PACIFIC GREAT BLUE HERON
(Ardea herodias fannini)

NESTING ACTIVITIES (1998 – 2015)
BOWEN ISLAND, BC

Prepared for:

Bowen Heron Watch
(*Bowen Nature Club & Bowen Island Conservancy*)
Bowen Island, BC

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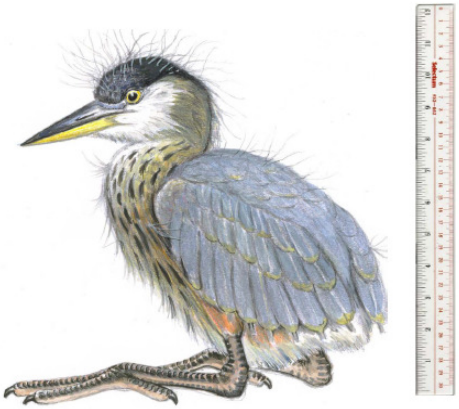
Bowen Island Municipality staff members have diligently referred to the municipal Heron Nest Protection regulatory policy during island-wide recreational and construction-related activities that have had the potential to adversely influence heron nesting activities and have also conducted municipal maintenance works with adherence to this policy. Metro Vancouver Regional parks staff have contributed valuable data over the years and have been willing to consider adjustments in timing to park maintenance during the sensitive nesting periods. There has often been vital support for fledgling rescue provided by the local veterinarian Dr. Alistair Westcott, CAWES (Coast Animal Welfare & Education Society) on Bowen Island, BC Wildlife Rescue Society in Burnaby and various local community members during eagle attacks. Expert knowledge, resources and guidance have periodically been provided by biologists, Rob Butler, Ross Vennesland and Rob Knight with regard to Great Blue Heron biology, behaviour and management throughout the last 18 years of monitoring the heronry.



Great Blue Heron Chick, 2 - 4 weeks of age
(courtesy of Heron Working Group, Vennesland and Norman 2006,
Illustration - Donald Gunn)

Cover photographs courtesy of B. Gowans

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1 Introduction

Nests of the Pacific Great Blue Heron (*Ardea herodias fannini*) were first observed on Bowen Island in 1998 in the small commercial hub of Snug Cove. This small group of nests was established in a mature stand of deciduous trees at the interface of busy urban life and the south edge of Crippen Regional Park forest, northwest of what is now the Bowen Island Library. Human activity in Snug Cove then, and now, is associated with small to large vehicle traffic, a ferry terminal, marinas and boating, local businesses and residences, park recreation and management, land development and road maintenance. To the north and east beyond Crippen Park, there is a freshwater lagoon and the adjacent marine foreshore of Deep Bay opening out to Howe Sound. Prior to 1998, herons had been observed carrying nest material in this area, but nests or breeding colonies had not previously been documented, although likely present and undetected. Pairs of herons have continued to court, build nests, lay eggs and, in most years, raise young at the Crippen Park - Library site. Other pairs have expanded the breeding range to various other sites in and around Snug Cove, including the communities of Snug Point and Deep Bay, and riparian areas of Crippen Park (i.e., Davies Creek and Terminal Creek). In recent years, nesting activity has also been documented in the residential communities of Tunstall Bay and Sealeigh Park, within the riparian area of Explosives Creek and relatively near the west marine shore of the island. The overall distribution of historical heron nest sites on Bowen Island is shown in Figure 1

This report summarizes the breeding activities of Great Blue Herons and other relevant information compiled over the past 18 years (1998 – 2015) as documented by the island stewardship group, Bowen Heron Watch. Also included is a description of Great Blue Heron biology to facilitate an understanding of habitat requirements, and the species conservation status and regulatory oversight. Recommendations are provided to mitigate local disturbance to heron nests from various activities and manage/protect nesting habitat. This small island colony may be an important source population for other south coast and lower mainland colonies, supplementing new breeding adults and contributing to the regional gene pool.

1.1 Bowen Heron Watch

Environment and Climate Change Canada annually documents and monitors heronries on Vancouver Island, areas within and adjacent to the Strait of Georgia, including Bowen Island, and the Lower Fraser Valley. Citizen science is considered a very important contribution to provincial and federal databases. To this end, naturalist groups monitor heron activity and nesting colonies in an attempt to better understand behaviour, the nature and effect of disturbances, and how best to protect nesting habitat. Bowen Heron Watch contributes seasonal observations from an established and valued database for Bowen Island.

