Ten Years of Monitoring Nesting Ospreys (*Pandion haliaetus*) in the West Kootenay Region of British Columbia

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Abstract

The nesting activities of Ospreys (*Pandion haliaetus*) in the southern West Kootenay region of British Columbia were monitored monthly during the breeding season from 1997 to 2006. Numbers of breeding pairs and measures of nest success fluctuated considerably from year to year but did not show any significant trends over time. Evidence suggests, however, that numbers have decreased since the late 1980s. The extent to which Osprey nests were used by Canada Geese (*Branta canadensis*) was also examined.

Introduction

Ospreys are conspicuous members of the West Kootenay avifauna. Their particularly high numbers in this region (see Campbell et al. 1990) have attracted considerable research interest (*e.g.,* Flook and Forbes 1983, Machmer and Ydenberg 1990, Steeger et al. 1992, Steeger and Ydenberg 1993, Green and Krebs 1995, Elliott et al. 1998).

The breeding chronology of this species in southeastern British Columbia has been well established as a result of some of these studies (Steeger et al. 1992, Steeger and Ydenberg 1993). Ospreys nesting in this region return from their southern wintering area around mid-April. Over the following weeks, the birds are involved in pre-nesting activities, including courtship flights, courtship feeding, nest-building and nest re-furbishing. Egg-laying may begin as early as the last week in April and continue as late as the second week of June, but most clutches are laid in May. The incubation period is approximately 39 days, and young begin to hatch early in June. Hatching continues through June and into the first third of July. Chicks remain in the nest approximately 55 days (Figure 1), and most young fledge in August. The breeding season of West Kootenay Ospreys, from pre-incubation to post-fledging, totals approximately 22 weeks (Campbell et al. 1990).

Declines in Osprey numbers in eastern North America 40 years ago led to discovery of the effects of the pesticide DDT on the environment. Since that time, Ospreys have been considered effective indicators of environmental health. These birds are relatively easy to observe at their nests without causing disturbance, and so provide ideal subjects for monitoring. This study examines the status and trends of the nesting Osprey population in the southern portion of the West Kootenay region over a ten-year period.

Study Area

The area included in this study is the West Arm of Kootenay Lake, from Balfour to southwest of Nelson; the lower Kootenay River, from southwest of Nelson to its confluence with the Columbia River at Castlegar; and the Columbia River, from Castlegar to Waneta (south of Trail) at the Canada-U.S. border. These sections constitute a continuous waterway approximately 120 km long. For monitoring purposes, the study area was divided into an upper or northern section (Balfour to Nelson), and a lower or southern section (Nelson to Waneta).

Methods

The study was conducted from 1997 to 2006. Two teams of two observers each monitored Osprey nests monthly from April through August. Use of binoculars and spotting scopes ensured

Figure 1. The mottled plumage of these Osprey triplets suggest they are ready to fledge. Salmon Arm, BC. August 2002 (Trevor Forder). BC Photo 3462.

that disturbance to breeding pairs was minimal or non-existent (Figure 2). Information collected at each site included the presence or absence of birds at or near the nest and evidence of breeding. All known potential nest sites, including those used in previous years and man-made platforms that had not been used, were checked each year for activity. A nest was considered occupied if at least one of the following criteria was met during at least one visit: active nest-building, copulation, an adult sitting low in the nest in a horizontal position (indicating probable incubation), or young present in the nest. Observations generally lasted about five minutes per nest; however, more time was taken as needed, particularly to ascertain the presence of small young. Number of young were counted in nests containing chicks. Nests that had young present at the last visit were assumed to be successful and were treated as productive nests. Because nest visits were up to four weeks apart and fledging was not always confirmed, productivity values could be slightly elevated if chicks died following our last visit and prior to actually leaving the nest. Nest-sites were categorized as either natural or man-made.

We calculated the average number of young per occupied nest and per successful nest, and the percentage of occupied nests that were successful. Regression analysis was conducted on the following parameters to check for overall trends over the ten-year period: number of occupied nests, number of successful nests, percentage of occupied nests that were successful, total number of young, average number of young per occupied nest and average number of young per successful nest.

Figure 2. Mary Lue Braun, Elaine Moore and Janice Arndt monitoring Ospreys at Longbeach, 9 km west of Balfour, BC. 28 May 2003 (Ben Braun). BC Photo 3463.

