

# Pacific Great Blue Heron Population and Monitoring Vancouver Island and the Gulf Islands 2005



*Photo: Trudy Chatwin*

by  
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## SUMMARY

During the 2005 breeding season, the British Columbia Ministry of Environment inventoried Pacific Great Blue Heron (*Herodias ardea fannini*) nest sites on Vancouver Island. Most of this work was conducted between March and September by Ministry staff and volunteers from TimberWest, Nanaimo & Area Land Trust, and the public. Data was collected from 52 sites, 12 of which had not been documented previously. In total, 790 nests, including 648 active nests, were documented in 34 active colonies. Differences in the number of active nests each year on Vancouver Island from 1997 to 2005 were not statistically significant. In 2005, half of the active colonies (17 of 34) failed completely; at least 5 failures were due to predation by Bald Eagles. The size of failed colonies was significant: 94% of failed colonies were small (<25 nests), and of the 5 colonies that failed due to Bald Eagle predation, 4 were small. To our knowledge, all colonies north of Nanoose Bay failed and were small. In addition to overall colony success, we monitored 253 nests at sites selected for visibility. Of the successful nests monitored, 122 nests fledged 196 young, yielding a productivity of 1.61 for successful nests, whereas the productivity for all initiated nests (including failed nests) was only 0.78. Although productivity was lower in 2005 than in 2004, the difference in yearly productivity from 2002 to 2005 was not statistically significant.

The continuing low productivity and high rates of colony failure suggest future population declines. Management issues, including housing developments and tree cutting, are ongoing concerns in this fast-urbanizing area. The low productivity, especially in the northern part of their range, combined with the development pressures, makes Great Blue Herons a priority for ongoing protection and monitoring.

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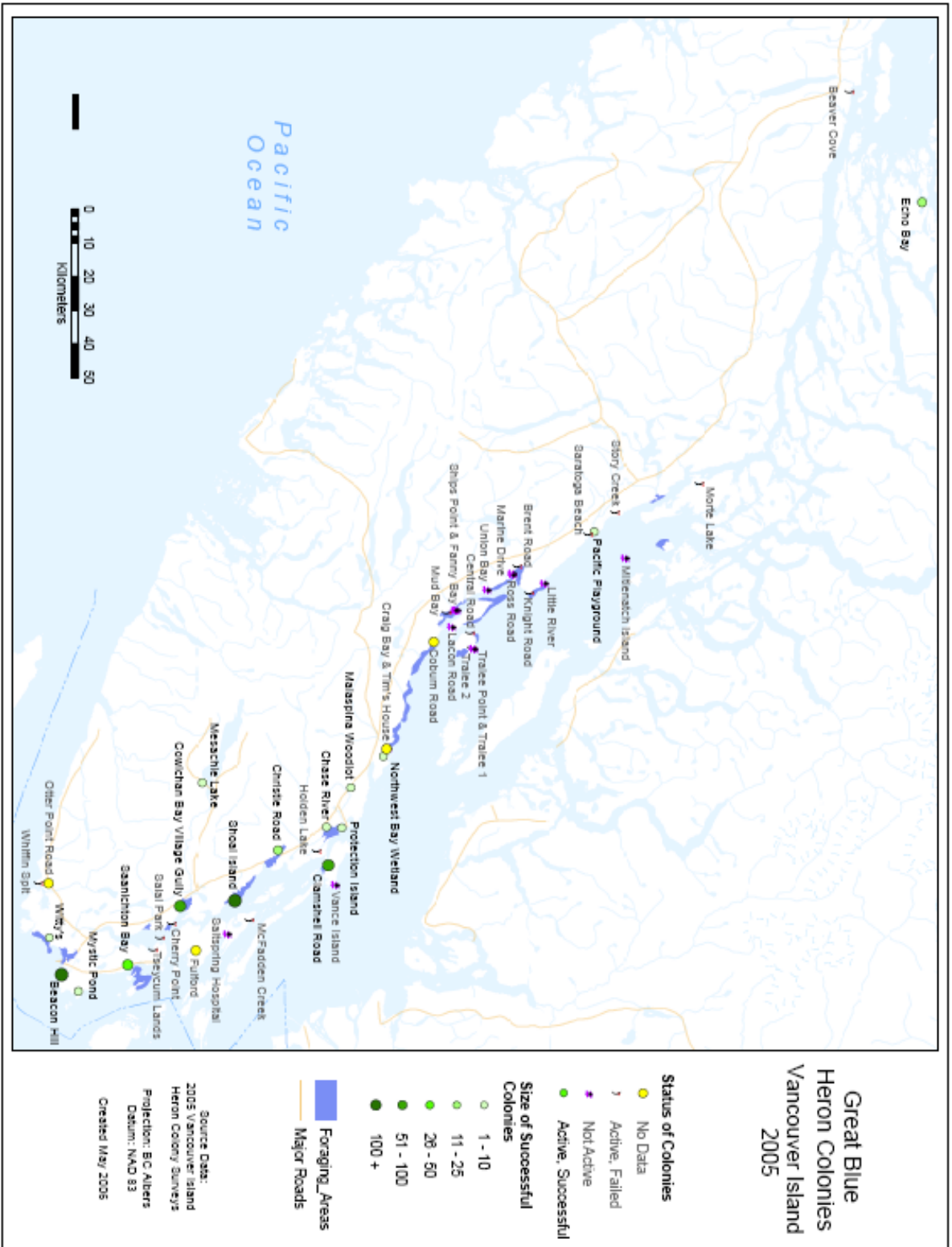