Bowen Heron Watch is a joint effort of the Bowen Nature Club and the Bowen Island Conservancy. Volunteer members, including biologists and naturalists, monitor heron activity all year, with a particular focus on documenting and describing nest sites and activity during the breeding season. Lead members train and orient volunteers, provide public education and seasonal briefings, offer data and/or management guidance to local residents, businesses, the Municipality and organizers of recreational events, and generally promote community awareness and conservation. Bowen Heron Watch develops annual summaries and/or reports including data and maps, and provides periodic colony status updates to relevant agencies (e.g., Canadian Wildlife Service, BC Ministry of Environment, the provincial Heron Working Group, and Bowen Island Municipality).

Since herons depend year-round on several habitat types, e.g., marine foreshore, freshwater streams, lakes, ponds, wetlands, grassy fields, and forest refuges, local efforts to manage and conserve survival habitat for an umbrella species, such as Great Blue Herons, will also contribute to habitat conservation for a range of other species that also require these same ecosystems. The objectives of Bowen Heron Watch are to:

- monitor and record the annual breeding activities of Great Blue Herons on Bowen Island
- investigate reported or known sources of disturbance and subsequent effects on breeding activities, and assist rescue efforts, where needed
- report seasonal data to various interested parties and/or agencies
- promote the conservation of herons and their habitat, and assist with community awareness.

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FIGURE 1.
Great Blue Heron nesting sites recorded on Bowen Island, Howe Sound, between 1998 and 2015

Prepared by Bowen Heron Watch, a joint project of
the Bowen Nature Club and Bowen Island Conservancy.

Base map courtesy of the Bowen Island Municipality GIS. All feature locations are approximate.
Aerial photography circa 2005.

2 Pacific Great Blue Heron

2.1 Species Biology

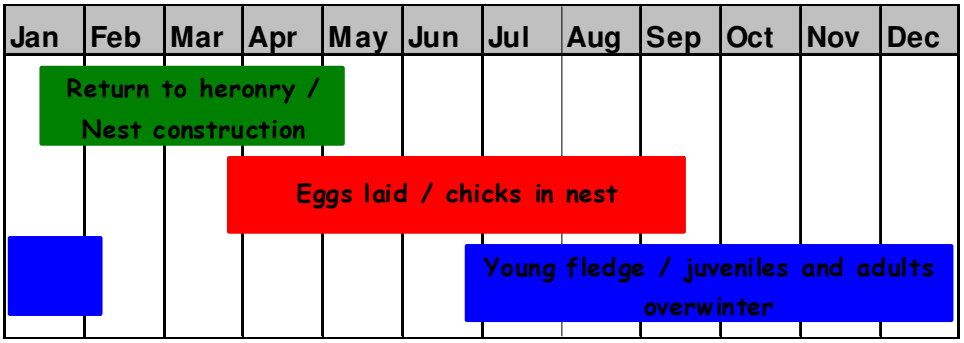
The Great Blue Heron is a very tall, long-legged wading bird found near watercourses, lakes, wetlands and coastal marine areas throughout BC. Two subspecies occur: *A. h. fannini* west of the mountain ranges, and *A. h. herodias* in the east. Although this species is typically migratory, some birds stay in ice free areas in southern BC. The subspecies *fannini* is considered to be resident with most of the BC population concentrated in the Vancouver Lower Mainland where birds winter in close proximity to breeding areas.

The adult bird is approximately 1 m in height with dark blue-grey body plumage, rust-coloured upper legs, and a black and white striped crown. The wings are long (1.5 m) and rounded, the neck is long, and the tail is short. The head and face are white, and a long black plume extends from above the eye to beyond the back of head. There is also a bib of long trailing plumes on the chest and scapula. The bill is long and bi-coloured yellow below and gray-black above. Both sexes have similar plumage (Butler 1992, 1997; SCCP 2011). Juvenile birds can be discerned by their solid dark grey crown, and grey-brown back and upper wing plumage. They lack black eyebrows, and head and bib plumes (Butler 1992, 1997). Herons fly with their necks folded in an S-shape and using deep slow wing beats.

