GREAT BLUE HERON BREEDING INVENTORY AND HABITAT ASSESSMENT IN THE COLUMBIA BASIN

PREPARED BY:

MARLENE M. MACHMER & CHRIS STEEGER

Prepared For:

Columbia Basin Fish and Wildlife Compensation Program

And

Columbia Basin Trust

April 2004
GREAT BLUE HERON BREEDING
INVENTORY AND HABITAT ASSESSMENT
IN THE COLUMBIA BASIN

Prepared for:

COLUMBIA BASIN FISH & WILDLIFE
COMPENSATION PROGRAM
SUITE 103, 333 VICTORIA ST., NELSON, BC  V1L 4K3

Prepared by:

Marlene M. Machmer & Chris Steeger
PANDION ECOLOGICAL RESEARCH LTD.
532 PARK ST., NELSON, BC  V1L 2G9

In cooperation with:

THE WEST KOOTENAY NATURALISTS

April 2004
Executive Summary

From April to August of 2003, Pandion Ecological Research Ltd. and the West Kootenay Naturalists completed the second year of a Great Blue Heron breeding inventory and habitat assessment project in the Columbia Basin. This project was funded by the Columbia Basin Fish & Wildlife Compensation Program and the Columbia Basin Trust. It was intended to provide resource management agencies with updated information on heron population estimates and breeding distributions, and to promote public awareness, stewardship, habitat protection and enhancement efforts aimed at this blue-listed species. Project objectives in year two included the following: (1) maintain a heron public awareness campaign and sighting network established in 2002; (2) conduct systematic surveys for active and historical heron breeding sites; (3) monitor nest activity and reproductive success at active sites; (4) conduct assessments to describe the habitat/site characteristics, current land uses, and status of breeding sites; (5) produce a report with general and site-specific recommendations for heron breeding habitat conservation; (6) extend the findings of this project to basin residents; (7) inform private landowners of the presence of active nests and their sensitivity to disturbance; and (8) develop a heron stewardship brochure. This report summarizes the findings for objectives 1-7.

A total of 254 sightings from 117 different contributors across the Columbia Basin were received through the heron sightings network in 2003 (as compared with 352 sightings from 185 contributors in 2002). This high level of public response assisted in identifying the locations of heron concentrations and prioritizing areas for field surveys. A total of 46.4 person-days were spent by biologists conducting field surveys (ground-based and aerial combined). These days were supplemented with an additional 25 person-days of volunteer time contributed by the WKNs and affiliated volunteers.

Sixteen active heron breeding sites (3 new sites and 13 sites re-occupied from 2002) were found in 2003, and a total of 33 breeding sites (16 active sites and 17 historical) were found during the two years of inventory. Of 16 active sites, five were located in the West Kootenay, ten in the East Kootenay and one in the Robson Valley. With the exception of one site, all were detected during ground-based surveys.

A total of 289 active heron nests were counted in 2003 (136 in the West Kootenay, 151 in the East Kootenay and two in the Robson Valley), and 80% of nests were within six colonies. Active nest colonies had from 2–27 nest trees (mean ± SE = 8.9 ± 1.8) supporting 2–86 (18.1 ± 5.7) active nests. Reproductive success averaged 2.43 ± 0.42 chicks per successful nest (n = 117) and 1.81 ± 0.27 chicks per active nest (n = 147), based on a sub-sample of visible nests that were consistently monitored. These rates are very similar to those estimated in 2002 (2.32 ± 0.10 per successful nest). Reproductive success rates were comparable in the East and West Kootenay and in both regions, an estimated 20% of active (visible) nests failed to produce young. Low nesting success at selected sites may be attributed to Bald Eagle depredation. Repeated eagle incursions and/or heron mortality were observed at 5 of 16 (31%) active heron colonies in 2003. A single breeding site in the Robson Valley failed, and the overall breeding site failure rate was only 13% (2 of 16 sites) in 2003, compared with a rate of 24% in 2002 (4 of 17 sites).

A comparison of 2002-2003 survey results with data from a 1982 heron breeding survey indicates that numbers of active nests are similar (289 in 2003, 259 in 2002, and 266 in 1982), while average colony size has decreased substantially (from 29.6 active nests in 1982 to 15.2 in 2002 and 18.1 in 2003), and numbers of active sites have increased (9 in 1982 to 17 and 16 in 2002 and 2003, respectively). Conclusions regarding long-term heron population trends based on this comparison are limited, due to the less intensive methods and smaller geographic scope of the 1982 survey.
Breeding sites were located from 4–1,500 m (average of 261 ± 71 m) away from a water body and closest water bodies included large to small rivers (30%), small lakes and wetland complexes (21% each), reservoirs and large creeks (12% each) and large lakes (3%). Heron nest stands were characterized as pure coniferous (48.5%), cottonwood deciduous (45.5%), and mixed (6.1%). Breeding sites were in mature (72.7%), young (18.2%), and old forest (9.1%) structural stages and tended to have high levels of crown closure (66.4 ± 4.1%). Black cottonwood (*Populus balsamifera*) comprised 46% of nest trees, and all other nest trees were conifers (eight species in total). Nest trees tended to be live trees of large diameter and height, relative to trees available in surrounding stands.

Well over half (69%) of the active breeding sites found in the basin during 2003 were located on private land, with the remainder in provincial wildlife management areas (19%), and on crown land (12.5%). These findings emphasize the need to promote stewardship efforts and work cooperatively with private landowners to protect heron breeding habitat and minimize disturbance at active sites.

Other observations pertaining to heron populations and disturbance factors are discussed, and general recommendations for heron habitat protection and monitoring are provided. They include the following:

1. continue monitoring rates of nest activity and reproductive success (per active and successful nest) at known active heron breeding colonies in the Columbia Basin;
2. quantify impacts of Bald Eagles on heron populations by conducting focal observation sessions at a subset of heron breeding colonies;
3. conduct late fall/winter heron searches in the basin and make recommendations for habitat protection and enhancement at key overwintering sites;
4. provide landowners and land managers with a stewardship brochure and encourage selected landowners to explore possible land conservation agreements with land trust/acquisition agencies;
5. acknowledge the efforts of all contributors and volunteers involved in this study over the last two years with an article summarizing the main findings of the project to date and thanking all of the contributors;
6. establish a formal “heron-watch” program comprised of volunteers willing to “keep an eye” on active breeding sites (in order to supplement formal monitoring and/or act as a surrogate in some years); and
7. undertake or encourage cottonwood protection projects at active and good potential heron breeding sites in the basin and develop a basin-wide cottonwood protection, management and recruitment strategy directed at both crown and private land.

General best management practices in the vicinity of heron breeding sites are provided and site-specific recommendations for the protection of active breeding sites found in the basin are proposed.
Great Blue Heron Breeding Inventory and Habitat Assessment in the Columbia Basin

Table of Contents
EXECUTIVE SUMMARY .............................................................................................................. ii
TABLE OF CONTENTS ................................................................................................................ iv
ACKNOWLEDGMENTS ................................................................................................................... v
1.0 INTRODUCTION and BACKGROUND .................................................................................. 1
   1.1 Project Objectives ................................................................................................................. 1
   1.2 Study Area ............................................................................................................................ 2
2.0 METHODS ............................................................................................................................. 3
   2.1 Public Awareness Campaign ................................................................................................. 3
   2.2 Breeding Site Inventory and Monitoring ............................................................................. 3
      2.2.1 Assessment of Nesting Activity ...................................................................................... 4
      2.2.2 Assessment of Nesting Success ...................................................................................... 4
      2.2.3 Assessment of Breeding Habitat Characteristics ............................................................ 4
3.0 RESULTS AND DISCUSSION ............................................................................................... 5
   3.1 Public Awareness Campaign and Heron Sighting Network .................................................. 5
   3.2 Breeding Site Inventory and Monitoring ............................................................................. 5
      3.2.1 Nesting Activity .............................................................................................................. 8
      3.2.2 Nesting Success .............................................................................................................. 11
      3.2.3 Breeding Habitat Characteristics .................................................................................. 14
      3.2.4 Other Observations ...................................................................................................... 16
      3.2.5 Land Ownership of Breeding Sites .............................................................................. 16
4.0 RECOMMENDATIONS .......................................................................................................... 17
   4.1 General Recommendations .................................................................................................. 17
   4.2 Site-Specific Recommendations .......................................................................................... 19
LITERATURE CITED .................................................................................................................... 22
APPENDICES ................................................................................................................................ 25
   1. Heron Information Poster ...................................................................................................... 26
   6. Photo Record ...................................................................................................................... 40
APPENDICES WITH SENSITIVE /CONFIDENTIAL INFORMATION
   2. Reported Sightings Database ................................................................................................. 27
   3. Biologist Survey Log ............................................................................................................ 32
   4. Volunteer Survey Log ........................................................................................................... 34
   5. Breeding Site Database ....................................................................................................... 35

List of Tables
1. Summary of 2003 site visits, nest activity, and reproductive success (RS) at 16 active and 17
   historical heron breeding sites in the Columbia Basin ................................................................. 9
2. Summary of heron nest trees, nests, active nests, reproductive success (RS), and % nest and site
   failure data for active breeding sites in the East Kootenay, West Kootenay, and Robson Valley... 10
3. Comparison of the number of heron nests and active nests in 2003 with those surveyed in 2002
   (Machmer and Steeger 2003) and 1982 (based on data standardized by Moul et al. 2001) .......... 12
4. Summary of heron breeding site data gathered by the CBFWCP from 1993-1995 and 2002-2003... 13
5. Follow-up management recommendations for selected active heron breeding sites ................. 20