Figure 1. Pacific Great Blue Heron breeding colonies inventoried in 2005 in Region 1 (Vancouver Island and Gulf Islands, B.C.).

## 1. INTRODUCTION

The Great Blue Heron (*Ardea herodias*) is the largest of the North American wading birds (Butler 1997). Up to five subspecies of Great Blue Heron are recognized, two subspecies are found in British Columbia: *A. herodias herodias*, which tends to be an inland continental subspecies, and *A. herodias fannini*, which is a coastal subspecies (Butler 1997). *A. herodias fannini*, the Pacific Great Blue Heron, is less migratory than *A. herodias herodias* and is described as both smaller and darker. It is found along the Pacific Northwest coast from Alaska to Washington (Butler 1997). Pacific Great Blue Herons breed in forests within 5 to 10 km of their coastal foraging areas and these habitats are being lost to land cleared for urban development and forest harvesting (Butler 1997; Gebauer and Moul 2001). As well, an increasing human population (Moore 1990) and rebounding Bald Eagle (*Haliaeetus leucocephalus*) populations (Elliott and Harris 2001) within the study area appear to be linked to increased disturbance levels and high predation rates at breeding colonies and foraging grounds (Butler 1997; Gebauer and Moul 2001; McClaren 2005 Vennesland and Butler 2004). Critical marine foraging grounds are also threatened by development and contamination.

Since 1997, COSEWIC (Committee on the Status of Endangered Wildlife in Canada) has designated the Pacific Great Blue Heron as a species of special concern, and this subspecies has also been placed on the British Columbia provincial blue list. Its nests, eggs, young, and adults are protected by both the federal *Migratory Birds Convention Act* and the *Wildlife Act* of B.C. In addition,

Section 34 of the *Wildlife Act* protects the nest tree of Great Blue Heron.

Population trends for the Great Blue Heron are unclear because historical data on colony size, breeding activity, nesting success, and productivity were collected using non-standardized methods and variable effort (Dodd and Murphy 1995; Gebauer and Moul 2001). However, some data suggest breeding population numbers are declining (Downes and Collins 1996; Butler 1997; Gebauer and Moul 2001; Vennesland 2003). Productivity (number of nestlings per nest) on Vancouver Island was lower in 2002, 2003, and 2004 than numbers reported in other North American studies (McClaren 2005).

This report will focus on the 2005 nesting survey data for Vancouver Island and the Gulf Islands (Region 1).

Inventory objectives for 2005 were:

- To determine breeding activity at heron colonies that were active within the last three years within the Strait of Georgia, British Columbia.
- To track the fate of sampled nests, where possible, within active colonies throughout the breeding season to determine success rates and number of young fledged.
- To locate unknown heron colonies through tips from the public, landowners, biologists, and an educational heron poster campaign.
- To work with landowners, municipal and regional governments, developers, non-profit organizations,

First Nations, and the Heron Working Group to promote stewardship through education and involvement in the project.

## **2. METHODS**

### **2.1 Study Area**

Data was collected from 52 heron colonies located within the Strait of Georgia (Region 1, Vancouver Island and Gulf Islands). The most southerly colony was at 10U/472878E/5362368N, in Victoria, and the most northerly was at 10U/676974E/5625012N, on the Mainland at Echo Bay. Locations of Pacific Great Blue Heron colonies are shown in Figure 1.