Habitats used by herons for foraging vary by gender, age and time of year (McClaren 2003, Vennesland and Butler 2011). Preferred foraging habitats are eel grass beds, mudflats, old fields, wharves, beaches, wet ditches, lakes, streams and backyard ponds. Birds typically roost high in mature trees in proximity to foraging sites. A heron's diet consists primarily of small fish; however, they will also eat shellfish, insects, rodents, amphibians, reptiles, and small birds (COSEWIC 2008, SCCP 2011). During the breeding season, their principal prey is fish, while in winter, amphibians and small mammals hunted in wetlands, fields and meadows supplement their diet.

In early spring, most herons gather in colonies where they court, nest, and raise young (Chart 1). Nesting is initiated between mid January and early May (Butler 1992, 1997; Vennesland 2000; Vennesland and Butler 2004; SCCP 2011) when there is a period of courtship before eggs are laid. Courtship behaviour can last several weeks (Butler 1997, Vennesland 2000).

Chart 1 Great Blue Heron Breeding Chronology



Great Blue Herons may nest individually or in colonies, and typically return to the same nesting sites each year (Butler 1992, 1997; Vennesland 2000; COSEWIC 2009). Nests are large stick platforms, <1 m diameter, positioned from 4 - 70 m above ground (typically 20 - 30 m, Butler 1997). They are lined with twigs, bark strips, coniferous boughs and rushes. Some pairs have nested as low as 2 m in shrubs (Vennesland 2000). The most common tree species used are red alder (*Alnus rubra*), black cottonwood (*Populus balsamifera*), bigleaf maple (*Acer macrophyllum*), Sitka spruce (*Picea sitchensis*) and Douglas-fir (*Pseudotsuga menziesii*) (Gebauer and Moul 2001).

Typically 2 – 5 eggs are laid from early March to April, hatching in approximately 30 days (COSEWIC 2009). Adults share the duties of incubation and feeding the young. Pairs may re-nest and lay eggs after predation or other disturbance events (Vennesland 2000). Chick rearing lasts approximately 60 days (Krebs 1974,

Simpson 1984) after which the fledglings are able to fly and seek food. There are 0 - 4 young birds fledged per nest (Butler 1992, 1997; Vennesland 2000) beginning in late June. Fewer than 25% of juveniles survive to their second year after which adult survival is about 75% per year (Butler 1997). Herons may live to be 17 or more years old (COSEWIC 2008).

Great Blue Herons are most vocal during the breeding season; adults greet their partner at the nest with a "squawking landing call" and nestlings can be heard from afar with a constant rapid "chuck" sound. Especially during the sensitive breeding stages of egg-laying and incubation, unusual activities and loud noises can disturb adults at the nest (MOE 2014). When adults perceive a threat, they generally respond with a steady escalation in alarm behaviour. At first, they become alert and silent but as a threat continues or intensifies, they first vocalize with a repetitive "chortle" or "cluck", followed by a rapid "squawk", and eventually loud screaming "auk" sounds (Vennesland 2000). Adults will hop off their nests and eventually flush from the tree (Vennesland 2000) leaving nests unguarded. Depending on the severity of the disturbance, adults may not return to the nest for several hours. Opportunistic ravens, crows and other predators are quick to take eggs or young while the nests are left exposed (Butler 1989, Moul 1992).

Naturally sensitive to human presence, herons typically nest in stands of trees well away from noise, light and other disturbances; however, some heronries (e.g., Stanley Park in Vancouver, Snug Cove on Bowen Island), are located in urban areas where they appear to tolerate human activities (Vennesland 2000, Gebauer and Moul 2001). Research has shown that the number of fledglings raised where there have been frequent disturbances is significantly lower than at colonies with no disturbance (Carlson and McLean 1996, Vennesland and Butler 2004).

2.2 Conservation Status

The Pacific Great Blue Heron is non-migratory and a relatively small population is concentrated year-round on the south coast. Nest productivity has been in decline since the 1980's arising from the loss and degradation of habitat from urban and rural developments, bald eagle predation, and human disturbance at or near nests and in foraging areas. These threats have likely led to shifting prey abundance and a reduced population (Butler 1997, Vennesland 2000, McClaren 2003, COSEWIC 2008). The annual increase in bald eagle predation has resulted in chick mortality and reduced breeding success (SCCP 2011). Human activity near colonies tends to compound the threat posed by eagle predation (Vennesland 2000, Vennesland and Butler 2004).