List of Figures
1. Locations of suspected breeding sites and observations of one or more adult and juvenile herons
   based on information provided by all sources in Appendix 2 ...................................................... 6
2. Locations of 16 active and 13 historical heron breeding sites in the Columbia Basin .................. 7
3. Calendar months in which heron sightings were observed and reported (based on data reported from December 2002 to November 2003)................................................................................................ 5
4. Forest types (a) and structural stages (b) of active and historical heron nesting stands................................. 14
5. Diameters [estimated breast height in cm] (a), heights [estimated in m] (b), tree species (c), and decay classes (d) of a random sub-sample of heron nest trees in active and historical nesting stands15
6. Proportional (%) breakdown of the land/ownership status of heron breeding sites and active breeding sites only (WMA = provincial Wildlife Management Area; LMA = Land Management Agency). ................................................................. 16

Acknowledgements

This project would not have been a success without the tremendous response and enthusiasm we received from the public, land management agency personnel, the West Kootenay Naturalists, and other volunteers. We thank the following people for submitting sightings or information: Adam Kowalyshyn, Alice Nellistijn, Alison Elmes, Allison McConnell, Angela Prince, Anna Anderson, Ann Blackmore, Arron Haggart, Art Allen, Art Groenig, Arthur Schoedert, Barb Rilling, Barrett Cowles, Barry Mason, Barry Whiting, Becky Pintir, Becky Rippel, Beryl Lindley, Bev & Alta Pinney, Bill Bryce, Bill Fadden, Bill Westover, Bob Ashfield, Bob Brade, Bob Ferguson, Bob Jamieson, Bob White, Bonnie New, Brad Stubbs, Brenda Goodman, Brenda Herbison, Brian Gadbois, Brian Koochin, Brian Stushnoff, Brian Weeks, Britt Kirsch, Candido Pooli, Carol Fehr, Carol Hutchinson, Cathy Wickstrom, Charlie Harvey, Chris Buckley, Chris Maxfield, Chuck Dinning, Cindy McVor, Colin Hamilton, Colin MacIntosh, Colin Pike, Cory Cherriere, Cory Legebokow, Craig Dodds, Daniel Bastaja, Darlene Marceau, Darrell Delaronde, Darryl Becker, Darrell and Diane Fatum, Dave Adams, Dave Hillary, David MacDonald, Dawn Beynon, Dean den Biesen, Debbie Walshaw, Del Williams, Dennis Foley, Deyanne Davies, Diane Tammen, Dick Gondek, Dirk Rinehart-Pidock, Don DeHart, Don Jacobite, Donna McCaro, Donna Smith, Doug Adama, Doug Kelly, Dustin Steeger, Dusty Hemmingsway, Earnie & Marilyn Fulton, Ed Beynon, Eileen Perks, Elaine Bohnet, Ellen Zimmerman, Emelda Fields, Erin McDonald, Eugene Champagne, Eugene Champagne, Fran Kimpton, Gail Spitler, Garth Mowat, Gary Davidson, Gary Tipper, George Guimont, Gerry Krivsky, Gerry Nellistijn, Gillian Cooper, Gertrud Klopp, Gina Ostman, Grant Clubine, Greg Booth, Greg Cooper, Greg Ross, Gwen Nicol, Gwen Regnault, the Hagan family, Hailey Dawson, Hans Dummeaur, Harry Kuregen, Harry Steinwand, Heather Dalgrin, Helen Assel, Helen Obalek, Helga Dummeaur, Herb Bower, Hillary Page, Ian Moul, Irene Linden, Irene Teske, Jack and Ellen Bellamy, Jack Floyd, Jackie Allen, Jacqui Bullock, Jakob Dulisse, James Atheson, Jan Rodman, Janet Gagner, Janet Sawyer, Janice Arndt, Janis Jarvis, Jeanne Hird, Jennifer Rosewarne, Jenny Welsch, Jerry Rideout, Jerry Srida, Jesse Ellingson, Jim Cook, Jim Morris, Jim Partridge, Jim Patterson, Jim and Mary Webster, Joanne Bertrand, Joanna Emery, Joanna Whiting, Joe Maze, Joe Nicolas, John Anderson, John and Ann Bonderoff, John Cooper, John Gwilliam, John Krebs, John Moroz, John Rinker, John Schnarr, John Schut, John Woods, Jon O’Grady, Joy Cwikula, Judy Hyham, June Seminoff, Karen Cote, Karen Rinehart-Pidock, Kari Stuart-Smith, Kari Tanner, Kari Tyler, Kate Hood, Kathleen Kondborg, Kathleen Sparkes, Kathy Woodward, Ken Streflo, Kevin Shaw, Kris Mitchell, Krispen Elder, Kristen Carlson, Laine Mitchell, Larry Halversen, Larry Ingham, Lee Harding, Lee Hiberd, Leon Davidoff, Leona Young Schadlich, Libby Weaver, Lillian Liberty, Linda Demharter, Lois Johnson, Lori Friesen, Lori Mitchell, Lorraine Fadden, Louise Halvorsen, Lucille Campbell, Lucille Whalen, Lyn Miller, Lynn Muller, Malford Bell, Marc-Andre Beacher, Marcell Gates, Margaret Picaud, Marilyn Burgone, Marilyn Smith, Mark Graham, Mark Hall, Marlene Johnson, Mary Baker, Mark Swindel, Martin Forget, Maryann McDonough, Maureen Hamilton, May Ratcliffe, Michael Landrecht, Micheal McMann, Michelle Cushway, Mike Callas, Mike Gall, Mike Roy, Miles Rubenic, Mindy Brugman, Nola Alt, Norman Fields, Pat Hutchinson, Patty Gay, Pauline Newhouse, Penny Ohanjanian, Robert Louie, Peter Klopp, Peter Davidson, Pierre Dupont, Rachael Miller, Rachel Holt, Ralph Beatty, Ralph Guerin, Ray Obalek, Ray Rybachuk, Richard Allen, Rita Wege, Rob Brown, Robert Jackson,
Great Blue Heron Breeding Inventory and Habitat Assessment in the Columbia Basin


Special thanks go to Ed Beynon for organizing volunteers and compiling sighting information, Amy Waterhouse for producing the maps, Barry Bartlett for organizing the media coverage, Beth Woodbridge for her administrative “wizardry”, Hillary Page and Jakob Dulisse for assisting in selected areas, and John Krebs for his interest, support and patience throughout this project. Rob Butler, Ian Moul, Ted Antifeau, Myke Chutter, and Kathy Paige provided heron background information. We are grateful to the Columbia Basin Fish & Wildlife Compensation Program and the Columbia Basin Trust for funding this project, and to the many members of the public who actively supported it.
1.0 Introduction and Background

The Great Blue Heron (Ardea herodias) is a large and distinctive wading bird found throughout North America (Butler 1997). Two subspecies are recognized in British Columbia: the coastal A.h. fannini and the inland continental A.h. herodias. Both subspecies are provincially blue-listed by the Conservation Data Centre (CDC 2003) because of vulnerability to habitat loss and disturbance in prime breeding and wintering habitats (Gebauer and Moul 2001). Current population trends are somewhat unclear for both subspecies because historic data on colony size, breeding activity, nesting success and productivity were collected using non-standardized methods with variable effort (Gebauer and Moul 2001).

In the interior of BC, herons nest along the margins of lakes, slow-moving rivers, wetlands and sloughs in small to large breeding colonies (Campbell et al. 1990; Butler 1992), and occasionally as single pairs (Machmer 1996; Butler 1997). They typically breed and roost in mature black cottonwood (Populus balsamifera) or coniferous trees along lakeshores, on lake islands, in wooded swamps, or other isolated locations near shallow water foraging habitat (Vermeer 1969; Forbes et al. 1985b; Butler 1992). Interior herons eat primarily fish (Forbes 1987a; Machmer 2002), but other prey are also taken (e.g., amphibians, reptiles, invertebrates, small mammals and birds; Butler 1992). As cool weather and freezing conditions approach, some herons from the interior migrate south, while others remain around ice-free watercourses with an adequate food supply (Campbell et al. 1990).

Valley bottom riparian and wetland areas in the Columbia Basin represent important breeding and wintering areas for interior herons (Gebauer and Moul 2001; Machmer 2001, 2002; Machmer and Steeger 2003). Forbes et al. (1983, 1985a) compiled information on 19 breeding colonies in the Columbia Basin known prior to 1983. Some of these sites were altered by the construction of power dams and other developments (Thurber Consultants Ltd. 1980; S. Forbes and B. Herbison, pers. comm.) and many are no longer occupied. Herons frequently abandon their breeding sites when disturbed (particularly during the early stages of nest selection, nest building, pair formation and egg laying; Quinney 1983; Butler 1992; Vos et al. 1985; Vennesland 2000), and a systematic effort is required to locate new breeding colonies (Gebauer and Moul 2001). Monitoring of active breeding sites is essential to estimate population trends and identify critical sites for habitat protection purposes. Furthermore, tracking reproductive success in this top-of-the-food-chain predator provides a benchmark against which to measure the effects of environmental perturbations (e.g., contamination, habitat alteration, and predation; Elliott et al. 1988 and 1989). Increasing human disturbance at heron breeding or foraging sites is associated with higher predation rates, lower breeding success, and reduced foraging time or efficiency (Butler 1997; Gebauer and Moul 2001). Bald Eagle (Haliaeetus leucocephalus) depredation in particular is increasing in coastal heron colonies (Vennesland 2000; 2003) and eagles may be an important mortality factor in the interior as well (Machmer and Steeger 2003).

In collaboration with the West Kootenay Naturalists (WKNs), Pandion Ecological Research Ltd. initiated a Great Blue Heron breeding inventory in the Canadian portion of the Columbia River Basin in April of 2002. This initiative was funded by the Columbia Basin Fish & Wildlife Compensation Program (CBFWCP) and the Columbia Basin Trust (CBT). The inventory was intended to provide resource management agencies with updated information on heron breeding distributions and population estimates, and to promote public awareness, stewardship, habitat protection and enhancement efforts aimed at this blue-listed species.

