# Field evaluation of a visual barrier to discourage gull nesting

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Expanding gull populations along the Columbia River have been implicated in depredations to threatened and endangered migrating salmon smolt. We tested a visual barrier made of woven black polypropylene fabric to discourage gull nesting. The barrier was installed on Upper Nelson Island, Benton County, Washington, in parallel rows spaced 5 m apart. Gulls used 87% of the 7.9 ha island as nesting habitat and we estimated >21 000 gull nests, 80% Ring-billed Gull *Larus delawarensis* and 20% California Gull *L. californicus* nests. The zone with fencing had 84% fewer nests than the control zone. Silt fencing showed potential as a nonlethal bird management technique.

Key words: California Gull, Endangered species, *Larus californicus*, *Larus delawarensis*, Nesting deterrent, Ring-billed Gull, Visual barrier.

## INTRODUCTION

RING-BILLED Gull *Larus delawarensis* and California Gull *L. californicus* populations have increased throughout the western United States in close association with human settlement (Conover 1983; Ryder 1993). On Upper Nelson Island in the Columbia River, the number of Ring-billed and California Gull nests increased from 4 600 in 1978 to 21 000 in 1999 (Thompson and Tabor 1981; Pochop, this manuscript). Agriculture and landfills provided food sources, and construction of reservoirs increased island nest sites for gulls (Ryder 1993). Gulls gather below hydroelectric facilities in the spring to feed on migrating juvenile salmonids (Steuber *et al.* 1995). Also, increased gull populations present bird-aircraft strike hazards, create nuizances and potential threats to public health, and damage cherry orchards (Greenhalgh 1952; Blokpoel and Strugger 1988; Blokpoel and Tessier 1992; Gabrey and Dolbeer 1996; Hatch 1996).

Chinook Salmon *Oncorhyncus tshawytscha*, Chum Salmon *O. keta*, and Sockeye Salmon *O. nerka* are listed as threatened or endangered in the Columbia and Snake Rivers by the National Marine Fisheries Service (Federal Register 1998, 1999). The disorientation and stunning from passing through turbines, combined with upwelling water, brings juvenile salmonids close to the surface where they are easily caught by gulls (Ruggerone 1986; Steuber *et al.* 1995). Below the Wanapum Dam, up to 2% of the spring migration was depredated, and the cumulative impact of gulls at the 13 dams along the Columbia and the Snake likely is substantial (Ruggerone 1986). Most salmonids taken by gulls were healthy, but some (17%) were killed or injured by the turbines (Ruggerone 1986; Steuber *et al.* 1995).

Management of gulls nesting on islands close to hatchery release points and dams may reduce their impact on migrating salmonids (York *et al.* 2000). Habitat modification is the best long term, most ecologically sound and socially acceptable solution for reducing nesting gull populations (Blokpoel and Tessier 1988). Ring-billed and California Gulls nest on the ground in open areas with low or sparse vegetation, probably to evade predators (Vermeer 1970; Ryder 1993). Established gull nesting colonies are difficult to disperse (Blokpoel and Tessier 1992) and damage vegetation by trampling and deposition of faeces (Hogg and Morton 1983). Interim solutions are needed to give vegetation time to recover. Here, we evaluated a visual barrier for reducing gull nesting on Upper Nelson Island.

## STUDY AREA

Upper Nelson Island (7.9 ha) is located in the Columbia River in Benton County, Washington (46°22'50"N, 119°15'05"W; 100 m asl). Thompson and Tabor (1981) discussed the climate and vegetative characteristics typical of islands in the Columbia River. Upper Nelson Island is located 0.5 km from the shoreline of Richland, Washington. Airports, food processing plants, restaurants, landfills and Ice Harbor Dam are within gull foraging distance of the island (25 km; Madenjian and Gabrey 1995). Upper Nelson Island serves as a nesting area for Ring-billed Gulls, California Gulls, and Canada Geese *Branta canadensis*.

## METHODS

We established a 70 × 70 m treatment zone and a 70 × 70 m control zone 30 March-1 April 1999 in the centre of the island where

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observations from 1998 indicated most gulls nested (P. Pochop, unpubl. data). We installed the barrier before gulls established nesting, because we felt that if nests already contained eggs or nestlings, the parents would be less likely to abandon the site and would act as decoys. The control zone was 15 m from the treatment zone and marked on its corners with T-posts. The treatment zone had 15 parallel rows of fencing spaced at 5–m intervals.

T-posts (168 cm height, 4 kg) and U-posts (152 cm height, 1 kg) were alternated every 3 m along each row of fencing to support the aircraft cable (3.2 mm diameter) to which the barrier material was attached. The barrier material was black woven polypropylene (90 cm height, 30 m length) attached with plastic cable ties.