The Great Blue Heron is a provincially Blue-listed species. The coastal *fannini* subspecies is listed as a species of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), the body responsible for classifying species at risk in Canada, and the pre-requisite to protection under the federal *Species at Risk Act* (SARA). In 2010, *A.H. fannini* was also listed as a species of Special Concern in Schedule 1 of the SARA (Environment Canada 2015, BC CDC 2015) reflecting the continued threat of endangerment and habitat destruction that the species faces in Canada. A federal SARA management plan (Environment Canada 2016) has been proposed and will soon be finalized.

Table 1 Conservation Status of the Pacific Great Blue Heron

Species Name	Scientific Name	BC Status	COSEWIC Status	SARA Status, Schedule 1
Great Blue Heron	*Ardea herodias fannini*	Blue*	Special Concern** (2008)	Special Concern** (2010)

*Blue: have characteristics that make them particularly sensitive or vulnerable to human activities or natural events (CDC 2015)
**Special Concern: particularly sensitive to human activities or natural events (COSEWIC 2015) and which may become threatened or endangered because of a combination of biological characteristics and identified threats.

The birds and their nests are subject to protection under the federal *Migratory Birds Convention Act* and the BC *Wildlife Act (*see Section 5.1 below*)*. Great Blue Herons are also designated as Identified Wildlife under the *Forest and Range Practices Act* and, as such, require special management attention to address the potential impacts of forest and range activities on Crown land. Habitat may also be governed under the provincial *Fish Protection Act* and the federal *Fisheries Act*, as well as regional and local government by-laws and policies (SCCP 2011).

This small Bowen Island population is quite valuable from a regional perspective. Its ecological significance is as a large and sensitive umbrella species, a component of local biodiversity, and an indicator of marine foreshore and wetland environmental quality. Although breeding colonies were historically present in many locations of the Fraser River Delta and the Sunshine Coast, the closest colonies are now in Stanley Park, Vancouver (83 nests in 2015) and Half Moon Bay, Sunshine Coast (10 nests in 2013) (BC CDC 2015).

3 Nest Observation Methods

In the early spring of each year, a public awareness campaign which targets residents of Bowen Island has included email bulletins, newspaper articles, posters and local flyers. Volunteers have been recruited from a list of previous years' participants and new contacts. An orientation session and/or mail out is used to familiarize local observers with what to expect, how to identify adult and young birds and nests, how to observe without disturbing the nesting birds, and what to record. Heron activity and vocalizations often lead to new nesting sites, especially early in the season. Abundant anecdotal reports from the public, primarily by phone and email, are also helpful in locating new activity or new sites throughout the nesting period.

Standardizing survey methods and data collection by various citizen science initiatives in the province allows informative and valid project comparisons and summaries. Bowen Heron Watch has adopted a method for observations with reference to survey protocols in Vennesland and Norman (2006), Moul et al. (2001) and RISC (1998). To quantify the total number of nests 'initiated' (active construction or refurbishing) and 'established' (progressed to incubation), ground-based surveys begin early in the breeding season, using binoculars and/or a spotting scope, to investigate activity at all historical nest sites. Sites are approached cautiously to minimize any potential disturbance to nesting birds, particularly early in the nesting period (i.e., egg-laying/incubation). Where appropriate, the base of nest trees are searched for signs of activity including the presence of eggshells, whitewash and boluses (indigestible food that is periodically regurgitated). A nest is considered active when herons are observed at the nest or when wildlife sign is present on the ground below. A nest is considered established when incubating herons or young are visible within the nest. The number and configuration of each nest or group of nests (e.g., location, number of nest trees, tree species and nests per tree) is documented, geo-referenced and photographed.