During 2002 surveys, 30 heron breeding sites (17 active and 13 historical) were found in the Columbia Basin (Machmer and Steeger 2003). Of 17 active sites, eight were located in the West Kootenay, eight in the East Kootenay and one in the Robson Valley. A total of 259 active nests were counted, and 85% of all nests were located within six colonies. Reproductive success averaged 2.32 ± 0.10 young per
successful nest, and four active sites (24%) failed to produce any young. Reasons for the nest failures could not be determined conclusively, however three of the four sites were subject to disturbance within 500 m of the nests during the breeding season.

A total of 352 sightings from 185 different contributors across the basin were received in 2002 and this high level of public response assisted in identifying the locations of heron breeding sites and prioritizing areas for field surveys. Due to the large size of the study area, not all areas could be adequately surveyed in 2002, hence the inventory was continued during the 2003 breeding season.

1.1 Project Objectives

Specific objectives of this project in 2003 were to:

1. Continue with the heron public awareness campaign and sighting network;
2. Co-ordinate selected volunteers to assist with the recording of breeding sightings and participation in field surveys;
3. Continue with systematic early season nest searches and an inventory of historical and active heron breeding sites;
4. Monitor late season breeding activity (i.e., number of successful nests, number of young per successful nest) at 2002 sites and additional sites found in 2003;
5. Conduct assessments of active sites to describe their habitat and site characteristics, current land uses, and status;
6. Produce a report that summarizes all project components and includes general and site-specific recommendations for habitat protection and enhancement;
7. Inform private landowners of the presence of active nests and their sensitivity to disturbance;
8. Liaison with relevant agencies and update them on local inventory data, and monitoring and management efforts;
9. Develop a brochure that describes heron status, habitat requirements, breeding schedules, and sensitivity to disturbance and provides guidelines for “best management practices” near heron breeding colonies in the Columbia Basin; and
10. Extend the results of this project to basin residents and the general public to promote awareness, stewardship and conservation efforts directed at this species, its habitat, and sites of importance.

This report describes project activities (objectives 1-7) and results completed in 2003. Extension and liaison activities are ongoing and the brochure will be produced as a separate deliverable.

1.2 Study Area

The survey area for this inventory encompassed most of the Columbia Basin, as defined by the program mandate of the Columbia Basin Fish & Wildlife Compensation Program. This area includes the East and West Kootenays and the Robson Valley (roughly bordered by the Fraser River at McBride in the north, Upper/Lower Arrow Lakes to the west, and the Elk River to the east), but excludes the Okanagan, Similkameen and Flathead drainages. The vast size of the study area and the available budget did not permit systematic aerial and ground-based surveys of all potential heron breeding habitat in the basin. Areas were therefore prioritized for field inventory based on (a) the nature and frequency of reported heron sightings, (b) proximity to suitable riparian/wetland foraging habitat, and (c) ease of access. Volunteers were solicited to assist with heron monitoring in areas that project biologists could not survey.
2.0 Methods

2.1 Public Awareness Campaign

Beginning in April of 2003, a public awareness campaign and “report-a-heron-network” targeting residents of the Columbia Basin was re-established. This campaign involved the following components:

- Color-laminated posters with heron information requests (Appendix 1) were displayed at public libraries, post offices, and on community information boards throughout the Columbia Basin.
- Heron appreciation cards were sent out to 185 contributors in the Columbia Basin that provided sightings information in 2002. The cards described 2002 findings and provided contact information for reporting additional sightings in 2003.
- A heron data form developed in summer 2002 was re-posted on the CBFWCP web site (www.cbfishwildlife.org) in late April with links to “heron project”. Data inputted on-line to this web page was automatically downloaded to Marlene Machmer (MM) for follow-up.
- Information updates were emailed to approximately 75 wildlife and habitat management personnel, consultants and/or naturalists throughout the basin in late April 2003.
- A database summarizing all heron sightings submitted by email, telephone, web and in-person was again compiled in 2003 (Appendix 2). The database includes the following fields: date sighting was reported, mode of reporting, name of contributor and contact information; sighting location (general and specific description) and UTMs (approximated from descriptions); type of sighting (active or historical nesting, number of adult or juvenile herons observed, etc.); and any follow-up actions taken (e.g., phone call, email, site visit).
- A press release describing year 2 of the project and soliciting sighting information was prepared and distributed to basin newspapers with the assistance of Barry Bartlett (CBFWCP).
- MM gave the following presentations on the heron project in 2003/04: (i) June 21, 2003 at the 13th Annual Conference of the BC Field Ornithologists in Radium, BC, (ii) September 19, 2003 at the Federation of BC Naturalists Conference in Kimberley, BC, (iii) February 27, 2004 at the West Kootenay Naturalists AGM in Castlegar, and (iv) April 28, 2004 at the Columbia Mountains Institute Annual General Meeting in Nakusp.
- MM prepared abstracts summarizing the project findings to date that appeared in the fall 2003 CVWMA Wetlander publication and in the most recent CBFWCP Update publication.
- Ed Beynon of the WKNs coordinated volunteers to assist with the compilation and emailing of sightings and participation in field surveys.
- Upon completion, copies of this report and associated databases will be distributed to provincial land management agencies within the Basin (Ministry of Water, Land & Air Protection, Nelson) and province-wide (Conservation Data Centre, Victoria).

2.2 Breeding Site Inventory and Monitoring

Ground-based surveys (RIC 1998) were conducted at historical, current, and good potential heron breeding sites in the Columbia Basin, based on tips obtained from all sources (section 2.1) and 2002 inventory findings. Surveys were conducted during the incubation and nestling periods (late April to early August) using standardized methods outlined by the Resources Inventory Standards Committee (1998) and Moul et al (2001). Survey areas were generally accessed by vehicle, and more intensive follow-up searches were conducted on foot, by kayak, canoe or mountain bike. Ground-based surveys were supplemented with a fixed-wing aircraft survey on April 28th, 2003 covering the following areas on
the Arrow Lakes system: Nakusp, Arrow Park, Mosquito Lake, Whatshan Lake, Burton, Fauquier, Needles, Edgewood, Applegrove, Inanoaklin Creek, Renata, and Broadwater. A second fixed-wing survey of the Creston Valley was conducted on June 4th, 2003, in conjunction with their regular spring waterfowl inventories.

### 2.2.1 Assessment of Nesting Activity

All potential breeding sites were visited at least once (and up to five times) during the season to quantify abundance (based on the total number of nests visible and the number of active nests). Potential nesting areas were approached cautiously to minimize disturbance, particularly early in the nesting period (April to mid-June). As the observer entered the colony, he/she searched for signs of activity including presence of eggshells, whitewash, boluses, incubating adults, or chicks in nests. A nest was considered active during the breeding season when a heron was present in the nest and/or fresh eggshells were observed on the ground below the nest (Moul et al. 2001). During initial visits, an accurate nest count was undertaken and the configuration of each colony (i.e., locations/numbers of nest trees and numbers of nests per tree) was roughly sketched out.

During nest visits, incursions into breeding colonies (by Bald Eagles, Ospreys \[Pandion haliaetus\] and other intruders), observations of dead herons (adults/juveniles), predation events, and other types of disturbance were noted. This information was collected anecdotally but it does provide some evidence of mortality factors that can be linked to nest success and mean productivity at particular breeding sites.

### 2.2.2 Assessment of Nesting Success

Active breeding sites were re-visited in late June to early July (and one late nest in early August) to determine nest success and count the number of young. Last visits were scheduled in an attempt to count chicks before they were “branching” away from their nests (i.e., preferably ≤6.5 weeks old). A nest was considered successful if one or more chicks were observed in the nest (Moul et al. 2001). Reproductive success was calculated based on (a) the number of chicks per successful nest and (b) the number of chicks per active (and visible) nest. Nest visibility was a limiting factor, particularly in large colonies characterized by dense stands of black cottonwood, where visibility deteriorated through the course of the breeding season.

### 2.2.3 Assessment of Breeding Habitat Characteristics

Assessments of breeding habitat and site characteristics were conducted during the first and subsequent visits to unoccupied and active breeding sites, respectively. The following site and habitat parameters were recorded during field visits: estimated distance (m) from water and closest water body; dominant forest type and structural stage (as defined by BC Ministry of Environment, Lands and Parks and BC Ministry of Forests 1998); slope and aspect; mean crown closure (defined as the average of four readings taken with a spherical densiometer in the middle of a colony); nest tree species; and estimated diameter [dbh in cm], height [m] and decay class (BC Wildlife Tree Committee 2001) of ≤5 randomly selected nest trees.

The locations of all active and historical breeding sites were determined using GPS and mapped by Amy Waterhouse (CBFWCP). The biogeoclimatic zone/variant and land designation and ownership status for each breeding site was subsequently determined from maps, also with the assistance of Amy Waterhouse. A photo record was established for active and historical breeding sites, as well as other features of interest encountered during our surveys.
3.0 Results and Discussion

3.1 Public Awareness Campaign and Heron Sighting Network

Appendix 2 provides a database of all Great Blue Heron sighting information compiled in 2003. Approximate UTMs were assigned to each sighting described in the appendix and these are mapped by observation type (possible nesting location, observation of one or multiple adults and/or juveniles) in Figure 1. Heron observations were received from as far north as McBride, however most sightings were concentrated along major river systems south of Golden in the East Kootenay, and south of Revelstoke in the West Kootenay (Figure 1).

For the most part, concentrations of sightings corresponded reasonably well with the locations of confirmed breeding colonies (Figure 2). However some clusters of sightings were evident in areas without nearby breeding sites (compare Figures 1 and 2). The latter areas included the Lower Arrow Lake (Nakusp, Burton, Fauquier, Needles, Edgewood and Renata areas), the Genelle and Waneta areas, the Erie Lake to Salmo River corridor, the Fruitvale area (Marsh and Beaver Creek), the Kaslo/Meadow Creek corridor, the Slocan Lake/Bonanza Creek corridor, and the Jaffray area. An abundance of participating volunteers residing in some of the above areas may have contributed to these results, however it is likely that colonies were missed at one or more of the above locations.