### **2.2 Nest Site Inventory and Monitoring**

We collected data using standardized methodologies as described by the Resources Information Standards Committee (RISC 1998) and Vennesland and Norman (2006). Data collected during nesting site surveys included location, total number of nests, number of active nests, activity at nest, failed nests, number of young, age of young, number of young fledged, number of successful nests, and evidence of predation. Surveys were conducted by Trudy Chatwin with assistance of summer students, volunteers, landowners, TimberWest employees, and Nanaimo & Area Land Trust staff.

In March and April 2005, volunteers did a preliminary check for early nesting-season activity at colonies that had been active in the previous three years. We then conducted field surveys of nesting sites from April to

September 2005 and collected data from 47 locations. Permission from the landowner was requested for colonies located on private land. Each location was visited at least once, with some locations being visited up to five times during the 2005 nesting season. Sixty-six visits were conducted to 47 different sites in 2005; 36 sites were visited only once, eight sites were visited 2–3 times, and three sites were visited 4–5 times.

Colonies were classified as active successful, active failed, not active, or no data. A colony was considered successful if any young fledged. Young aged 4 to 8 weeks were counted as fledged (McClaren 2005).

Nests were classified as successful or failed; a failed nest had been active during some part of 2005 but did not fledge young. A successful nest had fledged young. A nest was considered Active if one or more of the following criteria were met: adults were seen incubating; young were observed within the nest; large amounts of excrement or fresh eggshells were found below the nest.

To facilitate counts of active nests, nesting trees were marked with flagging tape and numbered. This was done in late May, June, and July to minimize disturbance to the birds.

Predation evidence included reports of Bald Eagles and other predators, the finding of destroyed eggs, dead young, or adults.

For most colonies, low numbers of visits, lack of visibility, re-nesting, and movement of chicks made it difficult to determine

accurate productivity estimates. However, nests at Beacon Hill Park are visible from Rhiannon Hamdi's apartment, and a sketch was made of 30 visible nests. Rhiannon Hamdi was then able to monitor the nests for productivity using standard methodology. For two small colonies, Protection Island and Whiffin Spit, it was relatively easy to determine the fate of the chicks—and thus productivity—because all the nests were visible.

## **2.3 Data Analysis**

Summary statistics for colony success and nest success were calculated in Microsoft Excel 2003. Colony activity, colony success, and colony success by size were analyzed in S-PLUS 7.0 for Windows (Insightful Corporation, Seattle, WA).

### **2.3.1 Colony Success**

To determine the proportion of successful colonies, we divided the number of successful colonies by the number of active colonies. We also compared the distribution of active successful colonies with active failed colonies using the nonparametric Wilcoxon rank sum test to determine if smaller colonies were more vulnerable to failure.

### **2.3.2 Nest Success**

To determine the mean number of fledglings per active nest, the sum of fledglings per active nest was divided by the total number of active nests. The mean number of

fledglings produced per successful nest was calculated as the sum of fledglings per successful nest divided by the total number of successful nests sampled. The nest failure rate was calculated as the sum of sampled nests that failed to produce fledglings divided by the sum of active sampled nests.

### **2.3.3 Active Nests Compared to Other Years**

Regression methods were used to establish if any increasing or decreasing linear trend existed in the number of active nests from 1997 to 2005.

### **2.3.4 Colony and Nest Success Compared to Other Years**

Colony success and nest success rates from 2002 to 2005 were compared using a chi-square test to compare differences in the probability of success across years.

## **3. RESULTS**

Inventory results are listed in Table 1.

### **3.1 Colony Activity and Success**

Of the colonies active in 2004, nine colonies (Drinkwater Road, Shorewood Drive, Craig Bay, Pym Road, Tralee 1, Fanny Bay, Marine Drive, Lacon Road, and Robertson Road) were not active in 2005. There was evidence of eagle predation at eight of these colonies (89%) in 2004.

