Great Blue Heron

Ardea herodias

Original[1] prepared by Ross G. Vennesland

Species Information

Taxonomy

Three subspecies of the Great Blue Heron are recognized in North America, two of which occur in British Columbia: *A. herodias herodias*, which occurs across most of North America, and *A. herodias fannini*, which occurs only on the Pacific coast from Washington to Alaska (Payne 1979; Hancock and Kushlan 1984; Cannings 1998). The separation of these subspecies is based on differences in plumage, morphology, and migratory behaviour (Hancock and Elliott 1978; Payne 1979).

Description

The Great Blue Heron is the largest wading bird in North America, and measures about 60 cm in height, 97–137 cm in length, and 2.1–2.5 kg in mass (Butler 1992). The wings are long and rounded, the bill is long, and the tail is short (Butler 1992). Great Blue Herons fly with deep, slow wingbeats and with their necks folded in an S-shape. Plumage is mostly a blue-grey colour and adults have a white crown.

Distribution

Global

Great Blue Herons breed in three distinct regions of North America. *Ardea herodias occidentalis* breeds in Florida, *A. herodias fannini* breeds on the Pacific coast from Washington to Alaska, and *A. herodias herodias* breeds from southern Canada south to Central America and the Galapagos (Butler 1992). Populations of *A. herodias fannini* are non-migratory (Butler 1992). Winter ranges for *A. herodias herodias* include the Pacific coast of North America, the continental United States, Central America, and northern South America to Colombia, Venezuela, and the Galapagos (Butler 1992).

British Columbia

In British Columbia, *A. herodias fannini* occurs year-round on the Pacific Coast and occasionally inland to the Bulkley Valley (Campbell et al. 1990; Gebauer and Moul 2001), and *A. herodias herodias* occurs in southern interior regions of the province primarily during breeding and migratory periods (Campbell et al. 1990; Cannings 1998). The highest concentrations of breeding herons occur in the Georgia Depression ecoprovince due to the presence of several large colonies (Campbell et al. 1990; Gebauer and Moul 2001).

Forest regions and districts

The *A. herodias fannini* subspecies occurs in the Coast Forest Region and the *A. herodias herodias* subspecies occurs in the Southern and Northern Interior forest regions.