![Figure 3. Calendar months in which heron sightings were observed and reported (based on data reported from December 2002 to November 2003).](image)

A total of 254 sightings from 117 different contributors were submitted in 2003 (Appendix 2), as compared with 352 sightings from 185 contributors in 2002 (April to November). Observations of herons were highest from May to August, followed by a decline through the fall and winter months (Figure 3). Reporting of sightings was also generally highest from May through to August (but note that in late December of 2002, a large number of sightings were submitted by Tyrell Allen, who kept daily records of heron numbers on the Lower Arrow Lakes in both years). Of the sightings reported in 2003, 152 (60.1%), 70 (27.7%), 24 (9.5%) and 7 (2.8%) were submitted by email, telephone, in person, and on-line, respectively.
Figure 1. Locations of potential breeding sites and observations of one or more adult and juvenile herons based on information provided by all sources in Appendix 2.
Figure 2. Locations of 16 active and 17 historical heron breeding sites found in the Columbia Basin during 2003 surveys.
A total of 12 tips (4.7% of the total sightings reported) describing potential heron breeding sites were received in 2003, and many of these involved multiple sightings corresponding to the same heron colony. The vast majority of reported sightings were of one or more adult herons: 127 sightings (50.2%) of individual herons and 108 sightings (42.7%) of groups of herons together. Sightings involving single (4 sightings or 1.6%) or multiple (2 sightings or 0.8%) juveniles were rare, and the latter are almost certainly underestimated due to difficulties in distinguishing juveniles from adult birds. Juvenile sightings corresponded to the period from April 10th to September 21st, 2003 (Appendix 2).

The public awareness campaign was a success on many levels. Sightings reported to the database in both years by an estimated 300 contributors were instrumental in establishing and fine-tuning the locations of selected heron breeding colonies. The nature, timing and frequency of sightings received also provided us with criteria to prioritize specific areas for field surveys. Furthermore, the awareness campaign put us into direct contact with people that are keenly interested in herons and typically reside close to key heron breeding and foraging sites across the basin. Through follow-up contact, many of these individuals expressed a willingness to “keep a watchful eye” on a breeding colony and to report serious disturbances or abandonment. In future, there is an opportunity to set up a formal “heron watch” program to supplement existing population monitoring (see recommendations in section 4.2). A critical component to the success of any program based on volunteers is that their assistance and contribution is regularly acknowledged, and that they are kept updated regarding project progress and findings. Recommendations to ensure this are provided in section 4.2.

It is important to distinguish between involving the public in the reporting of heron sightings or in performing a stewardship role at a specific site, as opposed to the public conducting systematic monitoring at heron colonies. Encouraging the public to enter colonies (to count numbers of active nests, chicks and fledged young) is not an appropriate strategy given the blue-listed status of this species and its demonstrated sensitivity to human disturbance near nest sites (Butler 1992; Vennesland 2000 and references therein).

3.2 Breeding Site Inventory and Monitoring

A biologist survey log that lists areas surveyed by date, surveyor, and survey methods used is provided in Appendix 3. A similar volunteer log describing the areas surveyed by WKNs appears in Appendix 4. A total of 371 hours (46.4 person-days) were spent by biologists conducting field surveys (ground-based and aerial combined). These hours were supplemented by an additional 200 volunteer person-hours (25 person-days) contributed by the WKNs and their affiliates.

3.2.1 Assessment of Nesting Activity

A total of 33 heron breeding sites (16 active sites and 17 historical) were found during the course of this inventory (Table 1). Of 16 active sites, five were located in the West Kootenay, ten in the East Kootenay and one in the Robson Valley (Table 2). These sites are mapped in Figure 2 and information pertaining to their locations, breeding activity, reproductive success, and habitat characteristics is summarized in Appendix 6. With the exception of the Goat River, all breeding sites (in both years) were found during ground-based surveys. A fixed wing survey of the Lower Arrow Lake Reservoir in late April of 2003 did not uncover any heron breeding sites, despite numerous sightings from this area.

Three new active sites were found in 2003 and all were located in the East Kootenay (Wasa Lake, Toby Creek and Fort Steele; Table 1). Two of these colonies produced young in 2003, whereas the two females incubating at Toby Creek abandoned. These individuals may have been re-nests from the nearby Wilmer colony that was subject to high levels of Bald Eagle depredation, but this could not be confirmed.
Table 1. Summary of 2003 site visits, nest activity, and reproductive success (RS) at 16 active and 17 historical heron breeding sites in the Columbia Basin.

<table>
<thead>
<tr>
<th>Breeding Site Name</th>
<th>Nest Active</th>
<th>Nest Success.</th>
<th># Nest Trees</th>
<th># Nests</th>
<th># Nests Active</th>
<th># Active Nests Visible</th>
<th># Nests Success.</th>
<th># Chicks</th>
<th>Mean RS per Successful Nest</th>
<th>Mean RS per Active/Visible Nest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leach Lake</td>
<td>y</td>
<td>y</td>
<td>27</td>
<td>92</td>
<td>86</td>
<td>25</td>
<td>22</td>
<td>50</td>
<td>2.27</td>
<td>2.00</td>
</tr>
<tr>
<td>Proctor</td>
<td>y</td>
<td>y</td>
<td>4</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Revelstoke</td>
<td>y</td>
<td>y</td>
<td>14</td>
<td>14</td>
<td>11</td>
<td>7</td>
<td>7</td>
<td>17</td>
<td>2.43</td>
<td>2.43</td>
</tr>
<tr>
<td>Dutch Creek</td>
<td>y</td>
<td>y</td>
<td>9</td>
<td>51</td>
<td>42</td>
<td>17</td>
<td>15</td>
<td>42</td>
<td>2.80</td>
<td>2.47</td>
</tr>
<tr>
<td>Nicholson</td>
<td>y</td>
<td>y</td>
<td>7</td>
<td>18</td>
<td>15</td>
<td>13</td>
<td>12</td>
<td>31</td>
<td>2.58</td>
<td>2.38</td>
</tr>
<tr>
<td>Parson</td>
<td>y</td>
<td>y</td>
<td>19</td>
<td>61</td>
<td>42</td>
<td>18</td>
<td>18</td>
<td>41</td>
<td>2.28</td>
<td>2.28</td>
</tr>
<tr>
<td>Wilmer</td>
<td>y</td>
<td>y</td>
<td>12</td>
<td>16</td>
<td>11</td>
<td>11</td>
<td>1</td>
<td>2</td>
<td>2.00</td>
<td>0.18</td>
</tr>
<tr>
<td>Goat River</td>
<td>y</td>
<td>y</td>
<td>5</td>
<td>26</td>
<td>26</td>
<td>-</td>
<td>unknown¹</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Gold Creek</td>
<td>y</td>
<td>y</td>
<td>6</td>
<td>10</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Moyie Lake</td>
<td>y</td>
<td>y</td>
<td>3</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>20</td>
<td>2.86</td>
<td>2.50</td>
</tr>
<tr>
<td>Sparwood</td>
<td>y</td>
<td>y</td>
<td>6</td>
<td>10</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Valemount</td>
<td>y</td>
<td>n²</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0²</td>
<td>0</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>Goose Creek</td>
<td>y</td>
<td>y</td>
<td>7</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>4</td>
<td>7</td>
<td>1.75</td>
<td>0.70</td>
</tr>
<tr>
<td>Wasa Lake</td>
<td>y</td>
<td>y</td>
<td>16</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>17</td>
<td>44</td>
<td>2.59</td>
<td>2.20</td>
</tr>
<tr>
<td>Toby Creek</td>
<td>y</td>
<td>n</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0.00</td>
</tr>
<tr>
<td>Fort Steele</td>
<td>y</td>
<td>y</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>2</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Creston West</td>
<td>n</td>
<td>n</td>
<td>3</td>
<td>5</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Duck Lake</td>
<td>n</td>
<td>n</td>
<td>3</td>
<td>5</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Saughum Lake 2002</td>
<td>n</td>
<td>n</td>
<td>14</td>
<td>27</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Champion Lake</td>
<td>n</td>
<td>n</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Waldie Island</td>
<td>n</td>
<td>n</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Golden</td>
<td>n</td>
<td>n</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Saughum Lake 1999</td>
<td>n</td>
<td>n</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Brisco</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Thompson's Landing</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mud Lake</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Perry Siding</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Edwards Lake</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cherry Creek</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Norbury Lakes</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pend d'Oreille</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Begbie Falls</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Begbie 1 &amp; 2</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Summary</td>
<td>16</td>
<td>14</td>
<td>186</td>
<td>413</td>
<td>289</td>
<td>147</td>
<td>117</td>
<td>288</td>
<td>2.43 ± 0.42</td>
<td>1.81 ± 0.27</td>
</tr>
</tbody>
</table>

¹No access; stand watches indicate sites were active late and likely produced some young. ²Data provided by M. Callas and C. Pooli.
Table 2. Summary of heron nest trees, nests, active nests, reproductive success (RS), and % nest and site failure data for active breeding sites in the East Kootenay, West Kootenay, and Robson Valley.