**Table 1. Region 1 (Vancouver Island and Gulf Islands) Pacific Blue Heron Breeding Colonies inventoried in 2005. Colonies first inventoried in 2005 are in bold. Status of colony: ND = no data; AS=Active Successful (at least 1 nest successful), AF=Active Failed, NA=Not Active, A/ND=Active, success not determined.**

Colony ID	Colony Name	Total Number of Nests	No. Active Nests	No. sampled Nests	No. Initiated Nests	No. Successful Nests	Number of Fledglings	Productivity/ Initiated Nests	Productivity/ Successful Nests	Visits	Failed Site	Status of Colony	Evidence of Predation
H101-001	Beacon Hill	103	103	30	30	19	44	1.47	2.32	4	–	AS	1
H101-005	McFadden Creek	0	–	–	–	0	–	–	–	–	1	AF	–
H101-010	Mystic Pond	11	10	1	–	1	1	–	1.00	1	–	AS	–
H101-026	Saanichton Bay	33	33	0	–	–	–	–	–	1	–	AS	–
H101-031	Vance Island	3	0	0	0	0	–	–	–	1	1	NA	–
H101-032	Clamshell	85	84	22	–	22	35	–	1.59	3	–	AS	1
H101-034	Saltspring Hospital	0	0	0	0	0	–	–	–	1	–	NA	–
H101-035	Tseycum Lands	2	2	0	0	0	–	–	–	1	1	AF	–
<b>H101-036</b>	<b>Witty's</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>5</b>	<b>2.50</b>	<b>2.50</b>	<b>1</b>	–	<b>AS</b>	–
<b>H101-037</b>	<b>Fulford</b>	<b>8</b>	<b>1</b>	<b>0</b>	–	–	–	–	–	<b>1</b>	–	<b>ND</b>	–
<b>H101-038</b>	<b>Salal Park</b>	<b>11</b>	<b>11</b>	<b>11</b>	–	<b>0</b>	<b>0</b>	<b>0.00</b>	<b>0.00</b>	<b>1</b>	<b>1</b>	<b>AF</b>	<b>1</b>
H102-001	Whiffin Spit	2	2	2	0	0	0	0.00	0.00	1	1	AF	–
H102-009	Cowichan Bay	75	63	5	5	2	7	1.40	3.50	2	–	AS	–
H102-005	Cherry Point	8	5	5	–	0	0	0.00	0.00	2	1	AF	1
<b>H102-010</b>	<b>Otter Point Rd.</b>	<b>7</b>	<b>7</b>	<b>0</b>	–	–	–	–	–	<b>1</b>	–	<b>ND</b>	–
H104-001	Quamichan Lake	–	–	0	0	0	–	–	–	–	–	ND	–
H104-011	Skutz Falls	2	0	0	0	0	–	–	–	1	–	NA	–
H104-012	Mesachie Lake	1	1	1	1	1	2	2.00	2.00	1	–	AS	–
H105-001	Shoal Island	153	144	27	–	27	55	–	2.04	5	–	AS	–
H105-002	Holden Lake	22	11	11	ND	0	0	0.00	0.00	2	1	AF	1
H105-007	Protection Island	6	6	6	6	5	8	1.33	1.60	4	–	AS	–
H105-027	Northwest Bay Wetland	28	28	18	–	11	18	1.00	1.64	2	–	AS	–
H105-032	Craig Bay	10	0	0	–	0	0	–	–	1	–	NA	–
H105-033	Christie Road	24	23	11	–	11	19	–	1.73	2	–	AS	–

