5 young fledged.



APPENDIX 2. Dates of first sighting of Migrants in 1992

| Species | 1989 | 1990 | 1991 | 1992 |
|------------------------|----------|----------|----------|----------|
| Prairie Falcon * | March 9 | Feb 26 | March 18 | March 21 |
| Golden Eagle * | April 6 | Feb 27 | March 18 | March 21 |
| Canada Goose * | March 9 | March 6 | March 18 | March 21 |
| Richardson's Merlin * | March 9 | April 17 | April 18 | |
| Whistling Swan | March 10 | | | |
| Flicker | | March 17 | April 20 | |
| California Gull | March 25 | | | |
| Goshawk * | March 25 | | April 8 | |
| Pintail Duck | April 5 | | April 6 | March 21 |
| Bohemian Waxwing | April 5 | | | |
| Red-breasted Merganser | April 7 | | | |
| Mountain Bluebird | April 7 | | April 5 | |
| Mallard Duck * | | | April 6 | March 21 |
| Horned Lark * | March 9 | Feb 26 | March 18 | March 21 |
| Starling | | March 27 | | March 21 |
| Crow | | | April 7 | March 21 |
| Robin | March 9 | March 17 | | March 21 |
| Meadowlark | May 1 | April 16 | | March 24 |
| Red-tailed Hawk | March 10 | April 3 | April 6 | March 24 |
| Killdeer Plover | March 25 | March 26 | March 18 | March 25 |
| American Widgeon | | May 1 | May 6 | March 25 |
| Common Goldeneye | | | April 13 | March 25 |
| Ferruginous Hawk | March 31 | April 17 | April 13 | March 27 |
| Bufflehead Duck | | | April 13 | March 29 |
| Common Merganser | March 30 | | | March 29 |
| Dark-eyed Junco | | | April 25 | March 30 |
| American Kestrel | March 25 | April 16 | April 7 | March 31 |
| Northern Harrier | April 5 | April 16 | April 7 | March 31 |
| Great-Blue Heron | April 6 | April 25 | April 7 | April 5 |
| Rough-winged Swallow | April 13 | | | |
| Barrow's Goldeneye | | | | April 14 |
| Tree Swallow | | | May 14 | April 14 |
| Sharp-shinned Hawk | | April 30 | April 23 | April 15 |

| | | | | |
|---------------------------|----------|----------|----------|----------|
| Eastern Kingbird | May 12 | | | |
| Western Kingbird | | | | April 15 |
| Long-billed Curlew | May 2 | April 18 | April 20 | April 16 |
| Say's Phoebe | April 14 | June 6 | April 14 | April 16 |
| Bank Swallow | | | | April 18 |
| Canvasback | | | May 16 | April 20 |
| Eared Grebe | | May 1 | April 27 | |
| Horned Grebe | | | | April 20 |
| Belted Kingfisher | May 2 | April 19 | | |
| Rough-legged Hawk * | March 31 | April 25 | April 13 | |
| Shoveller | | | | April 20 |
| Swainson's Hawk | May 1 | April 24 | April 22 | |
| Western Grebe | | May 1 | May 4 | |
| Common Grackle | May 1 | May 1 | | |
| Red-winged Blackbird | May 1 | | April 25 | |
| Snow Goose | May 1 | | May 4 | |
| Brown-headed Cowbird | May 2 | May 2 | | |
| Barn Swallow | May 2 | | | |
| Yellow-bellied Sapsucker | May 10 | | | |
| Ruby-throated Hummingbird | May 10 | | | |
| Spotted Sandpiper | May 10 | June 12 | | |
| Willet | May 12 | | | |
| Mourning Dove | May 12 | | | |
| Yellow-rumped Warbler | May 12 | | May 15 | |
| Wilson Phalarope | | | May 1 | |
| Blue-winged Teal | | May 1 | April 25 | |
| Cinnamon Teal | | May 1 | April 19 | |
| Brewer's Blackbird | | | May 6 | May 1 |
| Savannah Sparrow | | | | May 1 |
| Vesper Sparrow | May 2 | | | May 1 |
| Lesser Scaup | | May 1 | | May 14 |
| Gadwall | | May 1 | May 16 | May 14 |
| American Coot | | | | May 14 |
| Black Tern | | | | May 14 |
| Double-crested Cormorant | | May 15 | | |