Beginning in 1998, the second year of this study, an additional visit was made to potential Osprey nest sites in late March or early April to record the frequency of use by Canada Geese (*Branta canadensis*). An Osprey nest was noted as being used by Canada Geese if a goose was present and in incubating posture. Goose occupancy was expressed as the percentage of potential Osprey nesting sites (*i.e.,* sites where Osprey nesting material remained from the previous season) that contained an incubating goose. Average number of young per occupied nest, average number of young per successful nest, and percentage of occupied nests that were successful were compared for nests used by geese versus all nests combined (1998-2006).

Basic data were submitted annually to the British Columbia Nest Record Scheme. Total monthly rainfall amounts from Castlegar Airport, available for 1997 through 2004, were examined and compared with 30-year normals for April through August (Environment Canada 2007a, 2007b). Relationships between monthly rainfall and productivity values (average young per occupied nest and average young per successful nest) were tested with Pearson correlation. Analyses were performed with Systat Version 10 and JMP IN Version 3.2.6.

Results

A total of 103 individual nest sites were used by Ospreys between 1997 and 2006; 84 (82%) were used more than once (Figure 3). Ninety-three (90%) of the sites were productive at least once. Although none were used every year, there were cases in which more than one platform was erected in close proximity (*e.g.,* two platforms on one wharf) and one or the other was used in all ten years.

Total number of occupied nests for the study area averaged 34 per year over the ten years. Highest number of occupied nests was 56 in 1998; the other nine years ranged from 21 to 42 (Figure 4). More occupied nests were found in the northern portion of

Figure 3. Incidence of nest reuse among West Kootenay Ospreys from 1997 to 2006.

the study area from Balfour to Nelson (19 nests per year on average and 60 nest-sites used in total) than the southern portion from Nelson to Waneta (15 nests per year and 41 total), despite the southern portion being considerably larger. Number of successful nests per year ranged from 10 to 53, averaging 25. Neither the number of occupied nests nor the number of successful nests changed significantly over the period of this study. Percentage of occupied

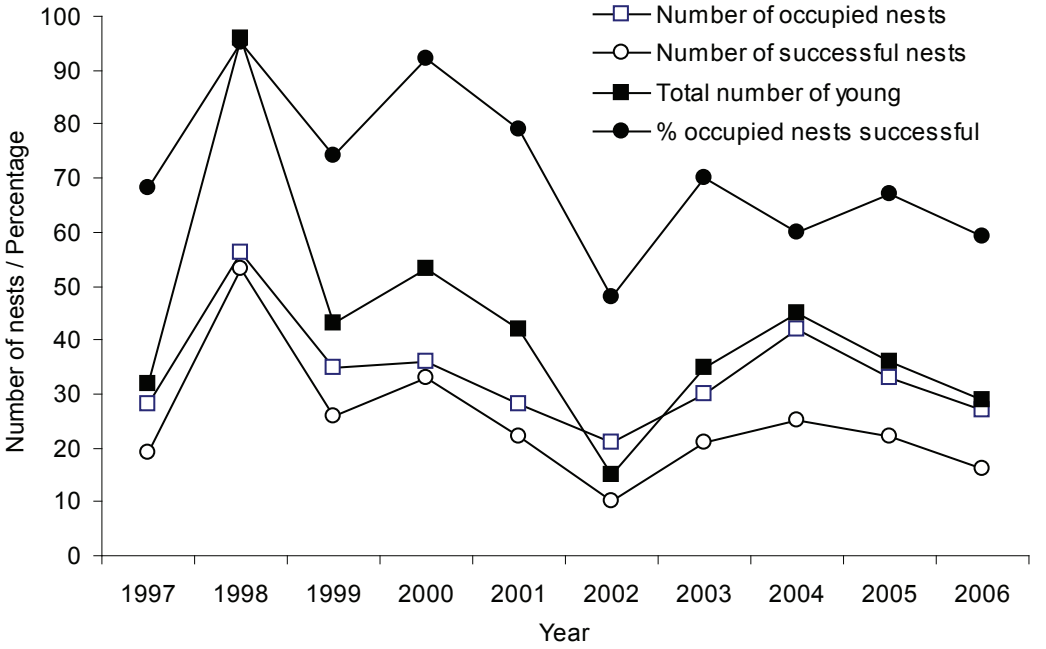

Figure 4. Osprey nesting success in the West Kootenay, BC, 1997-2006.

nests that produced young ranged from 48% to 95% and averaged 71%. Regression analysis revealed a marginally significant (p=0.09) decline in the percentage of successful nests per year. Number of successful outcomes totalled over all years was 248 of 336 attempts, or 74%.