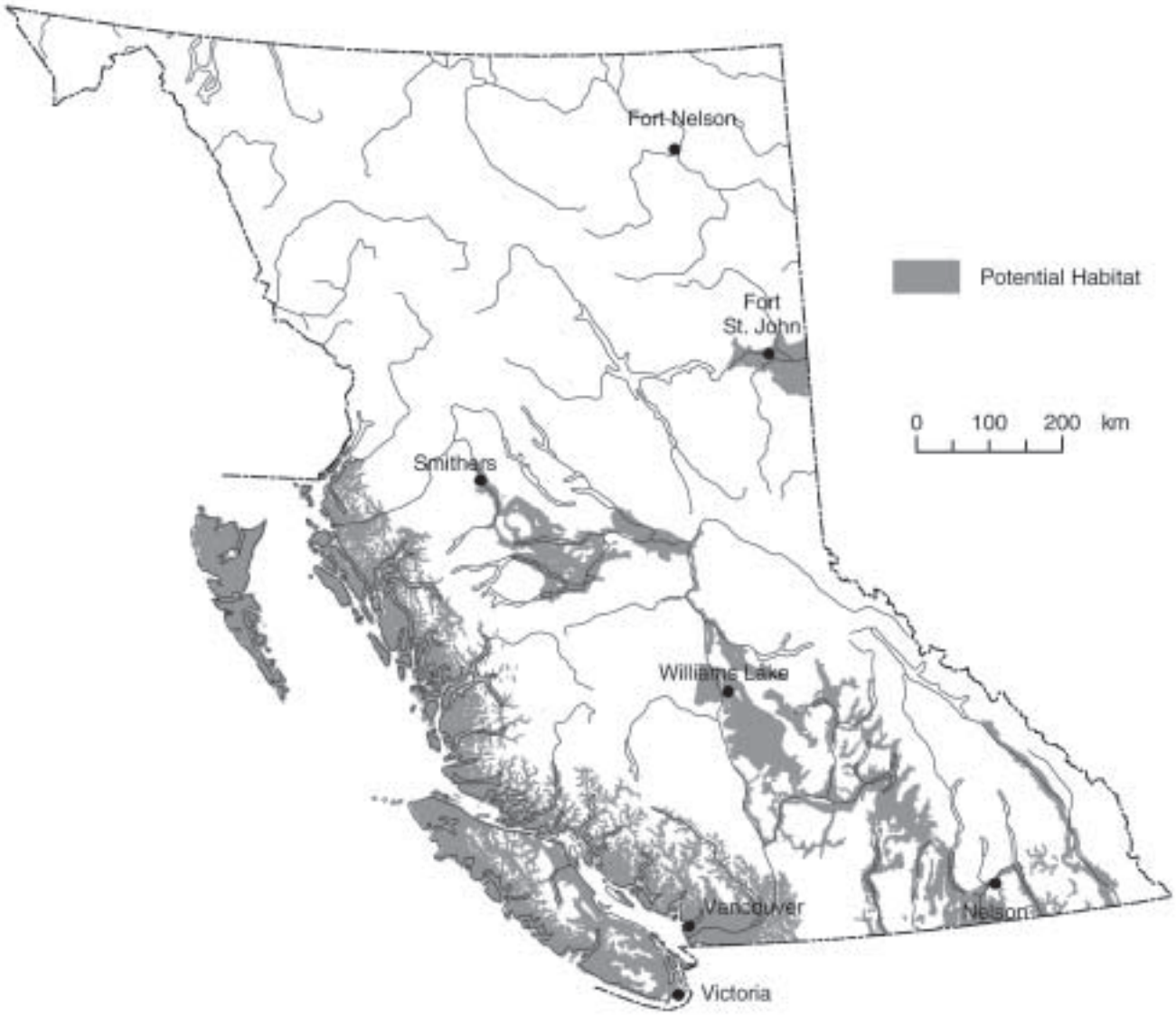
Coast: Campbell River*,[2] Chilliwack*, North Coast*, North Island, Queen Charlotte Islands*, South Island*, Squamish*, Sunshine Coast*

Northern Interior: Kalum, Nadina, Peace, Prince George, Skeena Stikine, Vanderhoof

Southern Interior: 100 Mile House*, Arrow Boundary*, Cascades*, Central Cariboo*, Chilcotin, Columbia*, Headwaters*, Kamloops*, Kootenay Lake*, Okanagan Shuswap*, Quesnel*, Rocky Mountain*

1 Draft Vol. 1 account prepared by Ken Summers.
2 * = known to breed.

Great Blue Heron
(Ardea herodias)



Note: This map represents a broad view of the distribution of potential habitat used by this species. The map is based on several ecosystem classifications (Ecoregion, and Biogeoclimatic) as well as current knowledge of the species' habitat preferences. This species may or may not occur in all areas indicated.

Ecoprovinces and ecosections

BOP: PEL, HAP

CEI: BUB, CAB*, CAP*, CHP, FRB, NAU, NEU

COM: CPR, CRU, EPR*, HEL*, KIM, KIR, MEM, NAM, NCF, NIM, NPR, NWC*, NWL, OUF, QCL*, QCT, SBR, SKP*, SPR*, WIM*, WQC*

GED: FRL*, GEL*, LIM*, NAL*, SGI*, SOG*

SBI: BAU, BUB, NEL, NSM, SSM

SIM: BBT, CAM, CCM*, EKT*, EPM, MCR, NPK, SCM*, SFH*, SHH*, SPK*, SPM*, UCV*, UFT

SOI: GUU*, LPR, NIB*, NOB*, NOH*, NTU*, OKR, PAR, SCR, SHB*, SOB*, SOH, STU*, THB, TRU*

Biogeoclimatic units

BG: xh1, xw1

CDF: mm

CWH: dm, ms1, ms2, vh1, vh2, vm1, vm2, wh1, xm

ICH: dw, mk1, mk2, mk3, mw2, mw3, xw

IDF: dk3, dm2, mw1, mw2, un, xh1, xh2

MS: dk

PP: dh2, xh1, xh2

SBS: dk or dh, dw1

Broad ecosystem units

CB, CF, CR, ES, IM, PR, RR, SP, SR, WL, (UR in GED ecoprovince)