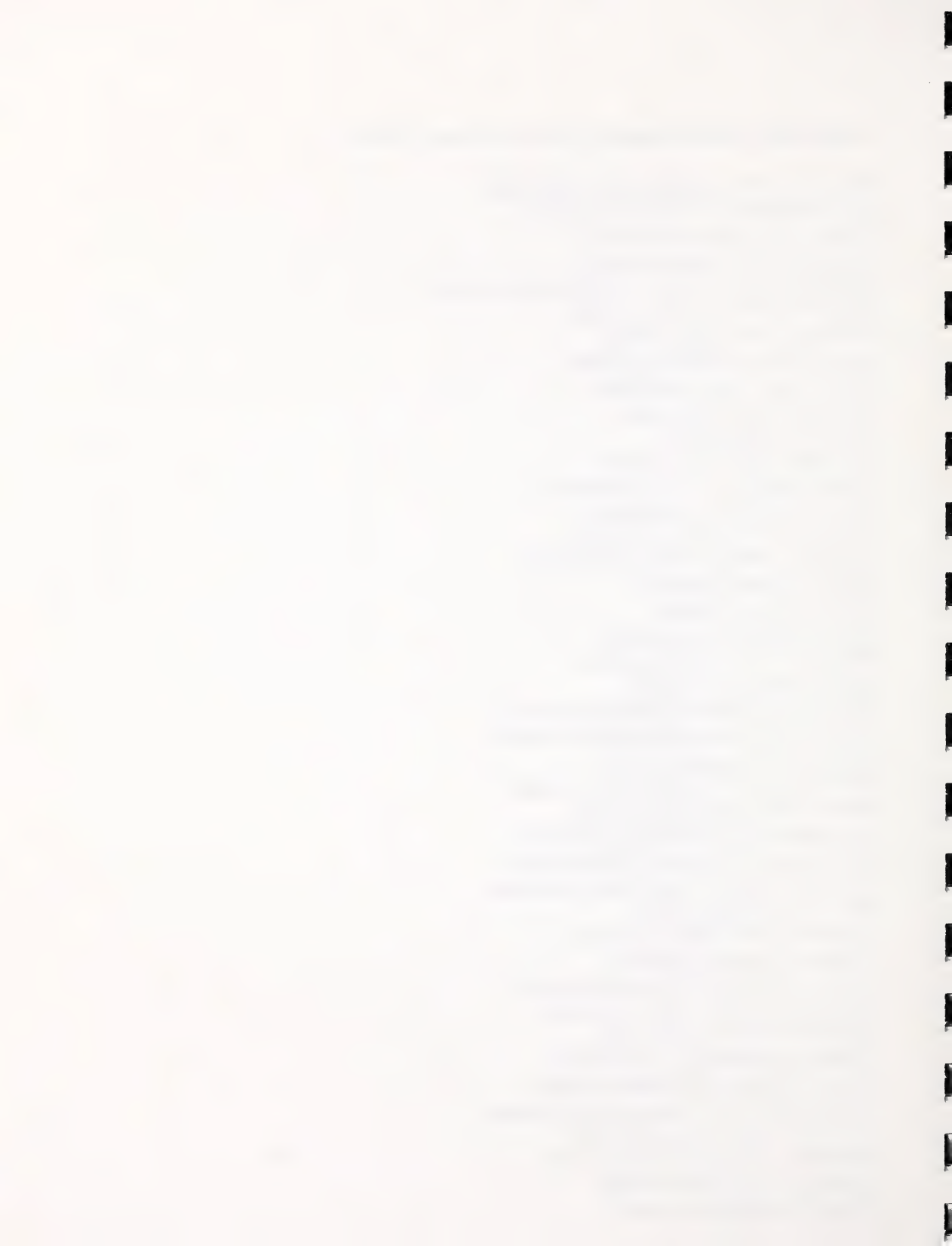
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|-----------------------|----------|---------|--------|--------|
| Wood Duck | April 15 | | May 15 | May 14 |
| Common Loon | | | | May 15 |
| Red-breasted Nuthatch | | June 6 | | |
| Rock Wren | | June 6 | | |
| Catbird | | June 6 | | |
| Western Wood Pewee | | June 6 | | |
| Goldfinch | | June 6 | | |
| House Wren | | June 7 | | |
| Veery | | June 7 | | |
| Cedar Waxwing | | June 7 | | |
| Spotted Sandpiper | | June 12 | | |
| Yellow Warbler | | June 28 | | |
| Ring-necked duck | | July 11 | | |
| White-winged Scoter | | July 11 | | |
| Ruddy Duck | | July 11 | | |
| Clarke Nutcracker | April 5 | July 11 | | |
| Bank Swallow | | July 11 | | |
| Burrowing Owl | | | | |

* Possibly winter resident or visitant

[The text in this section is extremely faint and illegible. It appears to be a list or a series of entries, possibly a table of contents or a list of items, but the specific details cannot be discerned.]