From mid-January to late August, nest checks continue at each of the established sites as often as possible (approximately once or twice per week), depending on available volunteer resources. Observations are recorded throughout the breeding stages of nest-building, incubation, brooding and finally fledging, where nests have progressed this far. Detailed notes provide a seasonal account of volunteer observations and anecdotal information gathered in the community. Data sheets distributed to observers allow the independent collection of the following information:

- Name of observer(s), date, time and weather
- Nest site area and location
- Numbers of adults, nests and nestlings, if present
- Observed behaviours (e.g., standing in the nest, perched beside it, presenting nest material, incubating, feeding chicks) and vocalizations
- Estimated nest status (e.g., incubating, brooding, fledging) including, if possible, age of nestlings
- Nest site description, when and where possible
- Incidental observations and opportunistic recording of bald eagle, human activity and/or other forms of disturbance, comments from residents or land-owners, or any information relevant to the heron nest management, e.g., loud noises, changes in land-use, tree cutting or construction.

Nest site biophysical information is collected at the end of the season, when and if time and equipment allows. Nest trees are mapped, and data are kept on file. Detailed site data include the following:

- Nest site GPS location (georeferenced)
- Distance to nearest trail, road or other significant natural or urban feature
- Site elevation, aspect and slope
- Nest Tree Species, height and diameter
- Dominant understory, stand canopy cover and structural stage

- Nest height and orientation
- Evidence of nesting activity.

4 Nesting Activity

On Bowen Island, Great Blue Herons tend not to nest in large colonies as is typical of some other areas of the Lower Mainland and BC. Some few (up to 5) nests may be found in the same tree or adjacent trees; however, more commonly solitary nests or pairs of nests are distributed around the island, primarily in the east portion within or proximal to Snug Cove. Adult pairs may return to nests or nest sites from previous years; however, nests are also commonly found in new locations each year. In most years, they return to the site northwest of the Library in Crippen Park, and to various historical nest trees on Snug Point.

Breeding activity typically begins with courtship behaviour in mid to late January or February with subsequent nest building from late February to April. The deciduous stand near the Library in Snug Cove appears, in more recent years, to be an important destination for early courtship and where some pairs will initiate nests which typically don't progress to the egg-laying or incubation phase. Some pairs take up nesting at sites used in previous breeding seasons and others construct nests in completely new or previously unknown areas. The herons appear to distribute themselves in an array of available nest habitat around the island as a strategy to avoid predation. This is consistent with a trend in the Pacific Northwest where heronries have re-distributed into smaller, more widely-scattered colonies in response to rebounded eagle populations (Kenyon 2005). Although this strategy may be successful in avoiding eagle attacks and fledging chicks at some sites, the risk is that, once detected, the young of all nests at that site die.

4.1 Nests

There has been substantial year to year variation in the observed numbers of nesting pairs (Table 2, Chart 2) and nest success on Bowen Island. During the 18 years of monitoring, the number of 'established' (incubating) nests observed has ranged from 14 nests in 2003 to only one nest in 2012 with no obvious trend. It follows then that up to 14 pairs (28 adult) herons have been present and actively breeding in some seasons. The mean number of established nests across years is 6.5 (median: 6.5).

Chart 2 Numbers of Established Nests and Estimated Fledglings per Year (1998 – 2015)