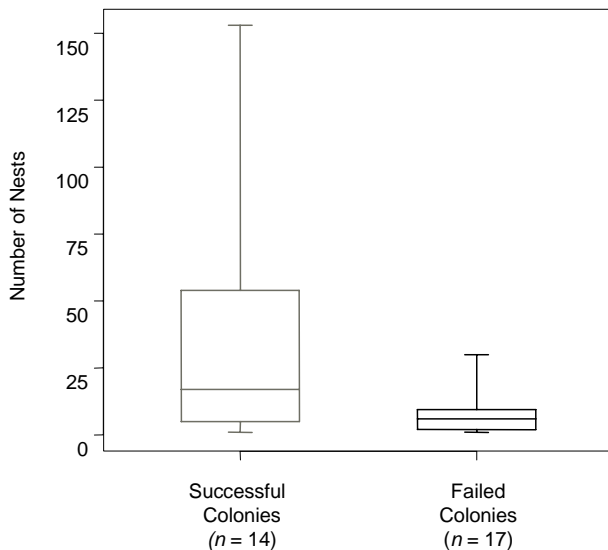
Colony ID	Colony Name	Total Number of Nests	No. Active Nests	No. sampled Nests	No. Initiated Nests	No. Successful Nests	Number of Fledglings	Productivity/ Initiated Nests	Productivity/ Successful Nests	Visits	Failed Site	Status of Colony	Evidence of Predation
H105-035	Malaspina Woodlot	ND	3	3	–	–	–	–	–	2	–	AS	–
<b>H105-037</b>	<b>Chase River</b>	<b>8</b>	<b>8</b>	<b>8</b>	–	<b>5</b>	–	–	<b>0.00</b>	<b>1</b>	–	<b>AS</b>	–
<b>H105-038</b>	<b>Tims House</b>	<b>4</b>	<b>4</b>	<b>4</b>	–	–	–	–	–	<b>1</b>	–	<b>A/ND</b>	–
H106-006	Tralee 1	–	–	–	–	–	–	–	–	–	–	NA	–
H106-007	Tralee 2	7	6	6	–	–	0	0.00	0.00	1	1	AF	–
H106-008	Tralee point	–	–	–	–	–	–	–	–	1	–	NA	–
H106-009	Fanny Bay	6	0	–	–	–	–	–	–	1	–	NA	–
H106-012	Union Bay	1	–	0	–	0	–	–	–	1	–	NA	–
H106-013	Little River	7	–	0	–	0	–	–	–	1	–	NA	–
H106-014	Ross Road	2	–	0	–	0	–	–	–	1	–	NA	–
H106-031	Marine Drive	13	–	0	–	0	–	–	–	1	–	NA	–
H106-033	Saratoga Beach	12	10	10	–	0	–	0.00	0.00	1	1	AF	–
H106-034	Ships Point	0	–	0	–	0	–	–	–	1	–	NA	–
H106-035	Central Road	5	5	5	–	0	0	0.00	0.00	1	1	AF	–
H106-036	Lacon Road	12	0	0	–	0	0	–	–	1	–	NA	–
H106-038	Twillingate Road	–	–	–	–	–	–	–	–	1	–	ND	–
<b>H106-040</b>	<b>Mud Bay</b>	<b>8</b>	<b>8</b>	<b>8</b>	–	<b>0</b>	<b>0</b>	<b>0.00</b>	<b>0.00</b>	<b>1</b>	<b>1</b>	<b>AF</b>	–
<b>H106-041</b>	<b>Knight Road</b>	<b>30</b>	<b>30</b>	<b>30</b>	–	<b>0</b>	<b>0</b>	<b>0.00</b>	<b>0.00</b>	<b>1</b>	<b>1</b>	<b>AF</b>	<b>1</b>
<b>H106-042</b>	<b>Pacific Playground</b>	<b>3</b>	<b>3</b>	<b>3</b>	–	<b>1</b>	<b>2</b>	–	<b>2.00</b>	<b>1</b>	–	<b>AS</b>	–
<b>H106-043</b>	<b>Coburn Rd</b>	<b>31</b>	–	–	–	–	–	–	–	<b>1</b>	–	<b>A/ND</b>	<b>1</b>
<b>H106-044</b>	<b>Brent Road</b>	<b>1</b>	<b>1</b>	<b>1</b>	–	–	–	<b>0.00</b>	<b>0.00</b>	<b>1</b>	–	<b>AF</b>	–
<b>H110-006</b>	<b>Beaver Cove</b>	<b>6</b>	<b>1</b>	<b>1</b>	–	–	–	<b>0.00</b>	<b>0.00</b>	<b>1</b>	–	<b>AF</b>	–
<b>H110-007</b>	<b>Story Creek</b>	<b>4</b>	<b>0</b>	<b>0</b>	–	<b>0</b>	–	<b>0.00</b>	<b>0.00</b>	<b>1</b>	–	<b>AF</b>	–
H114-002	Echo Bay	17	17	17	–	15	–	–	–	2	–	AS	–
H115-010	Cortes Island	5	5	5	5	0	0	0.00	0.00	1	1	AF	–
H115-013	Schooner Road	ND	–	–	–	–	–	–	–	–	1	AF?	–
H115-017	Middlenach Isl.	ND	0	–	–	–	–	–	–	–	–	NA	–
<b>H115-019</b>	<b>Morte Lake</b>	<b>11</b>	<b>11</b>	<b>0</b>	–	<b>0</b>	–	–	–	<b>1</b>	<b>1</b>	<b>AF</b>	<b>1</b>

Colony ID	Colony Name	Total Number of Nests	No. Active Nests	No. sampled Nests	No. Initiated Nests	No. Successful Nests	Number of Fledglings	Productivity/ Initiated Nests	Productivity/ Successful Nests	Visits	Failed Site	Status of Colony	Evidence of Predation
<b>SUMMARY</b>		<b>790</b>	<b>648</b>	<b>253</b>	<b>49</b>	<b>122</b>	<b>196</b>	<b>1.49</b>	<b>1.61</b>	<b>66</b>	<b>15</b>	<b>AS=15</b>	<b>8</b>