Elevation

In British Columbia, most herons occur near sea level on the coast or in the lowlands and valley bottoms of the Interior, though nesting and occurrences have been documented to 1100 m (Campbell et al. 1990).

Life history

Diet and foraging behaviour

Great Blue Herons are prey generalists, although they primarily forage for fish. They stalk prey by walking or standing in shallow water along the shoreline of oceans, marshes, lakes, and rivers and in fields or other vegetated areas (Butler 1992). In upland areas they stalk mostly small mammals such as rodents (Butler 1992). This upland foraging behaviour is more common in winter and for juveniles learning to hunt (Butler 1991). Other prey types include amphibians, reptiles, invertebrates, and birds (Butler 1992). Prey is located by sight and is caught by a rapid thrust of the neck and head (Butler 1992). Herons generally swallow their prey whole (Butler 1992). See Gebauer and Moul (2001) for a more exhaustive review of diet and foraging behaviour.

Reproduction

Great Blue Herons nest throughout the southern Interior and coastal areas of the province, but breeding is concentrated in the Strait of Georgia where several colonies of >100 breeding pairs occur (Eissinger 1996; Butler 1997). It has been estimated that about 84% of the *A. herodias fannini* population and about 65% of all Great Blue Herons in the province breed in this area (Butler 1997; Gebauer and Moul 2001). Large colonies are associated with extensive estuarine mudflats and eelgrass beds around the Fraser River delta (Butler 1993; Eissinger 1996). Colony size has been associated with available foraging area for the Great Blue Heron (Gibbs 1991; Butler 1992; Gibbs and Kinkel 1997).

Breeding is initiated between February and April for *A. herodias fannini* and in late March for *A. herodias herodias* (Butler 1992; Gebauer and Moul 2001). Males arrive at the colony site and establish territories, followed about 1 week later by the females (Butler 1991). Courtship and nest repair and/or building take from several days to about a month (Butler 1991). Monogamous pairs are established for the season (Simpson 1984), and an average of four eggs is laid at about 2-day intervals (Vermeer 1969; Pratt 1970). Clutch size ranges from one to eight, with three to five being typical (Ehrlich et al. 1988; Campbell et al. 1990). Incubation begins soon after the first egg is laid, resulting in asynchronous hatching (Butler 1992). Hatching occurs after about 27 days of incubation (Butler 1992). Young are reared on the nest for about 60 days, fed mostly fish caught near the colony site (Krebs 1974; Simpson 1984). One breeding cycle requires about 100 days, and herons reproduce for about 200 days around the

Strait of Georgia. Thus, herons can potentially breed more than once if their first attempt fails. Breeding duration for the Interior is not known. Heron breeding sites can be relocated rapidly because nests can be built in 3 days (Butler 1997) and eggs can be laid within about 1 week (Butler 1997).

Great Blue Herons first breed after their second winter (Pratt 1973). Estimates of mortality from band recovery data (outside of British Columbia) range from 69% for first year juveniles, 36.3% for second year juveniles, and 21.9%/yr thereafter (Henney 1972, cited by Butler 1992).

Site fidelity

Colonies are dynamic, especially in areas of high disturbance (Butler 1992; Vennesland 2000). Some colonies are used for many years (e.g., Shoal Island, Point Roberts, and Stanley Park, all about 28 years), but most colonies, especially those under 50 nests, are relocated more frequently (Gebauer and Moul 2001). Across British Columbia, it is not clear how frequently the same individuals return to the same nest site. However, at one colony on the Sunshine Coast, Simpson et al. (1987) found that 40% of the breeding herons in 1978 did not return in 1979, and most breeding herons were on different nests and with different mates in 1979. Once a colony has been abandoned for more than 1 year, recolonization occurs infrequently (Gebauer and Moul 2001).