Each year, more nest sites were available than were used, based on the number of sites that contained nest material. In most years fewer than 50% of potential nest sites were occupied; the maximum was 75%.

Total number of young present within the study area each year varied widely. Ninety-six chicks were counted in 1998 while only 15 were counted in 2002 (Figure 4). The average number of young present per year over the ten-year period was 43. The number of young per occupied nest averaged 1.22 per year, and ranged from 0.71 (2002) to 1.71 (2001; Figure 5). The number of young per productive nest averaged 1.71 per year, with a range of 1.50 in 2002 to 1.91 in 2001. There were no significant trends revealed by regression analysis for total number of young, number of young per occupied nest, or number of young per successful nest.

Information on Canada Goose use of Osprey nests was collected over nine years. Goose occupancy averaged 48% per year, ranging from 20% to 63%. Most years, about half of all potential Osprey nest sites hosted nesting Canada Geese. In most cases, Ospreys did not use these sites in the same season. However, 64% of all successful Osprey nests in 2005 had earlier been occupied by geese. In 83 instances where Osprey subsequently used the nests, 54 nests, or 65%, produced Osprey young. Average number of Osprey young per occupied nest for nests used by Canada Geese ranged from 0.67 to 2.00 and averaged 1.08 overall, compared to 1.22 for all nests combined over the same nine years. Average number of Osprey young per successful nest for nests used by Canada Geese ranged from 1.25 to 2.00 and averaged 1.68 overall, slightly less than the nine-year average of 1.71 for all nests combined.

Human-made structures were used as a base for 86% of successful nesting attempts over the ten-year

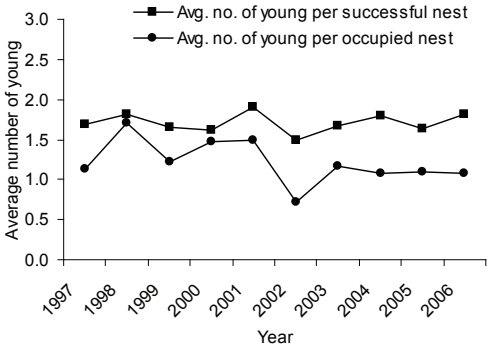

Figure 5. Average number of young Osprey in the West Kootenay, BC, 1997-2006.

period. Annual use of artificial nest sites ranged from 69% to 100% of successful pairs. Artificial sites included utility poles (tops or crossbars), transmission towers, single wooden pilings, piling bundles (Figure 6), metal poles, metal bars, bridges (Figure 7), hydro-electric dams, microwave towers and a gas pipeline tower. Structures erected specifically for Ospreys included wooden platforms, wire baskets and tires on top of pilings, poles or topped trees. As old channel markers, or dolphins, are updated along Kootenay Lake, their replacements are built to accommodate Osprey nests without compromising the effectiveness of the beacon (Figure 8). Natural sites consisted mostly of the broken tops of live or dead trees (Figure 9). While the majority of Ospreys in this region nest over the water or along the shoreline, some pairs nest further inland. The nest in Figure 9 is located in a logged area on a mountainside, more than one km from the West Arm of Kootenay Lake.

No significant negative correlations were apparent between monthly rainfall and nest success over the eight years for which data were available. There were positive correlations between some measures of breeding rates and rainfall amounts in April, June and July (Table 1). The wettest year, 1998, where rainfall for May through July was nearly double the 30-yr average, also showed the highest number of occupied nests, productive nests and young produced.

Figure 6. Osprey at a nest built on a bundle of pilings at Kokanee Landing, 11 km west of Balfour, BC. 13 June 2006 (Alistair Fraser; courtesy www.kootenay-lake.ca). BC Photo 3464.

Discussion

The number of occupied nests is likely very similar to the number of breeding pairs and therefore could be considered as an index of the size of the breeding population. While historical numbers of nesting Ospreys prior to the 1980s are not available, numbers from the northern portion of our study area can be compared with those of Steeger et al. (1992). They found 37 occupied nests in 1987 and 40 occupied nests in 1988 (Steeger et al. 1992). Their numbers included a nest at Crawford Bay plus all nests found by boat between Balfour and Nelson; some inland nests were likely missed (M. Machmer, pers. comm.). While our study did not include the Crawford Bay nest, it did include all

Figure 7. Osprey nest on a railway bridge at Waneta, BC. 12 August 2006 (Larry Prosser). BC Photo 3465.