In 2005, we counted 34 active colonies; of these, 14 were successful (41%), 17 failed (50%), and 3 were not determined. Twelve of the active colonies were new. Active colonies were grouped by the number of active nests: small colonies (<25 nests), medium-sized colonies (25–99 nests), and large colonies (>100 nests). Where the colony size was determined, most colonies were small (24 of 32, or 75%); 6 were medium-sized (19%), and only 2 were large (6%). Of the 16 failed colonies where size was known, 15 were small and only 1 was medium-sized.

All sites found to be inactive during the 2005 nesting season were small. The mean colony size of the active failed colonies was  $7.1 \pm 4.0$  nests.

We used a Wilcoxon rank sum test to determine whether small colonies were more vulnerable to failure. We found that small colonies were significantly more likely to fail than large colonies ( $p = 0.042$ ; Figure 2).



**Figure 2. Size of active successful colonies and active failed colonies, 2005.**

Colony success rates for 2002 through 2005 were 35%, 86%, 53%, 33%, respectively. Colony success rates were higher in 2003 and 2004, but significantly higher only when 2003 was compared with 2002 and 2005 ( $p < 0.001$ ; Figure 3).

### 3.2 Nest Site Activity

Of the 790 heron nests surveyed, 648 were considered active. The median number of active nests in a colony was 17 (interquartile range: 5, 53).

#### 3.2.1 Active Nests and Colonies Compared to Other Years

Differences in the number of active nests each year from 1997 to 2005 were not statistically significant ( $p = 0.073$ ), but there was a nearly significant increase in the number of active colonies on Vancouver Island from 1997 to 2005. We observed a mean increase of 1.9 active colonies per year (95% C.I. [0.3, 3.5];  $p = 0.051$ ; Figure 4).

### 3.2.2 Nest Site Productivity and Success

Of the 253 sampled nests, 122 successful nests were documented (48%), producing 196 young surviving to at least 4 weeks of age. The mean productivity per active nest and the mean number of young fledged per successful nest were 0.78 and 1.61, respectively.

### 3.2.3 Nest Productivity Compared to Other Years

The proportion of successful nests to active nests was highest in 2004. The proportion of successful nests for 2004 was significantly different from all other years tested (2002 = 41%, 2003 = 37%, 2004 = 71%, 2005 = 48%;  $p < 0.001$ ; Figure 5).

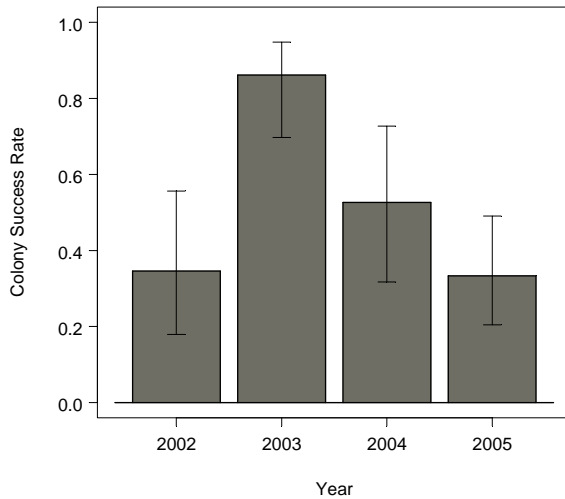


Figure 3: Colony success rates, 2002 to 2005.