<table>
<thead>
<tr>
<th>Active Breeding Site Location</th>
<th># Nest Trees mean ± SE (range)</th>
<th># Nests mean ± SE (range)</th>
<th># Active Nests mean ± SE (range)</th>
<th>RS/Active Nest¹ mean ± SE (range)</th>
<th>RS/Successful Nest mean ± SE (range)</th>
<th>Active Nests¹ Failed %</th>
<th>Active Sites Failed %</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Kootenay</td>
<td>11.4 ± 4.3 (4 – 27)</td>
<td>30.2 ± 15.8 (7 – 92)</td>
<td>27.2 ± 15.2 (3 – 86)</td>
<td>2.03 ± 0.49 (0.70 – 3.00)</td>
<td>2.36 ± 0.25 (1.75 – 3.00)</td>
<td>20%</td>
<td>0%</td>
</tr>
<tr>
<td>(5 sites; 136 active nests)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Kootenay</td>
<td>8.2 ± 1.8 (2 – 19)</td>
<td>20.0 ± 6.3 (2 – 61)</td>
<td>15.1 ± 4.8 (2 – 42)</td>
<td>1.90 ± 0.32 (0.00 – 3.00)</td>
<td>2.46 ± 0.13 (2.00 – 3.00)</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>(10 sites; 151 active nests)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robson Valley</td>
<td>3 (–)</td>
<td>3 (–)</td>
<td>2 (–)</td>
<td>0.00 ± 0.00 (–)</td>
<td>–</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>(1 site; 2 active nests)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>8.9 ± 1.8 (2 – 27)</td>
<td>22.1 ± 6.3 (2 – 92)</td>
<td>18.1 ± 5.7 (2 – 86)</td>
<td>1.81 ± 0.27 (0.00 – 3.00)</td>
<td>2.43 ± 0.42 (1.75 – 3.00)</td>
<td>21%</td>
<td>12.5%</td>
</tr>
<tr>
<td>(16 sites; 289 active nests)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Only a subset of active nests that were visible during late season nest visits were included in these tabulations (see number of active nests visible in Table 1).

The remaining 13 breeding sites active in 2003 were also active in 2002. Conversely, four breeding sites that were active but failed to produce young in 2002 were not re-occupied in 2003 (i.e., West Creston, Duck Lake, Saughum Lake, and Champion Lake). A fifth active site that failed in 2002 at Goose Creek was reoccupied and partially successful in 2003. Historical sites listed in Table 1 include the four abandoned sites active in 2002, as well as 13 other sites where active heron nesting was reported in previous years (i.e., their exact locations could be verified by land management agency personnel and/or nearby residents). These sites had some evidence of nesting activity from previous years (old nest, marked/flagged tree, chewed or blown over nest tree, etc.), but were last occupied anywhere from 1992 to 2001.

A possible heron breeding site was reported just north of Jaffray in mid-May of 2003. The owner of the property had observed as many as 13 herons at a time roosting in the trees across from his wetland in the previous three years (Darrell Fatum, pers. comm.). However the mixed stand of balsam poplar and ponderosa pine with heron activity was cleared in winter of 2003 (see Appendix 6). Breeding could not be conclusively determined and extensive surveys in the surrounding areas during May of 2003 did not uncover evidence of recent activity. Another adult was observed nest building along Marsh Creek (near Fruitvale) in May of 2003; although the pair was regularly observed in this area, that nest was never completed or occupied.

Breeding sites found in 2003 supported a total of 289 active heron nests (136 in the West Kootenay, 151 in the East Kootenay and two in the Robson Valley; Table 2). Active colonies had from 2–27 nest trees (mean ± SE = 8.9 ± 1.8) and 2–86 active nests (mean ± SE = 18.1 ± 5.7).
Six colonies accounted for 80% of all active nests found in 2003. Colonies in the West Kootenay averaged slightly larger in size, due mainly to one large colony with 86 active nests at Leach Lake (Tables 1 and 2).

**3.2.2 Assessment of Nesting Success**

Reproductive success averaged 2.43 ± 0.42 chicks per successful nest (n = 117) and 1.81 ± 0.27 chicks per active nest (n = 147), based on a sub-sample of visible nests that were consistently monitored (Table 2). These rates are very similar to those obtained for the same study area in 2002 (2.32 ± 0.10 per successful nest; Machmer and Steeger 2003). They also fall within the range of variation reported for 15 heron colonies in southwestern BC monitored from 1977–1981 (overall mean of 2.5 and a range of 2.2–2.8 young per successful nest; Forbes et al. 1985b). Rates found in this study are only slightly higher than the reproductive success rates reported for 51 coastal heron (*A.h. fannini*) colonies in 2003 (overall mean of 2.25 ± 0.13 chicks per successful nest; McClaren 2003).

Reproductive success rates (per active and successful nest) were highly comparable for the East and West Kootenay; in both regions, an estimated 20% of active (visible) nests failed to produce young (Table 2). Ten of 11 active nests in the Wilmer colony were abandoned and this high failure rate was attributed to Bald Eagle predation. At the Goose Creek colony, where 6 of 10 active nests failed and ≥8 dead chicks were detected below nests in late June, progressive draining and modification of a wetland may have been linked to high chick mortality. The single active breeding site in the Robson Valley failed when one nest tree fell during a storm and the second was abandoned. An overall breeding site failure rate of 13% (2 of 16 sites; Table 2) was recorded in 2003. This compares with a rate of 24% overall in 2002 (4 of 17 sites). Breeding site failure rates averaging 33% were reported in coastal heron colonies during 2003 (13 of 39 colonies; McClaren 2003), and the latter were attributed mainly to eagle predation.

Bald Eagle incursions were observed at 5 of 16 (31%) active heron colonies in 2003. These included Wilmer, Nicholson, Leach Lake, Toby Creek, and Moyie Lake. During observations of the Wilmer colony from a vantage, adult eagles were observed repeatedly landing on heron nests, attacking adults, removing nest contents, and carrying off chicks. Similar incidents were noted in 2002 at the Wilmer and Nicholson colonies (Machmer and Steeger 2003). At Leach Lake, adult eagles were observed attacking adults at several heron nests, knocking at least one adult heron to the ground in June of 2003. This bird sustained a broken wing, and two other adult heron carcasses were found nearby on the ground. Repeated eagle incursions at the Toby Creek site may have been linked to its, but appeared not to impact the Moyie Lake colony. Incursions into the Gorrie heron colony by a pair of Ospreys nesting within the stand were also noted.

Bald Eagle depredation on heron nestlings, juveniles and adults has frequently been reported in BC (Simpson and Kelsall 1978; Forbes et al. 1985a; Forbes 1987b; Simpson et al. 1987; Norman et al. 1989; Butler et al. 1995; Butler 1997; Vennesland 2000). Such predation is responsible for reduced breeding productivity and increased abandonment of colonies (Norman et al. 1989; Vennesland 2000). High levels of human activity near heron colonies have also been linked to increased disturbance from eagles and these two factors can act synergistically (Vennesland 2000). Bald Eagle populations have been steadily increasing in coastal BC (Blood and Anweiler 1994) and their impact on *A.h fannini* populations is thought to be increasing (Vennesland 2000, 2003). Bald Eagle populations in the interior are considered stable or increasing (although no systematic surveys have been undertaken; Blood and Anweiler 1994), but eagle impacts on heron breeding colony abandonment, nest failure and productivity has not been quantified.
Table 3. Comparison of the number of heron nests and active nests in 2003 with those surveyed in 2002 (Machmer and Steeger 2003) and 1982 (based on data standardized by Moul et al. 2001).

<table>
<thead>
<tr>
<th>Area</th>
<th>2003 Active Sites</th>
<th># Nests</th>
<th># Active</th>
<th>2002 Active Sites</th>
<th># Nests</th>
<th># Active</th>
<th>1982 Active Sites</th>
<th># Nests</th>
<th># Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Kootenay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revelstoke¹</td>
<td>14</td>
<td>11</td>
<td></td>
<td>Revelstoke¹</td>
<td>14</td>
<td>9</td>
<td>Revelstoke¹</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Proctor</td>
<td>7</td>
<td>3</td>
<td></td>
<td>Proctor</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Goose Creek</td>
<td>12</td>
<td>10</td>
<td></td>
<td>Champion Lake</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Goat River</td>
<td>26</td>
<td>26</td>
<td></td>
<td>Goat River</td>
<td>18</td>
<td>18</td>
<td>Goat River</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Leach Lake</td>
<td>92</td>
<td>86</td>
<td></td>
<td>Leach Lake</td>
<td>67</td>
<td>53</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Creston West</td>
<td>-</td>
<td>-</td>
<td></td>
<td>-</td>
<td>5</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td><strong>151</strong></td>
<td><strong>136</strong></td>
<td></td>
<td><strong>117</strong></td>
<td><strong>92</strong></td>
<td></td>
<td><strong>96</strong></td>
<td><strong>91</strong></td>
<td></td>
</tr>
<tr>
<td>East Kootenay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moyie Lake</td>
<td>8</td>
<td>8</td>
<td></td>
<td>Moyie Lake</td>
<td>8</td>
<td>4</td>
<td>Moyie Lake</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Dutch Creek</td>
<td>51</td>
<td>42</td>
<td></td>
<td>Dutch Creek</td>
<td>51</td>
<td>41</td>
<td>Fairmont</td>
<td>45</td>
<td>35</td>
</tr>
<tr>
<td>Nicholson</td>
<td>18</td>
<td>15</td>
<td></td>
<td>Nicholson</td>
<td>17</td>
<td>16</td>
<td>Golden</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Parson</td>
<td>61</td>
<td>42</td>
<td></td>
<td>Parson</td>
<td>77</td>
<td>66</td>
<td>Parsons</td>
<td>75</td>
<td>60</td>
</tr>
<tr>
<td>Wilmer</td>
<td>16</td>
<td>11</td>
<td></td>
<td>Wilmer</td>
<td>25</td>
<td>25</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Toby Creek</td>
<td>2</td>
<td>2</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Brisco north</td>
<td>-</td>
<td>-</td>
<td></td>
<td>Brisco north</td>
<td>54</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wasa</td>
<td>20</td>
<td>20</td>
<td></td>
<td>Saughum Lake</td>
<td>6</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fort Steele</td>
<td>4</td>
<td>4</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>St. Mary's River</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Gold Creek</td>
<td>10</td>
<td>3</td>
<td></td>
<td>Gold Creek</td>
<td>10</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sparwood</td>
<td>10</td>
<td>4</td>
<td></td>
<td>Sparwood</td>
<td>12</td>
<td>9</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td><strong>200</strong></td>
<td><strong>151</strong></td>
<td></td>
<td><strong>206</strong></td>
<td><strong>165</strong></td>
<td></td>
<td><strong>219</strong></td>
<td><strong>175</strong></td>
<td></td>
</tr>
<tr>
<td>Robson Valley</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valemount</td>
<td>3</td>
<td>2</td>
<td></td>
<td>Valemount</td>
<td>3</td>
<td>2</td>
<td>(area not covered)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td><strong>3</strong></td>
<td><strong>2</strong></td>
<td></td>
<td><strong>3</strong></td>
<td><strong>2</strong></td>
<td></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Total nests</strong></td>
<td><strong>354</strong></td>
<td><strong>289</strong></td>
<td></td>
<td><strong>326</strong></td>
<td><strong>259</strong></td>
<td></td>
<td><strong>315</strong></td>
<td><strong>266</strong></td>
<td></td>
</tr>
<tr>
<td><strong>No. colonies</strong></td>
<td><strong>16</strong></td>
<td><strong>17</strong></td>
<td></td>
<td><strong>-</strong></td>
<td><strong>17</strong></td>
<td></td>
<td><strong>-</strong></td>
<td><strong>9</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Size (mean ± SE)</strong></td>
<td><strong>22.1 ± 6.3</strong></td>
<td><strong>18.1 ± 5.7</strong></td>
<td></td>
<td><strong>19.2 ± 5.6</strong></td>
<td><strong>15.2 ± 4.8</strong></td>
<td></td>
<td><strong>35.0 ± 7.9</strong></td>
<td><strong>29.6 ± 6.5</strong></td>
<td></td>
</tr>
</tbody>
</table>