APPENDIX 3. Birds identified in the study area 1989-92

Western Grebe *Aechmophorus occidentalis*
 Red-necked Grebe *Podiceps grisegena*
 Eared Grebe *Podiceps caspicus*
 Horned Grebe *Podiceps auritus*
 Double-crested Cormorant *Phalacrocorax auritus*
 Great Blue Heron *Ardea herodias*
 Whistling Swan *Cygne siffleur*
 Canada Goose *Branta canadensis*
 Snow Goose *Chen hyperborea*
 Mallard *Anas platyrhynchos*
 Gadwall *Anas strepera*
 Northern Pintail *Anus acuta*
 Green-winged Teal *Anas carolinensis*
 Blue-winged Teal *Anas discors*
 Cinnamon Teal *Anas cyanoptera*
 American Widgeon *Mereca americana*
 Shoveler *Spatula clypeata*
 Wood Duck *Aix sponsa*
 Canvasback *Aythya valisineria*
 Ring-neck Duck *Aythya collaris*
 Lesser Scaup *Aythya affinis*
 Barrow's Goldeneye *Bucephala islandica*
 Common Goldeneye *Bucephala clangula*⁶
 Bufflehead *Bucephala albeola*
 White-winged Scoter *Melanitta deglandi*
 Ruddy Duck *Oxyura jamaincensis*
 Common Merganser *Mergus merganser*
 Red-breasted Merganser *Mergus serrator*
 Hooded Merganser *Lophodytes cucullatus*
 Soar Rail *Porzana carolina*
 American Coot *Fulica americana*
 Killdeer *Charadrius vociferus*
 Greater Yellowlegs *Tringa melanoleuca*
 Spotted Sandpiper *Actitis macularia*
 Marbled Godwit *Limosa fedoa*
 Willet *Catoptrophorus semipalmatus*
 Wilson Phalarope *Phalaropus tricolor*
 Long-billed Curlew *Numenius americanus*
 California Gull *Larus californicus*
 Ring-billed Gull *Larus delawarensis*
 Common Tern *Sterna hirundo*
 Black Tern *Chlidonias niger*⁶



Sharp-shinned Hawk *Accipiter striatus*
 Cooper Hawk *Accipiter cooperii*
 Goshawk *Accipiter gentilis*
 Red-tailed Hawk *Buteo jamaicensis*
 Swainson Hawk *Buteo swainsoni*
 Rough-legged Hawk *Buteo lagopus*
 Ferruginous Hawk *Buteo regalis*
 Golden Eagle *Aquila chrysaetos*
 Bald Eagle *Haliaeetus leucocephalus*
 Northern Harrier *Circus cyaneus*
 Osprey *Pandion haliaetus*
 Prairie Falcon *Falco mexicanus*
 Peregrine Falcon *Falco peregrinus*
 Richardson's Merlin *Falco columbarius richardsoni*
 American Kestrel *Falco sparverius*
 Grey Partridge *Perdix perdix*
 Mourning Dove *Zenaidura macroura*
 Rock Dove *Columba livia*
 Great Horned Owl *Bubo virginianus*
 Long-eared Owl *Asio otis*
 Burrowing Owl *Athene cunicularia*
 Common Nighthawk *Chordeiles minor*
 Ruby-throated Hummingbird *Archilochus colubris*
 Belted Kingfisher *Ceryle alcyon*
 Common Flicker *Colaptes cafer*
 Hairy Woodpecker *Dendrocopos villosus*
 Downy Woodpecker *Picoides pubescens*
 Yellow-bellied Sapsucker *Sphyrapicus varius*
 Eastern Kingbird *Tyrannus tyrannus*
 Western Kingbird *Tyrannus verticalis*
 Say's Phoebe *Sayornis saya*
 Western Wood Pewee *Contopus sordidulus*
 Least Flycatcher *Empidonax minimus*
 Horned Lark *Eremophila alpestris*
 Tree Swallow *Tachycineta bicolor*
 Northern Rough-winged Swallow *Stelgidopteryx serripennis*
 Bank Swallow *Riparia riparia*
 Barn Swallow *Hirundo rustica*
 Cliff Swallow *Petrochelidon pyrrhonota*
 Common Raven *Corvus corax*
 Common Crow *Corvus brachyrhynchos*
 Black-billed Magpie *Pica pica*
 Gray Jay *Perisoreus canadensis*
 Clark's Nutcracker *Nucifraga columbiana*