We used a geographic positioning system (Geo Explorer II® by Trimble Inc., Sunnyvale, CA, USA), to collect data on the size of the island, size and location of control and treatment zones, and size and location of the Ring-billed and California Gull nesting areas. We monitored nesting activity on April 22 and May 18, 1999. These dates maximized the chance of recording all clutches laid (early and late) and were based on a 25-day incubation period for Ring-billed Gulls, a 27-day incubation period for California Gulls (Vermeer 1970), and previous nesting chronology of Upper Nelson Island gulls (P. Pochop, unpubl. data). More frequent nest checks might have disturbed nesting and biased our results. Randomly placed sample quadrats were installed April 1, 1999, inside and outside the control and treated zones to determine the number of nests in the zones and on the island. We attached a string (2.8 m length) to each quadrat centre and counted nests and eggs within nests inside the radius of the string. If the centre of a nest was inside the radius, the nest was counted.

We compared the mean nest density (number/quadrat) and clutch size between the treated and control zones with a two-factor repeated measures design in a mixed linear model analysis (McLean *et al.* 1991; Wolfinger *et al.* 1991), using SAS PROC MIXED, with a restricted maximum likelihood estimation procedure (REML) to perform the calculations (SAS Institute Inc., Cary, NC, USA). We repeated these calculations using only data from Ring-billed Gull nests because California Gulls did not nest in the control zone. The proportion of quadrats in each zone with and without nests was compared using Pearson's chi-square test. Ring-billed Gull clutch size distributions were compared between the treated and control zones using a Fisher's "Exact" Test to determine if there were differences due to age or body condition. The number of nests for each species was estimated by dividing the mean number of nests/quadrat by the size of the quadrat and multiplying by the size of the nesting colony that species occupied (minus the area of the control and treated zones). The estimate for the entire island was the total for both species and their respective occupancy of the control and treated zones.

## RESULTS

Gulls used 87% of Upper Nelson Island as nesting habitat. The treated and control zones occupied about 12.3% of the gull nesting habitat. We estimated 21 049 (SE = 5 769) gull nests on the island. About 80% were Ring-billed Gulls, but Ring-bills only occupied 38% of the nesting territory with California Gulls accounting for the rest.

For all gulls, there was a strong interaction ($F_{1,22}$ = 15.71, $P$ = 0.01) between treatment and time, as the mean number of nests per quadrat increased from 2.92 to 10.08 in the control zone while it stayed the same (1.50) in the treated zone. Mean clutch size per quadrat was not found to be influenced by treatment, but it increased over time ($F_{1,36}$ = 239.69, $P$ = 0.01). No differences were observed in the number of quadrats without nests in treated and control zones ($\chi^2_1$ = 2.27, $P$ = 0.132).

For the Ring-billed Gull data, there was no interaction, but the mean number of nests increased between observation periods ($F_{1,13}$ = 6.96, $P$ = 0.02). Mean clutch size was not found to be influenced by treatment, but it increased over time ($F_{1,23}$ = 209.79, $P$ = 0.01). There was some indication of a difference in clutch size distribution for Ring-billed Gulls in control and treated zones, where one, two and three egg clutches in the control zone had at least 10 times the number of eggs as the treated zone and the treated zone had no four egg clutches (Fisher's Exact Test, $P$ = 0.085).

## DISCUSSION

On Upper Nelson Island, the treated zone occupied about 6.1% of the gull nesting habitat. We observed that Ring-billed Gulls moved their nesting colony in response to the treated zone and created two smaller satellite colonies in less suitable habitat (areas below the high water line where birds were not observed nesting in 1998). On islands in Miquelon Lake, Alberta, Canada, Ring-billed Gulls preferred to nest farther from water in flatter areas (Vermeer 1970). Conover and Miller (1978) showed that Ring-billed Gulls change the shape and location of their colony in response to predation or disturbances. We believe the behaviour of the Ring-billed Gulls in our study was a response to the barrier and to interactions with California Gulls. California Gulls are dominant to Ring-billed Gulls (Vermeer 1970) and they may have forced Ring-billed Gulls to use less desirable nesting sites. While we observed an overall treatment effect in this study, we were unable to determine the effects of the barrier on California Gulls because none chose to nest in the control zone. Further, the amount of nesting territory covered by the treatment might affect the gulls' response to it. Additional studies where greater percentages of the nesting area of a gull colony are covered with visual barriers would provide information on how much of an island would need to be covered to prevent gull nesting. Perhaps blocking visual contact with the main colony also would further deter nesting. We observed that Ring-billed and California Gulls nested outside of the treated zone right up against the last row of the barrier, indicating that an individual row of barrier would probably have little to no impact on gull nesting.