¹Breeding sites with the same names shown side by side in Table 3 do not necessarily represent the same point locations, however they are located within a similar geographic area and are shown for ease of comparison.
Data from Forbes et al. (1985a) and later standardized by Moul et al. (2001) were used to provide a rough comparison of heron nesting activity in 2002/2003 with nesting activity recorded during the last survey of a similar area (Table 3). Survey data from the year 1982 was chosen for comparison, because this year had the greatest number of entries for geographically comparable breeding sites. Table 3 suggests that although overall numbers of heron nests have increased since 1982, numbers of active nests are comparable (i.e., slightly lower and higher in 2002 and 2003, respectively). Furthermore, based on the 1982 data, numbers of total and active nests in the West Kootenay appear to have increased, whereas numbers in the East Kootenay appear to be decreasing.

Numbers of active heron colonies have increased since 1982 (from 9 in 1982 to 17 and 16 in 2002 and 2003, respectively), although this result is sensitive to the year selected for comparison (there was considerable year to year flux in the numbers and locations of colonies sampled; Forbes et al. 1985a). The average size of known colonies has decreased substantially since 1982 (from 29.9 active nests in 1982 to 15.2 and 18.1 in 2002 and 2003, respectively). Studies clearly demonstrate that smaller colonies have much higher variability in reproductive success and are more susceptible to nest failure (Forbes et al. 1985b; Butler et al. 1995; Gebauer 1995; Vennesland 2003). Therefore, the observed decreasing trend in colony size may have negative implications for breeding success and future heron recruitment.

All of the above comparisons are sensitive to the geographic scope of the area surveyed and the precise inventory methods used, which were not detailed in Forbes et al. The 1982 inventory results are based on a number of assumptions (Moul et al. 2001) and more intensive methods were used to capture a larger survey area during this inventory. For these reasons, conclusions regarding long-term population trends based on comparisons in Table 3 are limited.

The CBFWCP conducted opportunistic monitoring of heron colonies in the Columbia wetlands in June of 1993-1995 (Table 4). Colonies were visited once per year in June, all colonies were not visited in all years, and only active nests were counted in some years, making it difficult to use this data for comparative purposes. Table 4 suggests that the number of total and active nests at Dutch Creek was higher in 2002 and 2003
than in previous years, and that the total number of nests has declined in the Wilmer, Parson and Nicholson colonies relative to when they were first monitored. Few other generalizations can be made from this data set.

### 3.2.3 Assessment of Breeding Site Habitat Characteristics

Active and historical breeding sites were found in the following biogeoclimatic variants (see Appendix 5): PPdh2 (n = 6 or 18%); IDFun (n = 3 or 9%); IDFdm2 (n = 8 or 24%); ICHxw (n = 5 or 15% of sites); ICHdw (n = 5 or 15%); ICHmw2 (n = 1 or 3%); ICHmw3 (n = 3 or 9%); MSdk (n = 1 or 3%); and SBSdh (n = 1 or 3%). Breeding sites were located an average of 261 ± 71 m (range of 4–1,500 m) from a water body, and 73% of sites were found within 200 m of water. Closest water bodies ranged from rivers (n = 10 or 30% of sites) to small lakes and wetland complexes (n = 7 or 21% each), to reservoirs (n = 4 or 12%), large creeks (n = 4 or 12%) and large lakes (n = 1 or 3%). Often, multiple water bodies were associated with the same breeding site and further evaluation would be required to confirm where individuals were feeding. Two “islands” were included in our sample, however at least four additional sites in the Columbia wetlands were located on levees inundated for the bulk of the breeding season, and these essentially function as islands.

Active and historical nesting stands were characterized either as deciduous (cottonwood), coniferous, or mixed stands (Figure 4a). The proportion of coniferous nest stands we observed (48.5%) tended to be higher than that suggested in Forbes et al. (1985a). In terms of structural stage, 73% of sites were classified as mature, with the remaining 18% and 9% in young forest and old forest stages, respectively (Figure 4b). Crown closure in these stands tended to be high (overall mean ± SE = 66.4 ± 4.1%), but a wide range (25–93%) was observed. Over 80% of the breeding sites were located on flat ground, and the remaining sites had shallow slopes (overall mean ± SE = 3.3 ± 1.3%).

The diameter at breast height (cm), height (m), and decay class of a minimum of 75 sample nest trees (≤5 per nest stand) was visually estimated during nest visits. Sample sizes differ slightly by parameter because flooding occasionally obscured the base of a tree and hindered diameter estimation, but tree species and decay class could still be determined. Diameter, height, species, and decay class distributions of nest trees are shown in Figure 5 (a–d). A wide range of nest tree sizes were used by herons, however most trees were of relatively large diameter and height (Figure 5a,b). The sizes of random trees were not measured for comparison, however it appeared that herons were selecting trees of large diameter and height, relative to what was available in the surrounding stands. Herons nested in eight tree species (Figure 5c). Black cottonwood (*Populus balsamifera*; Ac) comprised 44% of all nest trees. Coniferous species combined [Douglas-fir (*Pseudostuga menziesii*; Fd), western white pine (*Pinus monticola*; Pw),

---

Figure 4. Forest types (a) and structural stages (b) of active and historical heron nesting stands.
hybrid white spruce (Picea glauca x engelmannii; Sx), ponderosa pine (Pinus ponderosa Py), western red cedar (Thuja plicata; Cw), western hemlock (Tsuga heterophylla; Hw), and western larch (Larix occidentalis; Lw) accounted for the 56% of the total. The vast majority of nest trees were alive, but a few had recently died (Figure 5d). Historical breeding stands tended to have more dead trees and whether these trees had already died at the time they were first used for nesting is unknown.
3.2.4 Other Observations

During 2002 surveys, it was apparent that beavers had chewed and cut down nest trees at several breeding sites, and particularly those within the Columbia wetlands (e.g., the historical Thompson’s Landing and Brisco colonies). In 2003, fresh beaver activity was noted only at the Parson and Nicholson colonies. Most trees in these colonies have already been protected with wire mesh, but additional wrapping of cottonwood nest trees at the periphery of both colonies is warranted. Nearby dominant cottonwoods that could function as recruitment nest trees in the event of nest tree failure are quite limited at the Parson, Nicholson and Wilmer sites. Physically protecting the bases of existing nest trees from beavers is the easiest and most cost-effective method to ensure suitable breeding habitat in the short term. However, in some portions of the Columbia wetlands, the supply of older cottonwood stands appears to be declining (Jamieson and Hennan 1998), and a cottonwood recruitment strategy will be required to ensure that adequate densities and distributions of these habitat elements are maintained through time.

3.2.5 Land Ownership of Breeding Sites

The proportional breakdown of breeding sites for all sites and active sites only is shown in Figure 6. Considering all sites, most are located on crown (n = 10) and private (n = 13) land. Seven are protected within designated provincial Wildlife Management Areas (WMAs) and two are managed by other land management agencies (LMA; i.e., The Nature Trust of BC). One additional site is located within a provincial park. When only active breeding sites are considered, 11 sites (69%) are on private land and clearly, working cooperatively with private landowners will need to be a priority to protect these sites.

Figure 6. Proportional (%) breakdown of the land/ownership status of heron breeding sites and active breeding sites only (WMA = provincial Wildlife Management Area; LMA = Land Management Agency).

The Great Blue Heron, its’ nests and eggs are protected year-round from direct persecution and harassment by the British Columbia Wildlife Act and the Migratory Birds Convention Act. More than half of heron nest stands in the Columbia Basin are located in mature coniferous stands, and there is a potential conflict between forestry operations and heron habitat protection. Under the Results Based Code and new Forest Practices and Range Act, some critical nesting and foraging habitats could be addressed through the establishment of Old Growth Management Areas (OGMAs), Riparian Management Areas (RMAs), Wildlife Tree Patches (WTPs) and Wildlife Habitat Areas (WHAs). “No disturbance” buffers around heron nesting stands are not currently enabled under the WHA designation (Paige 2003), however licensees may voluntarily maintain a buffer to minimize disturbance and protect the integrity of nesting habitat. At the municipal level, there may also be some potential to protect heron breeding sites on private land through zoning bylaws (see Paige 2003).
The *Results Based Code* offers no protection to \( \approx 70\% \) of the active heron breeding colonies in the Columbia Basin located on private land (Figure 6). This distribution emphasizes the need to protect those heron breeding sites on crown land, and to promote heron awareness and stewardship amongst private landowners and the general public.

Private landowners and land managers at most active sites were informally consulted during the 2003 breeding season (a single landowner declined to speak or meet with us and a 2nd absentee landowner could not be contacted). Each was informed of the presence of an active heron breeding site on their property. The vast majority of landowners and managers were receptive and expressed an interest in obtaining additional information on herons (see recommendations in Section 4.2).