Home range

In British Columbia, breeding colonies range in size from two to about 400 nests with some pairs nesting solitarily (Gebauer and Moul 2001). In south-coastal British Columbia in 1999, Vennesland (2000) reported a mean colony size of 62 nests (SD = 94, n = 31), a median of 26 nests, and that the "typical" heron nested in a colony of 199 nests. Large colonies in deciduous trees or small and dispersed colonies can encompass several hectares (R.G. Vennesland, pers. obs.; M. Chutter, pers. comm.). In southern British Columbia, Machmer and Steeger (2002) reported a mean colony size of 19 nests (SE = 6, n = 7) and a range of 1–77 nests. During the breeding season, adult herons range within about 30 km of their colonies, although most stay within 10 km (Butler 1991, 1997). During winter, some adults maintain small foraging territories (Butler 1991), but little is known of how frequently alternate sites are used.

Movements and dispersal

Little is known of the initial dispersal of Great Blue Herons from their natal site, but band recoveries suggest that most fledglings disperse from their natal areas (Henney 1972, cited by Butler 1992). Juveniles are believed to disperse widely, often northwards during the summer after fledging. Long distance dispersal of juveniles has been reported. Campbell et al. (1972, cited by Campbell et al. 1990) reported juvenile dispersal from Vancouver to the Fraser Lowlands, Washington State, Oregon State, and Kamloops. On the coast of British Columbia, *A. herodias fannini* is primarily non-migratory, with most birds wintering close to breeding areas (Butler 1997; Gebauer and Moul 2001). In contrast, *A. herodias herodias,* in the interior of the province, is primarily migratory, although the extent of southward movement is unknown. Groups of *A. herodias herodias* are known to overwinter along ice-free watercourses of southern British Columbia (Machmer 2002), but some birds migrate as far south as Mexico and South America (Campbell et al. 1990; Butler 1992).

Habitat

Structural stage (breeding)

5: young forest
6: mature forest
7: old forest

Important habitats and habitat features

Foraging

Great Blue Herons require abundant and accessible prey within 10 km of a breeding location (Butler 1995). Important foraging habitats include aquatic areas such as tidal mudflats, riverbanks, lakeshores, and wetlands (Butler 1992). Shallow water fish species are the most important prey group for herons during breeding and non-breeding seasons (Butler 1992). During winter on the coast, when

aquatic prey are less abundant due to a reduced duration of daytime low tides, fallow agricultural fields become important foraging areas for adult and juvenile herons (Butler 1992; Gebauer and Moul 2001). Inland fields are considered an important foraging habitat for both adults and juveniles in the lower Fraser Valley and on southern Vancouver Island (Gebauer and Moul 2001). The number of herons that use non-aquatic foraging habitats is not known, but large numbers of herons reside in south-coastal areas—an estimated 3326 herons (Gebauer and Moul 2001)—so it is likely that these areas are an important foraging habitat for a significant portion of the heron populations in this area. The importance of non-aquatic foraging habitat for herons in the Interior and on other areas of the coast is not known.

Nesting

Colonies occur in relatively contiguous forest, fragmented forest, and solitary trees (Butler 1997). Nests are generally located close together, although highly dispersed colonies have been reported (Vennesland, pers. obs.; M. Chutter, pers. comm.). The most common tree species used for breeding on the coast are red alder (*Alnus rubra*), black cottonwood (*Populus balsamifera*), bigleaf maple (*Acer macrophyllum*), lodgepole pine (*Pinus contorta*), Sitka spruce (*Picea sitchensis*) and Douglas-fir (*Pseudotsuga menziesii*) (Gebauer and Moul 2001). In the southeastern interior, black cottonwood comprises 54% of nest trees with coniferous species —Douglas-fir, western white pine (*Pinus monticola*), hybrid white spruce (*Picea glauca* × *engelmannii*), ponderosa pine (*Pinus ponderosa*), western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*)—accounting for the remaining 46% (Machmer and Steeger 2002). Nest in coniferous trees are more difficult to detect, even during aerial surveys. See Gebauer and Moul (2001) for a more exhaustive review of tree species utilized.