Figure 8. Pair of Ospreys at a nest at Nine Mile Narrows, BC. The dolphins (channel markers) on Kootenay Lake are designed specifically to accommodate this species. 6 May 2005 (Alistair Fraser; www.courtesy kootenay-lake.ca). BC Photo 3466.

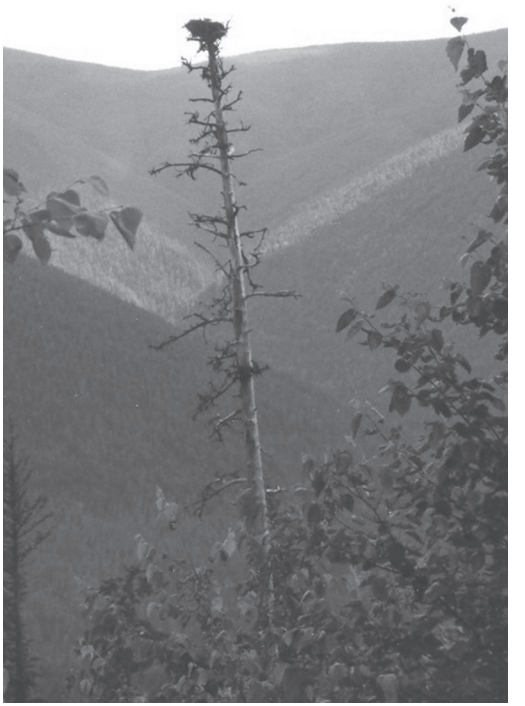

Figure 9. Osprey nest on a snag in a logged area near Redfish Creek, more than one km from Kootenay Lake, BC. 4 July 1998 (Emilee Fanjoy). BC Photo 3467.

known nests both near and away from the water and therefore likely provided more thorough coverage. Comparing the results from Steeger et al. (1992) with the present study would suggest that numbers of Osprey nesting in the Nelson area have declined since the late 1980s (Table 2). Comparing measures of breeding activity between the two studies would suggest that productivity (number of young per occupied nest and number of young per successful nest) may have also declined, while percentage of occupied nests producing young may have increased. These comparisons should be viewed with caution, however, because of differences in methodology between the two studies; for example, Steeger et al. (1992) climbed some nests to check actual contents

Table 1. Pearson correlation coefficients (*r*) and significance (*P*) of relationships between monthly rainfall amounts and measures of Osprey breeding success, 1997-2006.

Comparison	*r*	*P*
April rainfall and number of young per occupied nest	0.699	0.05
April rainfall and number of young per successful nest	0.640	0.09
May rainfall and number of successful nests	0.660	0.07
May rainfall and total number of young	0.666	0.07
July rainfall and number of successful nests	0.770	0.03
July rainfall and total number of young	0.785	0.02

(*i.e.,* number of eggs and young) and monitored these nests more frequently than we did.

Factors affecting Osprey populations and breeding rates have been identified in studies throughout the world. Numbers of Ospreys making breeding attempts in a given area are thought to be constrained primarily by nest-site availability (see discussion in Poole 1989). Recruits into the breeding population are generally younger where adequate nest sites are available; therefore, the population can grow more quickly, or sustain a lower productivity rate to maintain a stable population. Our observations suggest that the local Osprey population in the West Kootenay is not constrained by lack of nest sites, as there were many potential sites that remained unused each year. However, our study did not address nest-site quality which could provide more insight into this aspect of population regulation.

Osprey breeding rates may be influenced by prey availability, weather and nest initiation date (Poole et al. 2002). Prey availability was not addressed in this study. However, continued monitoring of the West Arm could soon reveal the potential effect of increased fish populations on Osprey breeding. Fertilization of the North Arm of Kootenay Lake to enhance fish stocks has been ongoing since 1992 (Ashley et al. 1997). South Arm fertilization was initiated in 2004, which may influence fish production in the West Arm (S. Arndt, pers. comm.).

High winds and rainfall have been found to affect hunting success of male Ospreys, though studies have not always found a corresponding decrease in provisioning rates to incubating females or chicks (*e.g.,* Machmer and Ydenberg 1990, Poole et al. 2002). Increased hunting effort in response to poor weather conditions sometimes results in adults remaining off the nest for longer periods, compromising survival of eggs or chicks when protection is most needed. During the period of the present study, higher monthly rainfall amounts in some years did not appear to have any negative impacts on breeding success. The positive correlation between rainfall and certain measures of breeding rate can not be easily explained and may warrant further study. Data on wind conditions during breeding were not available.