A heron stewardship brochure is currently being prepared for landowners and land managers in the Columbia Basin. This brochure provides voluntary *guidelines* and *best management practices* near heron breeding and overwintering sites in the basin. It also provides information on the status, year-round habitat requirements, breeding schedules, and sensitivity to disturbance of this species. Finally, it offers suggestions pertaining to heron habitat protection and/or enhancement in the basin and provides a list of further reading, information sources and key contacts.

### 4.0 Conclusions and Recommendations

An estimated 578 adults (289 breeding pairs) and 288 pre-fledged young were counted during this inventory. These are minimum estimates, because some active colonies were likely not detected, and herons frequently re-nest (and may also relocate) after nest failure or predation (Dodd and Murphy 1995). This makes it problematic to obtain accurate counts of large colonies and creates considerable age variation among chicks. Some chicks are already branching while others are still relatively young, and selecting the most appropriate window to count chicks can be difficult. Acknowledging these limitations, few conclusions can be drawn regarding changes in the number of breeding heron pairs and their productivity since the previous inventory of the Columbia Basin (Forbes et al. 1985a). Heron colony sizes do appear to be declining in the basin, and given that smaller colonies are reported to have consistently lower reproductive success and higher nest failure rates (Forbes et al. 1985b; Vennesland 2000, 2003), this trend could have negative implications for heron recruitment.

### 4.1 General Recommendations

We make the following recommendations based on the findings of this inventory:

- **Continue monitoring rates of nest activity and reproductive success (per active and successful nest) at known active heron breeding colonies in the Columbia Basin in 2004, according to protocols established in 2002-2003.** Place additional survey emphasis on (a) areas where concentrations of herons were apparent but not confirmed in 2003/2002 (e.g., Bonanza Creek corridor, Lower Arrow Lake, Renata, Erie Lake/Salmo corridor, Marsh Creek, and potentially the Kaslo/Duncan corridor), and (b) any new information received in 2004.

- **Quantify the impacts of Bald Eagles on heron populations by conducting focal observation sessions at a subset of heron colonies representative of those in the basin (i.e., deciduous and coniferous stands, East/West Kootenay, large and small colonies, etc.).** These sessions would document the conditions and frequency of Bald Eagle incursions into heron colonies and quantify their immediate and long-term effects on heron populations.
term impacts (e.g., adult and chick injury/mortality, colony abandonment and nest failure, reduced reproductive success, etc.).

- Undertake breeding surveys for Bald Eagles to evaluate changes in eagle population trends in selected areas of the Columbia Basin. Surveys should concentrate on areas where (a) eagle predation on herons is most likely to be a significant issue (e.g., Creston Valley and Columbia wetlands), and where (b) previous breeding inventory data for eagles is available (Blood 1982; Forbes and Kaiser 1984; Machmer and Steeger, unpublished data; McMann 1996, 1997).

- Winter represents an energetic bottleneck for Great Blue Herons and severe winters are associated with high rates of juvenile and adult mortality in the Columbia Basin (Blus and Henny 1981; Butler 1992; Machmer 2002). Relatively little is known about the winter distribution of herons in the basin (R. Butler, pers. comm.), however identifying and protecting sites where herons aggregate in winter should be a key component of an overall conservation strategy for this species. Based on concentrations of fall/winter sightings already provided in Appendix 2 (e.g., Wardner, Nakusp, Creston Valley, Renata), conduct late fall/winter (November – January) heron searches at selected sites in the basin. Based on findings, identify key overwintering sites used by herons, summarize their habitat characteristics, use, ownership/status, and make recommendations for habitat protection and enhancement.

- Provide landowners and land managers whose properties support active nests with a stewardship brochure and encourage selected landowners (see site-specific recommendations in section 4.2) to explore possible land conservation agreements with land trust/acquisition agencies.

- Acknowledge the efforts of all contributors and volunteers involved in the study over the last two years with an article summarizing the main findings of the project to date and thanking all of the contributors. The article could provide explicit instructions for further volunteer participation in 2004 and be circulated basin wide to participating newspapers.

- Establish a formal “heron-watch” program comprised of volunteers willing to “keep an eye on” an active heron breeding site. This “heron watch” could serve as a supplement and/or surrogate to more intensive breeding site monitoring in some years. Ideally, one or more contacts (the landowner, land manager, or a person living close to the site) would be established for each active site in the basin. These contacts would be telephoned 2-4 times per breeding season as a way of informally monitoring occupancy and potential disturbance issues at particular sites. To set up this program, landowners and/or candidate volunteers from the sightings database could be contacted to gage their willingness to participate, and then a list could be finalized.

- Some active and historical rookeries in the Columbia wetlands have been impacted by beaver activity. Although many nest trees have already been protected with wire mesh, some additional protection is warranted in the Nicholson, Wilmer, and Parson rookeries. This would involve wrapping the bases of selected nest trees (and adjacent veteran and dominant cottonwoods) with wire mesh. The CBFWCP should also encourage and fund non-profit societies, outdoor groups, youth groups, etc. to undertake additional cottonwood protection projects in the wetlands under their direction.

- The CBFWCP should continue to place a strong emphasis on the inventory and management of riparian cottonwood habitat as part of its program mandate. The development of a Basin-wide cottonwood management and recruitment strategy should be undertaken, to ensure that adequate densities and distributions of these habitat elements are maintained through time. This strategy must also address private land and provide an incentive program to promote protection of veteran
cottonwood stands. On crown land, penalties for cottonwood removal are currently negligible (Tracy Pearce, MOF, Castlegar, pers. comm.), and a public lobby to drastically increase and enforce existing penalties should be promoted.

- Although informal contacts with most landowners and land managers have already been made, forest companies and land management agency personnel responsible for the management of properties with active nest sites should also be contacted by the regional Rare and Endangered Species Biologist (or some other designate). Where development is planned, opportunities for the designation of OGMAs, RMAs, WTPs, WHAs, and/or “no disturbance buffer zones” (i.e., ≥300 m radius; Paige 2003) during the breeding season (early March to August) should be explored with them. In addition to protection of breeding habitat, protection of nearby feeding habitat is critical (Paige 2003) and should be emphasized in the delineation of areas above. Licensees should refer to the new Standards for Management of Identified Wildlife (Paige 2003) and also consider designation of voluntary buffers to supplement these guidelines.

- Best management practices or “guidelines” provided to landowners should include (but not be limited to) the following:

1. Minimize disturbance to the core nesting area (i.e., ≈300 m radius area) during the breeding season (March 1 to August 31).
2. Maintain important structural elements for nesting and foraging (i.e., suitable nest trees, non-fragmented forest around nest trees, wetland characteristics for foraging if applicable, roost trees, and ground barriers to exclude mammalian predators) within the core area.
3. Maintain integrity of foraging habitats and maintain adjacent roosting trees.
4. In areas where human disturbance is a concern, restrict access during the breeding season and maintain or incorporate boundaries (e.g., ditches, fences, water) that may act as barriers to humans wherever possible (see Carlson and McLean 1996). [Landowners willing to establish such barriers should be given funding consideration by the CBFWCP, or other funding agencies].
5. Do not develop roads or trails or recreational structures or facilities within the core area. Limit access to existing roads and trails during the breeding season (March 1 to August 31)
6. Do not conduct harvesting or silvicultural activities within the core area.
7. Do not develop recreational trails, structures or facilities within the core area.
8. Avoid mechanized activities in the core area during the breeding period (March 1 to August 31).
9. Where permanent activities or habitat modifications take place within the core area, vegetative screening should be planted or maintained between the activity/modification and the colony. Where possible, the trees/shrubs planted should be a mixture of deciduous and coniferous, and half should be of the same species currently used for nesting. Consider constructing a fence or other barrier between the activity and vegetative screening. [Landowners willing to establish such barriers should be given funding consideration by the CBFWCP, or other funding agencies].

### 4.2 Site-Specific Recommendations

In addition to the general recommendations above, specific recommendations are provided for the following active sites (Table 5).
Table 5. Follow-up recommendations for selected active heron breeding sites.