We installed 1 050 m of barrier to treat the 70 × 70 m area at a cost of $1,900.00 U.S. ($1.81/m). It took 147 person-hrs over three days to install the barrier and 18 hrs over one day to take down everything except the posts. This design withstood wind speeds of up to 17 mph (min. 2.21, max. 17.70, $\bar{X} = 8.08$, SE = 0.40, n = 73) and gusts of up to 38 mph (min. 16.11, max. 37.98, $\bar{X} = 25.71$, SE = 0.90, n = 41) with no maintenance for 2.5 months (The Weather Underground, Inc. at www.wunderground.com).

Silt fencing is a non-lethal method and as with other non-lethal methods, the birds will be displaced to sites where their activities could create new or similar problems. One potential resolution to this is to develop a mitigated site in an area to which the problem gulls could move. Visual barriers have potential as a tool for managing gull impacts on endangered migrating salmon smolt and should be further evaluated as a nesting deterrent.

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BOOK REVIEWS

# Preserving Wildlife: An International Perspective

**Mark. A. Michael, 2000.**
**Humanity Books, New York.**
**307 pp. ISBN 1-57392-727-9.**
**RRP AUD$63.**

NADIA ELIZABETH TAPP[1]

PRESERVING *Wildlife: An International Perspective* is an anthology of twenty papers exploring the issues related to the preservation of wildlife, with an emphasis on related management approaches. This topic is introduced philosophically with a discussion of moral values associated with human activities. Sport hunting, the medical aid of injured wild animals and the manipulation of wildlife during ecological field studies are discussed within this context. The focus then shifts to a selection of wildlife management strategies including habitat protection, captive breeding, culling of non-native species, eco-tourism and marketing of wildlife products.

Examples of successes and failures are used to stress the necessity for independent treatment of each wildlife preservation situation, in terms of possible management strategies. For instance, a significant part of this book is dedicated to emphasizing that Western methods of wildlife conservation are often unsuitable and ineffective in less developed countries. No attempt is made to cover all possible solutions or management options available to the discussed examples. Rather, the book encourages readers to think about wildlife preservation and to question the morality and efficacy of commonly accepted management approaches.

Although most of the articles are extracted from professional journals, technical terms are kept to a minimum. As a result, the subject matter should attract a wide audience. It will appeal to anyone who is concerned about the preservation of wildlife, but equally will arouse the interest of those with little understanding of these issues.

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# The Directory of Australian Birds: Passerines

**R. Schodde and I. Mason, 1999.**
**CSIRO Publishing, Collingwood, Vic., Australia**
**800 pp., Hardback**
**ISBN 0 643 06456 7**
**RRP USD$180.00**

HARRY RECHER[1]

THIS large, expensive and beautifully produced volume arrived on my desk in October 1999. There it has sat while I awaited it to be reviewed elsewhere. My intention was, and is, to not only review the book, but to review the reviews. I now have reviews by Allan Burbidge and John Blyth (*Western Australian Bird Notes* **95:** 3–5), Walter Boles (*Australian Zoologist*, in press), W. (Ted) Davis (*The Wilson Bulletin*, in press), Stephen Debus (*Australian Bird Watcher* **18:** 320–321), Ned Johnson (*The Condor* **103:** 200), and Allen Keast (*Emu* **100:** 341–2). Of these, Boles, Johnson and Keast are recognised avian systematists, while Burbidge, Blyth, Davis and Debus, as I am, are just plain old ornithologists. I say this because an Australian avian systematist once told me that I had no right to comment on the names of Australian birds because I was only an ecologist, but that has never stopped me before and will not now, and it appears that I am in good company.

The *Directory* is basically a book of names for Australian passerines with two more volumes in preparation to cover the remainder of the avifauna. It is nice to see somebody start with the passerines for a change so, if the remaining volumes are not forthcoming, the most interesting birds in Australia have been dealt with. How many "handbooks" begin with the non-passerines and the authors never live long enough, or the money runs out, to complete the passerines? By profession, if not nature, systematists seem to have a very ordered approach to their publications — begin at the beginning, end at the end.

The reviews of the *Directory* have been uniformly positive, even glowing. Davis describes it as an "important book" and points out that it is the first attempt since Mathews 100 years ago to deal with the taxonomy of Australian birds at the subspecies level. Johnson commends Schodde and Mason for respecting the work of others (is this not normal in taxonomy?) and considers the work "admirable", the authors "bold" and the work "scholarly" and "sophisticated". Debus also thinks the effort is "scholarly" and that it is "state of the art" taxonomy. Burbidge and Blyth are of the opinion that this "is an important document". Like Johnson, Keast appreciates the generosity of Schodde and Mason "in giving credit to their predecessors" (maybe taxonomists don't normally do this) and says "*The Directory* is to be admired". Boles tends to sidestep the praise and says only that the aims of the work are "highly commendable". As an ecologist who simply studies birds, even I am impressed and

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