The size of Great Blue Heron populations has been correlated with the area of foraging habitat available locally (Butler 1993; Gibbs and Kinkel 1997). It is therefore important, especially in highly urbanized areas such as Vancouver and Kelowna, that sufficient nesting habitat is maintained near important feeding areas (Butler 1997). In addition, since herons frequently relocate colonies, it is also important that alternate forested sites be available. The very large colonies (~200–400 breeding pairs) that occur around the lower Fraser Valley rely on large parcels of primarily deciduous (mostly red alder) forest. Eagle activity is likely increasing at these sites, making the availability of this type of forest important for reducing the potential impact of foraging eagles by giving herons alternate nesting locations if eagle activity becomes too high at traditional sites (Vennesland 2000).

Conservation and Management

Status

Both subspecies of the Great Blue Heron are on the provincial *Blue List* in British Columbia. In Canada, the *fannini* subspecies is considered a species of *Special Concern* (COSEWIC 2002). The status of the *herodias* subspecies has not been assessed.

Summary of ABI status in BC and adjacent jurisdictions (NatureServe Explorer 2002)

Subspecies	BC	AB	AK	ID	MT	OR	WA	Canada	Global
A. h. fannini	S3B, S5N	–	S4	–	–	–	?	N?	G5T4
A. h. herodias	S3B, S5N	S3B, S1N	–	S5B, S5N	S4B, SZN	S4	S4S5	N5B, NZN	G5T5

Trends

Population trends

Population size has been difficult to estimate for this species because colonies are not stable entities and are difficult to track in a standardized fashion (Butler 1997; Vennesland 2000; Gebauer and Moul 2001). The *fannini* subspecies in British Columbia is currently estimated at 3626 breeding adults, with an estimated 3326 adults breeding in the Strait of Georgia and 300 breeding elsewhere on the coast (Butler 1997; Gebauer and Moul 2001). The size of the *herodias* subspecies in British Columbia is not known, but probably ranges between 300 and 700 individuals (Gebauer and Moul 2001).

Population trends are also difficult to estimate. Few data are available on the coast prior to the past 30 years; however, over this period the population has been reported to be generally stable or declining. Gebauer and Moul (2001) reported that the Great Blue Heron population on the coast had apparently not changed significantly since Butler (1997) estimated the heron population from data collected from 1987 to 1992, although some measures showed declines (Gebauer and Moul 2001). An annual decline rate of 5.7% was reported from Breeding Bird Survey (BBS) data from 1966 to 1994 (Downes and Collins 1996), but Christmas Bird Counts (CBC) showed populations to be generally stable (Gebauer and Moul 2001). An exception is the Sunshine Coast area, where CBC data indicate a decline from 1991 to 1997. In addition, the number of herons observed breeding on the Sunshine Coast dropped from 97 in 1978 (Forbes et al. 1985b) to 11 in 1999 (Vennesland 2000). Campbell et al. (2001) concluded that coastal Great Blue Herons were the most at risk out of 28 species of birds in British Columbia that showed significant declines based on BBS data. It is generally believed that the size of the Great Blue Heron population in the Interior has increased over the past century, but little information is available on the magnitude of this increase (Gebauer and Moul 2001). Seventeen active breeding sites with 259 active heron nests were detected during a 2002 breeding inventory of the Columbia Basin in British Columbia (Machmer and Steeger 2002). This compares to 10 active sites with 266 active nests in a 1982 survey of a smaller portion of the basin (Forbes et al. 1985a); differences in survey methods and survey area size limit conclusions regarding population trends.