<table>
<thead>
<tr>
<th>Breeding Site</th>
<th>Land Status</th>
<th>Contact</th>
<th>Management Concern</th>
<th>Recommendations</th>
<th>Priority for Follow-up</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dutch Creek</td>
<td>private</td>
<td>-</td>
<td>This colony had nearby disturbance in spring/summer 2002 related to tree and brush removal associated with the construction of trails. No disturbance noted in 2003.</td>
<td>- A walking/horse trail that extends within ≈50 m of the rookery and is inundated at high water should be re-routed to bypass the rookery entirely, thereby minimizing the potential for future disturbance to this colony during the breeding season.</td>
<td>- Highest priority for formal protection</td>
<td>- NGO to approach landowner and explore potential interest in conservation agreement or land acquisition.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- A dialogue should be established with the property owner, as this rookery supports consistently high numbers of herons; it is located adjacent to an important feeding area and should receive some sort of formal protection.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- A walking/horse trail that extends within ≈50 m of the rookery and is inundated at high water should be re-routed to bypass the rookery entirely, thereby minimizing the potential for future disturbance to this colony during the breeding season.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- A dialogue should be established with the property owner, as this rookery supports consistently high numbers of herons; it is located adjacent to an important feeding area and should receive some sort of formal protection.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fort Steele</td>
<td>private</td>
<td>-</td>
<td>The landowners are aware of the herons nesting here for the first time and have a keen interest in seeing this site remain active/undisturbed. No current disturbance or changes to land use are anticipated.</td>
<td>- Continue monitoring of nest occupancy, activity and success; this nesting site was occupied for the first time last year, so it is important to check for re-occupancy.</td>
<td>- High priority for follow-up to ensure that nests are adequately protected in the event of future forest development activity.</td>
<td>- Rare &amp; Endangered Species Biologist, WLAP.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Maintain contact with the landowners and involve them in any ongoing monitoring initiatives.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goat River</td>
<td>private</td>
<td>-</td>
<td>The land manager is aware of the colony, which has been there for &gt;20 years. The area is inaccessible and no disturbance/land use changes are anticipated.</td>
<td>- This rookery can only be accessed from the air. The area should continue to be left alone and no follow-up is recommended at this time, other than continued annual monitoring of colony occupancy and number of active nests from the air.</td>
<td>- High priority for follow-up to ensure that nests are adequately protected in the event of future forest development activity.</td>
<td>- NGO to approach landowner and explore potential interest in conservation agreement.</td>
</tr>
<tr>
<td>Gold Creek</td>
<td>crown</td>
<td>-</td>
<td>The colony is located within a FDP area. The land manager has been made aware of the nest locations and has stated that they will be placed in some form of reserve.</td>
<td>- To ensure that this site is protected in the long term, the Rare &amp; Endangered Species Biologist should contact the land manager and discuss/track management options and their implementation at this site.</td>
<td>- High priority for follow-up to ensure that nests are adequately protected in the event of future forest development activity.</td>
<td>- Rare &amp; Endangered Species Biologist, WLAP.</td>
</tr>
<tr>
<td>Goose Creek</td>
<td>private</td>
<td>-</td>
<td>Some previous partial cutting has taken place in the stand adjacent to where the current colony is located. Since 2001, the landowner has been progressively clearing/draining a wetland across the road where the herons feed. The landowner does not want to be contacted, but has been made aware of the rookery on his property.</td>
<td>- A formal letter should be drafted to inform the landowner of the protected status of the nests under section 34 of the Wildlife Act. The occupancy status of this colony should continue to be monitored from the road.</td>
<td>- Medium priority for follow-up to seek conservation/purchase agreement with landowner.</td>
<td>- Rare &amp; Endangered Species Biologist to draft letter to landowner. - NGO to approach landowner and explore potential interest in conservation agreement or purchase.</td>
</tr>
<tr>
<td>Leach Lake</td>
<td>WMA</td>
<td>-</td>
<td>This site is well buffered and receives little human disturbance. The land manager is aware of the need to curb any management activities within 300 m of the colony during the breeding period.</td>
<td>- Bald Eagle incursions and mortality were observed here and should be further investigated to quantify their impact on this large colony.</td>
<td>- Low priority for follow-up to seek conservation agreement with landowner.</td>
<td>- NGO to approach landowner and explore potential interest in conservation agreement.</td>
</tr>
<tr>
<td>Moyie Lake</td>
<td>private</td>
<td>-</td>
<td>Herons at this site are subject to minimal disturbance, as long as current land use does not change. The landowner is aware of the rookery and would prefer if the site were observed from off his property.</td>
<td>- A Bald Eagle nest is located directly across the highway; this site should be observed to quantify potential eagle impacts on this colony.</td>
<td>- Low priority for follow-up to seek conservation agreement with landowner.</td>
<td>- NGO to approach landowner and explore potential interest in conservation agreement.</td>
</tr>
<tr>
<td>Breeding Site</td>
<td>Land Status</td>
<td>Contact</td>
<td>Management Concern</td>
<td>Recommendations</td>
<td>Priority for Follow-up</td>
<td>Responsibility</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>---------</td>
<td>--------------------</td>
<td>-----------------</td>
<td>------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Nicholson</td>
<td>private</td>
<td>- The land manager is aware of this breeding site and discourages people from accessing the area. - Beavers are active and have taken down large trees in this area; many nest trees are already screened. - There is an active Bald Eagle nest within 0.5 km of this rookery.</td>
<td>- A few additional nest trees and adjacent recruitment cottonwoods could be screened to protect them from beavers. - Bald Eagle incursions and mortality were observed at this site and it should be observed to quantify potential eagle impacts on this colony. - NGO should follow up directly with landowner to explore potential interest in conservation agreement.</td>
<td>Low priority since site receives minimal use and herons are already habituated to current uses.</td>
<td>NGO to approach landowner and explore potential interest in conservation agreement.</td>
<td>CBFWCP to follow up on tree screening.</td>
</tr>
<tr>
<td>Parson</td>
<td>WMA</td>
<td>- Access to this site is by water only and it receives little disturbance. - Some nest trees have been screened to protect them from beavers.</td>
<td>- Some additional nest trees and adjacent recruitment cottonwoods should be protected from beavers at this rookery.</td>
<td>Low priority</td>
<td>CBFWCP to follow up on tree screening.</td>
<td></td>
</tr>
<tr>
<td>Proctor</td>
<td>private</td>
<td>- The absentee landowner has been contacted (property has recently changed hands as part of an estate). The fate of the property is unclear, however the landowner expressed interest in the herons. Neighbours have apparently complained regarding early morning noise and have suggested cutting down the trees.</td>
<td>- The landowners should be informed of these concerns and of their rights/responsibilities under Section 34 of the Wildlife Act. - Options to protect this rookery through a conservation agreement should be explored with the current landowner prior to the sale of this property.</td>
<td>High priority for follow-up due to recent change of owner and high likelihood of property turnover.</td>
<td>NGO to approach landowner and explore potential interest in conservation agreement or purchase.</td>
<td></td>
</tr>
<tr>
<td>Revelstoke</td>
<td>private</td>
<td>- This rookery is located on a densely forested vacant lot; a single felled western red cedar was skidded out of the nest stand in spring 2003, but land does not appear to be used.</td>
<td>- The property owner (as well as the occupant of the adjacent property) should be provided with information regarding best management practices around heron nests. - This site has been re-used for many years, and the opportunity for a formal conservation agreement or land purchase should be explored with the landowner.</td>
<td>High priority for follow-up.</td>
<td>NGO to approach landowner and explore potential interest in conservation agreement or purchase.</td>
<td></td>
</tr>
<tr>
<td>Sparwood</td>
<td>private</td>
<td>- The site is industrialized and both the railway and a road run adjacent to it.</td>
<td>- The herons appear habituated to nearby industrial activity, but to minimize the potential for disturbance, loading of railcars and trucks idling should be minimized in early breeding season. - A dialogue regarding other best management practices should be initiated with the land manager.</td>
<td>Low priority for follow-up.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toby Creek</td>
<td>private</td>
<td>- The landowner is aware of this nest site and has been informed of the need to minimize disturbance in this area.</td>
<td>- The northern boundary of the nest stand is adjacent to a large industrial building and workers in this area should also be informed of the need to minimize disturbance adjacent to the nest stand.</td>
<td>High priority for follow-up.</td>
<td>NGO to approach landowner and explore potential interest in conservation agreement or purchase.</td>
<td></td>
</tr>
<tr>
<td>Wasa Lake</td>
<td>private</td>
<td>- The landowner is aware of the active rookery and expressed interest. The site is subject to very occasional disturbance (by people on horses with dogs) moving through on trails that traverse the stand and connect with the Kootenay River. No changes to land use are anticipated.</td>
<td>- The opportunity for a formal conservation agreement or land purchase should be explored with the landowner, given the ideal location of this site adjacent to the Wasa sloughs and the Kootenay River. - Best management practices should be provided to the landowner.</td>
<td>High priority for follow-up, (assuming it is occupied again this year).</td>
<td>NGO to approach landowner and explore potential interest in conservation agreement or purchase.</td>
<td></td>
</tr>
<tr>
<td>Wilmer</td>
<td>WMA</td>
<td>- Access to this site is by water only. Some trees have been screened. A pair of Bald Eagles nest within the rookery and persistent disturbance and mortality has been observed here.</td>
<td>- Additional nest trees and adjacent recruitment cottonwoods at this rookery could be protected from beavers. - Bald Eagle incursions and heavy mortality were observed at this site; it should be observed to quantify potential eagle impacts on this colony.</td>
<td></td>
<td>CBFWCP to follow up on tree screening.</td>
<td></td>
</tr>
</tbody>
</table>
Literature Cited


BC Wildlife Tree Committee. 2001. Wildlife/Danger Tree Assessor’s Course Workbook. BC Min. Forests, Min. of Environment, Lands and Parks, and Workers’ Compensation Board, Victoria, BC.


Appendices

1. Heron Information Poster
2. Heron Sighting Database (confidential information)
3. Biologist Survey Log (confidential information)
4. Volunteer Survey Log (confidential information)
5. Breeding Site Database (confidential information)
6. Photo Record
INFO WANTED ON:

GREAT BLUE HERON
NEST & COLONY LOCATIONS OR SIGHTINGS

IN THE COLUMBIA BASIN FOR AN INVENTORY SPONSORED BY:

COLUMBIA BASIN FISH & WILDLIFE
COMPENSATION PROGRAM AND THE
WEST KOOTENAY NATURALISTS

Please call: (250) 354-0150
Email: mmachmer@netidea.com
Report sightings on line: cbfishwildlife.org
a. Great Blue Heron foraging.
b. Eggshells and feathers at base of nest tree.
c. Bolus containing regurgitated prey remains.
d. Whitewash at base of nest tree.
e. Brood on nest.
f. View of Creston Valley from fixed wing aircraft.
g. Vehicle/kayak surveys.
h. Canoe survey of the Columbia wetlands.
i. Nest colony in cottonwood deciduous habitat.
j. Nest colony in coniferous habitat.
k. Nest colony in mixed habitat.
l. Ed Beynon, West Kootenay Naturalists.
m. View from historical Begbie Creek colony.
n. Nicholson breeding site and wetland.
o. Heron nesting colony in the Columbia wetlands with Bald Eagle nest (left) in center of colony.
p. Bald Eagle nest in historical heron colony.
q. Bald Eagle nest with chick in historical heron colony.
r. Heron nest trees felled by beaver in historical nesting colony.
s. Floating remains of heron nest trees in historical nesting colony.
t. Large cottonwood in wetlands with beaver chew.
u. Suspected heron nest stand near cleared in winter 2003.
v. Dead chick found under nest tree.