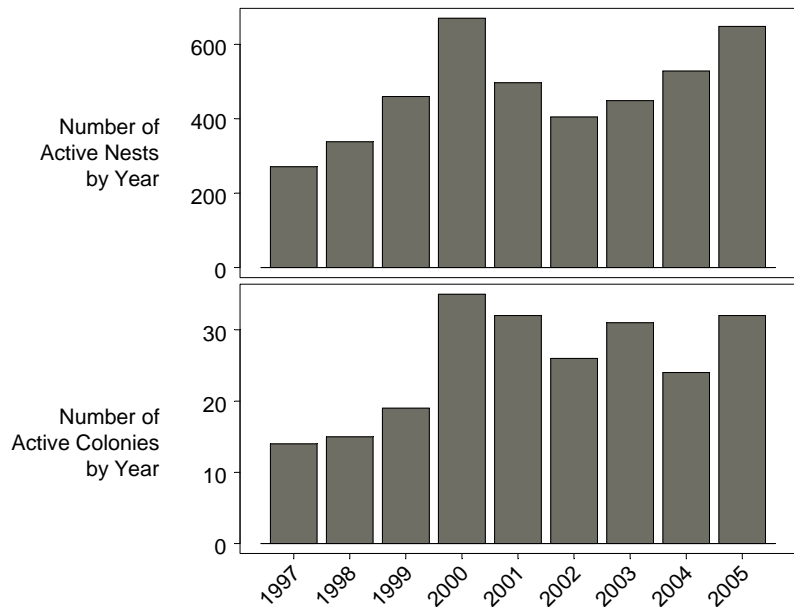


Figure 4. Number of active nests and active colonies, 1997 to 2005.

### 3.3 Predation

The predation of eggs, young, and adult herons was documented at 8 nesting sites; 5 sites failed completely due to predation. The Bald Eagle was identified as the predator at all sites, although Barred Owls were considered a possibility at the Holden Lake colony.

## 4.0 DISCUSSION

### 4.1 Colonies and Active Nests

Since 1997, the total number of active heron nests on Vancouver Island has fluctuated but has not changed significantly. However, the number of active colonies documented appears to be higher in 2005 than it was in 1997, possible due to increased survey effort. Fluctuations in the number of active colonies and nests could reflect the difficulty of monitoring colonies that are constantly changing locations, which is common in the northern range of Great Blue Herons.

The colony failure rate was high in 2005 because most colonies were small and this made them more vulnerable to disturbance and predation by

Bald Eagles. All failed colonies except one were small (mean size, 7.1). We suspect that only one colony failure was not due to Bald Eagle predation, although clear evidence of predation was documented at only five colonies. The colony failure not related to eagle predation was caused by adjacent tree cutting that resulted in parents abandoning the young chicks.

Colony failure was greatest at the northern extent of the herons' range where colonies were small and predation pressure high. No successful colonies were found north of Nanoose Bay. The higher predation pressure in this area might be related to a northern shift in herring spawning, which now occurs north of Nanoose Bay. This might have increased eagle density in the area, with more of the immature or un-mated eagles that predate herons and their eggs. The problem is exacerbated by habitat loss due to rapid development. The failure of northern colonies could result in a decreased range for the Great Blue Heron.

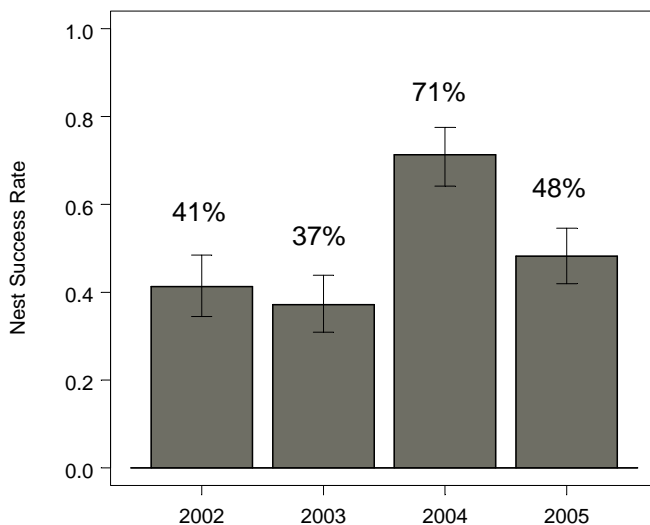


Figure 5. Success rate of active nests, 2002 to 2005.

## 4.2 Nest Productivity

Productivity for both active nests and successful nests was low. The most productive sites were the largest colonies, while small colonies had the lowest productivity. However, even in the large colonies, productivity averaged only two chicks per sampled nest.

## 4.3 Stewardship

In 2005, Nanaimo & Area Land Trust (NALT), a local conservation organization, was contacted to initiate stewardship of three large heron colonies deemed to be most critical to protect: Holden Lake, Shoal Islands, and Clamshell Road.

Work began with the Holden Lake colony where owners investigated the idea of placing a conservation covenant on part of the property. The proposed covenant contained the heron colony and a buffer of approximately 50 m. One co-owner agreed to the idea of a covenant and the other did not. A stewardship agreement was then suggested as a non-legally binding agreement to protect the colony. Further family discussion was triggered regarding the estate planning of the primary owner and the property in question. At this point, the family decided not to sign a stewardship agreement and felt strongly that both the herons and the habitat would be well looked after while the property remained in their ownership.