Habitat trends

Suitable nesting habitat has undoubtedly declined in British Columbia over the past century due to increases in the size of human populations and industry, especially in south-coastal areas around the Fraser River delta and Vancouver Island (Moore 1990; Butler 1997; Campbell et al. 2001). The availability of suitable forested lands in British Columbia continues to decrease (Butler 1997; Gebauer and Moul 2001). Habitat destruction in south coastal British Columbia has resulted in the abandonment of at least three colonies (Gebauer 1995; Vennesland 2000). Similarly, the construction of dams, flooding or reservoirs, and the development of forest and riparian lands is associated with some heron colony abandonment in the Interior (Machmer and Steeger 2002).

Suitable foraging habitat is also likely declining in British Columbia, and this decline is considered to be as or more important than that of breeding habitat (Gebauer and Moul 2001). The size of Great Blue Heron populations is correlated with the area of foraging habitat available locally, and consequently the largest concentrations of herons occur around the Fraser River delta where extensive mudflats and eelgrass beds provide abundant foraging locations (Butler 1993; Eissinger 1996; Gibbs and Kinkel 1997). Local declines in foraging habitat have likely been greatest in south-coastal British Columbia because most of the province's human population is located in this area (Butler 1997; Gebauer and Moul 2001).

Threats

Population threats

Direct threats to Great Blue Heron populations in British Columbia include disturbance and mortality from predators and humans, food supply limitations, contamination, and weather.

Vennesland (2000) reported that Bald Eagle (*Haliaeetos leucocephalus*) depredation and human disturbance were the most important direct threats to heron populations because of reductions in breeding productivity. During the 1998 and 1999 breeding seasons, eagles were likely involved in 13 of 14 colony abandonments observed, and eagle depredation of eggs and nestlings had a significant negative impact on the breeding productivity of colonies in south coastal British Columbia (Vennesland 2000). Over the same period, human disturbance was likely involved in one colony abandonment (Vennesland 2000). Other authors have also commented on the potential problems associated with eagles and humans (e.g., Parnell et al. 1988; Norman et al. 1989; Butler et al. 1995; Butler and Vennesland 2000; Gebauer and Moul 2001). Human disturbance has been implicated in many historical colony abandonments in British Columbia (Kelsall and Simpson 1979; Forbes et al. 1985a). Additionally, both these sources of disturbance are increasing in British Columbia (Vermeer et al. 1989; Blood and Anweiller 1994), and their impact on breeding herons is also probably increasing (Vennesland 2000). The killing of adult herons who feed on farmed fish stocks is currently prohibited due to the large influence that the removal of breeding adults can have on local heron populations (Butler and Baudin 2000; R.W. Butler, pers. comm.), although the regional manager of Environmental Stewardship, in consultation with the Canadian Wildlife Service, can issue a permit to kill herons at fish farms. Eagles also attack and kill adult herons (Forbes 1987; Sprague et al. 2002). In addition, although herons commonly nest in urban areas (Butler 1997; Vennesland 2000), disturbance from humans can cause herons to temporarily abandon their breeding attempts, allowing predators to take eggs (Moul 1990). High levels of human activity near breeding colonies have also been linked with increased disturbance from eagles (Vennesland 2000). There have been no reports of direct negative effects on breeding or non-breeding herons from cattle or other agricultural animals. Grazing could potentially alter heron foraging success if changes in vegetative cover made it more difficult to catch prey, but no data are available that address this question.

Food supply problems can also threaten Great Blue Heron populations. Pratt (1972) and Blus and Henney (1981) reported significant overwinter mortality of herons on the Pacific coast of the United States due to starvation. In addition, Butler (1995) found that starvation due to a lack of foraging skill was the most important factor affecting juvenile survival during the first winter after fledging. Food supply problems can also affect heron breeding productivity if adult herons cannot obtain enough food to adequately feed their young (Gebauer and Moul 2001). However, food limitations are currently viewed as a less important threat than disturbance from predators and humans (Butler 1997; Vennesland 2000).

Contamination from human industrial activities likely caused the abandonment of one colony near Vancouver Island in the late 1980s (Elliott et al. 1989), but this threat is declining in British Columbia and is currently not seen as a widespread problem (Elliott et al. 2003).