Black-capped Chickadee *Parus atricapillus*
Red-breasted Nuthatch *Sitta canadensis*
Rock Wren *Salpinctes obsoletus*
House Wren *Troglodytes aedon*
Catbird *Dumetella carolinensis*
American Robin *Turdus migratorius*
Veery *Hylocichla fuscescens*
Mountain Bluebird *Sialia currucoides*
Ruby-crowned Kinglet *Regulus calendula*
Sprague's Pipit *Anthus spragueii*
Bohemian Waxwing *Bombycilla garrulus*
Cedar Waxwing *Bombycilla cedrorum*
Northern Shrike *Lanius excubitor*
Starling *Sturnus vulgaris*
Yellow Warbler *Dendroica petechia*
Common Yellowthroat *Geothlypis trichas*
Yellow-rumped Warbler *Dendroica coronata*
Red-winged Blackbird *Agelaius phoeniceus*
Yellow-headed Blackbird *Xanthocephalus xanthocephalus*
Brewers Blackbird *Euphagus cyanocephalus*
Western Meadowlark *Sturnella neglecta*
Common Grackle *Quiscalus quiscula*
Brown-headed Cowbird *Molothrus ater*
Vesper Sparrow *Pooecetes gramineus*
Savannah Sparrow *Passerculus sandwichensis*
Clay-colored Sparrow *Spizella pallida*
Dark-eyed Junco *Junco hyemalis*
Pine Siskin *Spinus pinus*
American Goldfinch *Spinus tristis*



APPENDIX 4. Locations of platforms and nest poles

Watson Coulee

A pole is located to the south of the dam.

Tennessee Coulee -

2nd Dam to North - one pole is located to north.

Group Home -

One pole is located in the ditch at the bend of the road.

Delents

One pole is located just below the upper dam on a small flat in a bend and a second on the side of the second dam.

Welsch

Three poles are located on the island.

West of J Crossing Construction Bridge

Two poles on the island.

Stevick

Five poles.

Additional Poles have been placed near several of the small dams

APPENDIX 5. Definitions of terms used in report.

Nesting Territory - The area around a nest site that is normally defended by the pair of birds in residence

Courtship Behaviour - Activities associated with pair formation including the following:

Courtship flying (flight displays)

Nest displays (individual and as pairs)

Nest selection (one of both birds of a pair)

Nest construction (in falcons the scraping a nest hollow)

Food exchanges (where the male brings food to the female)

Copulation or mating attempt

Alternate Nest - A suitable alternate nest site in or adjacent to a nesting territory that is available in the event of failure or loss of a nest site.

Artificial Nest - A man-made nest structure or nest hole that has been constructed specifically to provide suitable nest sites for resident breeding birds. In the context of this project artificial nest structures are being constructed for Prairie Falcons and Ferruginous Hawks and may be utilized by other raptors, geese or ravens.

Foraging Habitat - Habitat associated with a breeding territory that maintains an adequate abundance of accessible prey species.

Young Fledged - the young known to have successfully flown from a nest site.

Disturbance - disturbance is defined as something which disrupts or destroys the peace. In reference to breeding birds disturbance would be any activity which disrupts the breeding cycle. For the sake of discussion and comparison I have referred to disturbance as minimal, moderate, high and severe.

Minimal disturbance would include the incidental transgression of any predator, human, or vehicle into the territory of a breeding pair which may or may not elicit a territorial response. In such an instance, a pair would return to normal behaviour as soon as the transgression ceased.

Moderate disturbance would include frequent transgression of a predator, vehicle, activity or humans in the territory of a breeding pair but at a sufficient distance from the nest site would not constitute a threat.

High disturbance is excessive disturbance which in my opinion would normally result in the desertion of a nest site for a given breeding season but which are tolerated either as a result of habituation or because the activity occurred relatively late in the breeding cycle.

Severe disturbance includes any activity which is threatening early in the breeding cycle, in particular during courtship and nest site selection. Such disturbance is very likely to result in desertion of a nest site or even a nesting territory for that breeding season.

Habituation - "the waning of a response to a repeated activity" (Marler and Hamilton, 1966) or in this application, the ability of individuals or pairs of birds to accept disturbance as a result of increased exposure to an activity which does not harm or threaten the individual or pair.

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