The second colony approached for stewardship was at Shoal Island. This colony is located on two islets in a series controlled by Norske Canada in the Chemainus River estuary adjacent to the Norske Canada log storage area. The Norske representative, Michelle Vessey, was contacted and provided with an information package about herons and conservation tools, including conservation covenants. At the time of writing, Norske is examining their options for protecting the colony.

The third colony approached for stewardship was the Clamshell Road colony on Gabriola Island. The property is owned by two generations of a family, both of which live in other regions of BC and have no interest in ever living on the property. Contact regarding this heron colony triggered family discussion around estate planning and possible sale of the property. Gabriola Lands and Trails Trust (GaLTT), another conservation organization, was contacted to work with the landowners on acquiring the land. Discussion and work was still progressing at the time of writing.

## 4.4 Management

During 2005 and 2006, heron colony management issues included development pressures, tree cutting, US military over-flights, and public interest. Of the 52 colonies studied in 2005, 15 had management issues that required a response from the Ministry of Environment, usually requiring a site visit. The most serious of these issues was tree cutting adjacent to Mud Bay near Bowser where a conservation officer response was required and charges are pending under the B.C. *Wildlife Act*. There is high public interest in Great Blue Herons. Municipalities and regional districts incorporate heron nests into their official community plans and require ongoing support for colony status and localities.

## 5. RECOMMENDATIONS

1. Continue the heron inventory program, focusing on collecting better information on productivity at selected colonies.
2. Continue stewardship activities for both the Shoal Island colony and the Gabriola Island colony.
3. Continue to distribute data to the regional districts and municipalities.

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Photos 2005 Inventory



Heron fledgling from Pacific Playground. Photo by Andy

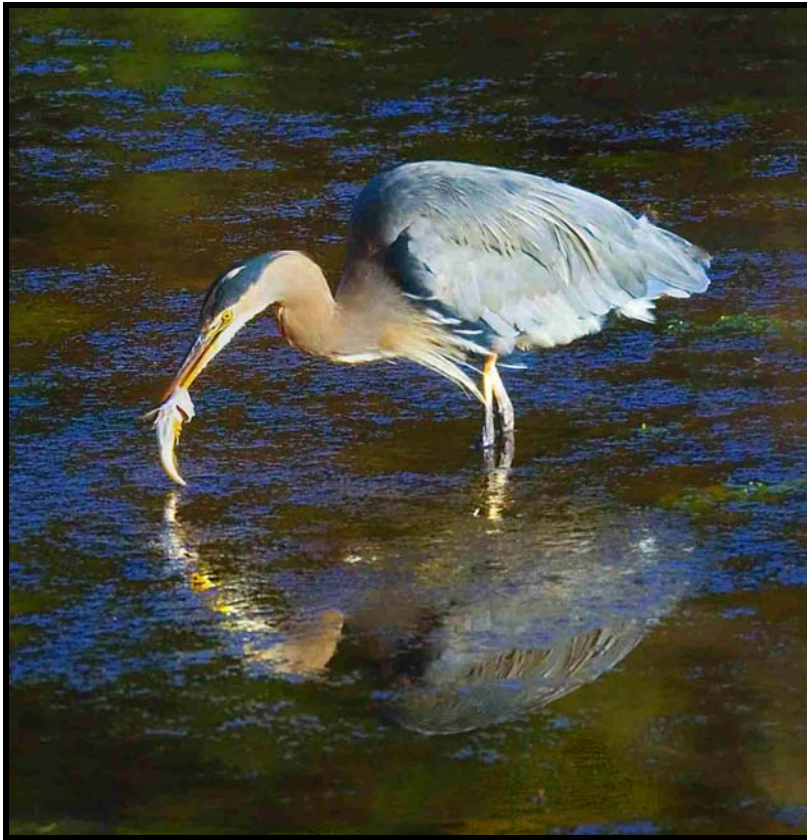


(Right) Breeding adult with plumes at  
Beacon Hill Park

(Below) Heron nests, Beacon Hill  
Park, Victoria, B.C.  
Photos by Rhiannon Hamdi



Photos 2005 Inventory



Great Blue Heron feeding on a sculpin.  
Photo by Ralph Hocken.

Bald Eagle predating on Heron colony at Beacon Hill Park, Victoria.  
Photo by Rhiannon Hamdi.