Adverse weather can also impact heron populations. Forbes et al. (1985b) suggested that low rainfall and/or extensive sunshine could increase breeding productivity, implying that high rainfall and limited sunshine might reduce productivity. This effect could be due to hypothermia in nestlings, or reduced prey delivery from attending adults (Gebauer and Moul 2001). Tree or nest blowdown has also been implicated in the death of nestlings (Burkholder and Smith 1991).

Habitat threats

Threats to Great Blue Heron habitat in British Columbia include the loss of breeding and foraging areas to urban development, forestry, hydroelectric power development, and natural processes. Urban development and forestry are the main causes of habitat loss. Heron populations in British Columbia are concentrated around the Georgia Depression ecoprovince and in valley bottoms of the Interior, and these two habitats are also the primary centres of human activity in the province (Moore 1990; Butler 1997; Campbell et al. 2001). Forestry can impact heron habitat through the removal of active

or potential nest trees (Bjorkland 1975; Werschkul et al. 1976; Gebauer and Moul 2001). Habitat is also threatened by weather-related problems such as tree or nest blowdown (see previous section). Forest fragmentation may increase access to, or visibility of, breeding colonies for predators, such as Bald Eagles, thereby reducing the amount of suitable breeding habitat available to herons (Vennesland 2000).

Legal Protection and Habitat Conservation

The Great Blue Heron, its nests and eggs are protected year-round from direct persecution by the provincial *Wildlife Act,* as well as the *Migratory Birds Convention Act*. Scare/kill permits were provided up to 1998 to control herons feeding on fish stocks, but these have since been revoked (Butler and Baudin 2000).

Many sites are currently protected within regional or municipal parks, wildlife management areas, or have other protected status directly related to the occupancy of breeding herons (Gebauer and Moul 2001). This includes colonies at Vaseux Lake and Wilmer Wildlife Area in the Kootenay region, as well as the four largest colonies in the lower Fraser Valley (67% of all active nests in the area, $n = 1070$) and two colonies on Vancouver Island and the Gulf Islands (39% of all active nests in the area, $n = 459$) (Gebauer and Moul 2001). In total, 59% of all active nests in the Georgia Depression are currently protected ($n = 1529$ active nests). The continuing efforts of the Wild Bird Trust are now directed at mid-sized colonies to secure covenants on private and commercial lands (Butler and Baudin 2000; Gebauer and Moul 2001). The Delta Farmland Trust has recently established grassland set-asides to protect heron foraging habitat, and several projects have been undertaken to restore original habitat in areas that have been altered by causeways and dikes (Gebauer and Moul 2001).

Under the results based code, some critical foraging and nesting habitats could be addressed through establishment of old growth management areas, riparian management areas and wildlife tree retention areas. In addition, the "wildlife habitat feature" designation may also protect known nest sites. Although buffers are not currently enabled under this designation, licensees should voluntarily maintain a buffer to minimize disturbance and maintain the integrity of nesting habitat. However, many breeding colonies are located on private land, and the protection of heron nesting locations on Crown land should be considered a priority because most herons nest on private land where less regulatory control is available.

For colonies on private land, best management practices guidelines have been created by the British Columbia Ministry of Water, Land and Air Protection, Region 1 (Vancouver Island). These voluntary guidelines outline how developers can help to protect breeding herons in existing developed areas (K. Morrison, pers. comm.). In addition, herons on private land can be protected through zoning at the municipal level (M. Henigman, pers. comm.).

Identified Wildlife Provisions

Wildlife habitat area

Goals

Protect heron nesting sites and adjacent foraging areas from human disturbance and habitat loss or alteration.

Feature

Establish WHAs at nesting areas and nesting colonies. Important foraging sites (i.e., concentrations of herons feeding on a regular basis) may be recommended for WHA establishment by the Canada/U.S. Heron Working Group.

Size

Typically 80 ha but will ultimately depend on site-specific factors. Size should depend on the number of individuals using locations for breeding and/or foraging (Butler 1997; Gebauer and Moul 2001) and density of use. Other important factors to be considered include location, topography, proximity of foraging sites (for colonies), relative isolation, and degree of habituation to disturbance.