The influence of timing of clutch initiation was

Table 2. Comparison of Osprey breeding rates, 1987-1988 and 1997-2006, Balfour to Nelson.

Breeding parameter (average)	1987-1988[1]	1997-2006[2]
Number of occupied nests	39	19
Number of successful nests	25	15
Percent occupied nests that were successful	68	77
Number of young per occupied nest	1.5	1.33
Number of young per successful nest	2.2	1.74

[1] Steeger et al. (1992)

[2] present study.

studied in the Creston and Nelson areas by Steeger and Ydenberg (1993). Clutch size, brood size and number of fledglings all declined when egg-laying was delayed. Osprey pairs were at times delayed by the presence of Canada Geese early in the season. Some pairs avoided the delay by using an alternate nest (Steeger and Ydenberg 1993). Our study showed a high use of Osprey nests by geese in some years, with up to 63% of potential nest sites occupied by geese. Steeger and Ydenberg (1993) found goose occupancy rates of 42% to 54% in the Creston and Nelson areas from 1987 to 1989. In most years, Osprey appeared to avoid using nests that contained geese. In the present study, overall incidence of success for Ospreys using nests that had been occupied by geese in the same season was 65%, slightly lower than the overall success of all nesting attempts (74%). Productivity, measured both as average number of young per occupied nest and per successful nest, was slightly lower for goose-occupied nests than for all nests combined. Productivity values for goose-occupied nests had a wider range of yearly averages (*i.e.,* higher highs and lower lows) than did all nests combined, suggesting that goose occupancy has a greater impact in some years than others. Perhaps the geese, which are resident in the study area, initiate first clutches earlier in some years than others, reducing the degree to which Ospreys delay nesting in those years, but this needs further study.

Numerous studies have demonstrated that Osprey productivity is higher at artificial nest platforms compared to natural tree sites (see summary in Poole 1989). Reduced predation may be a factor, but the primary explanation seems to be their stability in the face of storms. The majority of Osprey pairs in our study use man-made structures to support their nests. Not all are platforms purposefully erected for this species, but sites include pilings, bridges and similar structures that would provide greater stability than trees. Shoreline development also likely contributes to the incidence of Ospreys using artificial nest supports as fewer natural sites are available close to water.

Results from various studies throughout the Osprey's range have shown that productivity rates of 0.80 to 1.30 young per active nest are required to maintain stable populations in a given region, with the actual value depending on factors such as annual survival and average age of first breeding (Poole et al. 2002). Although survival and age at first breeding are unknown for the West Kootenay Osprey population, the number of young per occupied nest in our study exceeds the upper estimate for the breeding rate required to maintain a stable population. Measures examined in this study, including numbers of occupied nests (or breeding pairs), total number of young produced, and number of young per successful nest, none of which declined significantly, also support our impression that this Osprey population has been relatively stable over the period of this study. Considering the relative ease with which this species can be observed and studied, and its role as an indicator of environmental health, monitoring should be continued and is expected to yield valuable information regarding Ospreys and their aquatic habitat.

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About the Authors

Janice is a birdwatcher and biologist living in Nelson with her husband, Steve, and their children, Justin and Bethany. She has also lived and worked in New Brunswick and Ontario. Janice joined the Osprey monitoring project in 2002.

Elaine has been birding for about 15 years and has happily taken part in many Christmas bird counts, waterfowl counts, and the annual Rhoads counts. She helped co-ordinate the Nelson Naturalists' winter bird count for several years and is one of the original members of this Osprey survey team.

Larry, a computer technician, is a new-comer to birding with seven years of birding experience. He is a bird data collector and a co-contributor to the British Columbia Nest Record Scheme and has participated in Christmas bird counts, waterfowl counts, and owl surveys. Larry has been a project member since 2000.

Rita, a bookkeeper and small business owner, has over 30 years of birding experience. She has participated in Christmas bird counts, owl surveys, waterfowl counts and breeding bird surveys. An avid collector of bird sightings data and an enthusiastic participant in the British Columbia Nest Record Scheme, Rita has been with the Osprey nest monitoring project since 1997 as the team co-ordinator and fundraiser.