Design

The design of the WHA should consider the colony size, location, proximity of foraging sites, relative isolation, and degree of habituation to disturbance. The core area should be approximately 12 ha and include known nest sites, potential nesting areas and, where appropriate, foraging areas and flight paths. Ideally, the boundary of the core area should be approximately 200 m radius from the edge of the colony or important habitat feature(s). A 300 m management zone should also be included to minimize disturbance to all components of the WHA (nest site, foraging sites).

In areas where human disturbance is a concern, incorporate boundaries that may act as barriers to humans wherever possible. Carlson and McLean (1996) showed that barriers that completely excluded humans were more effective than management zones that allowed some intrusion, and breeding productivity was higher at sites with stronger barriers (e.g., ditches and fences).

For existing developed sites in areas of high human use, a minimum naturally vegetated strip around all breeding colonies of at least 50 m is recommended by the best management practices guidelines produced by the Ministry of Water, Land and Air Protection in Region 1 (K. Morrison, pers. comm.).

General wildlife measures

Goals

1. Minimize disturbance during the breeding season (15 February to 31 August) and between 1 November and 31 March for colonies that occupy areas year round.
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).

Measures

Access

- Do not develop roads or trails within the core area. Road and trail construction or blasting in the management zone should not occur between 15 February and 31 August.
- Limit access on existing roads and trails between 15 February and 31 August. Types and levels of use must not exceed levels that customarily occur during the breeding period.

Harvesting and silviculture

- Do not harvest within the core area.
- Do not harvest within the management zone between 15 February and 31 August.
- No silvicultural activities, except restoration or enhancement activities, should occur within the core area. In the management zone, no mechanized activities that exceed noise or disturbance levels (including distance from colony) previously experienced during this period should occur between 15 February and 31 August.
- Within a management zone that has few trees other than the nest trees, restocking and/or silvicultural techniques can be applied to enhance rapid development and protection of the stand.

Pesticides

- Do not use pesticides.

Range

- Maintain WHA in a properly functioning condition.
- Control level of livestock use and plan grazing to ensure that the structural integrity of stands of emergent vegetation are maintained. Fencing could be required by the statutory decision maker to meet goals described above.

Recreation

- Do not develop recreation trails, structures, or facilities.

Additional Management Considerations

Avoid disturbance within 500 m of colonies and adjacent foraging habitats between 15 February and 31 August and between 1 November and 31 March for year-round colonies. Some colonies may have become habituated to some levels of disturbance, in which case it may not be necessary to refrain from activities. In general, motorized, loud, or continuous activities are more disturbing than non-motorized activities. When incorporating barriers to minimize access or disturbance, it is better to use barriers that completely exclude humans than those that allow some intrusion (Carlson and McLean 1996).

Where permanent activities or habitat modifications are planned, vegetative screening should be planted or maintained between the activity and the colony as close to the activity area as possible. 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.

Protect heron foraging resources, especially those within 4 km of colonies and in key wintering areas, from development, degradation, and pollution, particularly aquaculture operations and discharge of toxic effluents. Coastal heron concentrations occur on estuaries and other low gradient intertidal habitats and on adjacent farmlands during the winter. Interior birds feed in marshes and along shallow shorelines of lakes and rivers; during winter they need areas of open (unfrozen) water.

Maintain perch trees adjacent to major summer and winter foraging areas.

Prevent further loss of important coastal and interior riparian mature/old-growth forest nesting habitat to urban/suburban and forest development.

Information Needs

1. Monitoring of key breeding locations is ongoing on the coast and should be continued at the existing, or a more intensive level.
2. Heron surveys on foraging grounds.
3. Current and future impact of Bald Eagle disturbance at coastal and interior heron colonies. Eagle populations are increasing, but it is not known how long they will continue to do so, whether human activities are enhancing their populations, or how this activity may change the location or distribution of breeding herons.

Cross References

Marbled Murrelet, "Queen Charlotte" Goshawk, Spotted Owl, "Vancouver Island" Northern Pygmy-Owl

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