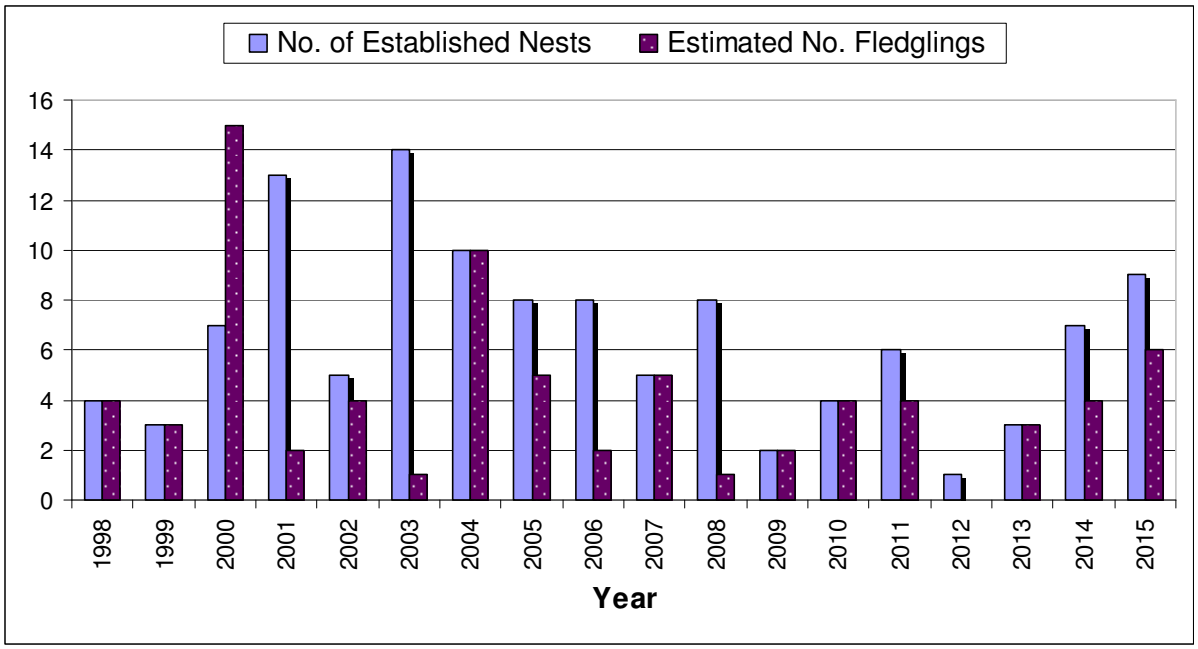


Table 2 Annual Summary of Established* Heron Nests and Estimated Fledging Success

Nest Area	Nest Site	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Snug Point	365 Cardena St																		
	369 Cardena St					2													
	407 Venture Rd						1	1											
	411 Venture Rd		1	2	2	1			1										
	412 Venture Rd												1					1	
	415 Venture Rd							1	6										
Snug Cove	Unidentified location**																1	1	
Lagoon	South of Melmore Road, west of Deep Bay							2		4				1	2			1	3
Crippen Park	Northwest of Library, North side of Bowen Island Trunk Road	2	2	5	8		6			1	5	8	1	2	3		2	1	
	Northwest of Miller Road at Terminal Creek							1	1	3									
	Festival Field south of Dorman Road at Davies Creek	2			3		1												5
	South end of Senator Rd													1					
Galbraith Bay	North of Mount Gardner Road														1	1		2	
Hunter Park	North of trail, south of 1520 Adams Rd.,																	1	1
Sealeigh Park	End of Adams Rd.					1		3											
Tunstall Bay	North of Tunstall Blvd, south of Braewood Place					1	6	2											
	Total Established Nests per Year	**4**	**3**	**7**	**13**	**5**	**14**	**10**	**8**	**8**	**5**	**8**	**2**	**4**	**6**	**1**	**3**	**7**	**9**
	Estimated No. Fledglings per Year	4	3	15	2	4	1	10	5	2	5	1	2	4	4	0	3	4	6

* Nests observed in which incubation had commenced (nests abandoned before incubation not included)
** Nest not observed but adults with young observed post fledging

There are typically many more nests initiated (refurbished or newly constructed) than progress to the stages of egg-laying or fledging of young. For example, in this past year 2015, there were 23 nests started and active in April (Table 3); however, only 9 nests at 3 sites progressed to incubation. Approximately 6 nestlings fledged from these remaining nests. New nest sites in this same year were initiated at 365 Cardena St. and 380 Cardena St. (Bowen Island Lodge) on Snug Point, and 465 Melmore Rd. in Deep Bay.

Table 3 Number of Great Blue Heron Nests Initiated (Active) in April 2015

Nest Site Location	No. Nests
365 Cardena St. Snug Point	1
412 Venture Rd., Snug Point	3
Bowen Island Lodge, 380 Cardena St, Snug Point	2
Lagoon, just south of Melmore Road, west of Deep Bay	4
469 Melmore Rd, Deep Bay	1
South end of Senator Rd, Deep Bay	2
Northwest of Library, Bowen Island Trunk Road, Crippen Park	3
Festival Field south of Dorman Road at Davies Creek, Crippen Park	5
North of Mount Gardner Road, Galbraith Bay	1
North of trail, north of Adams Road, Hunter Park, Sealeigh	1
Total Nests	**23**

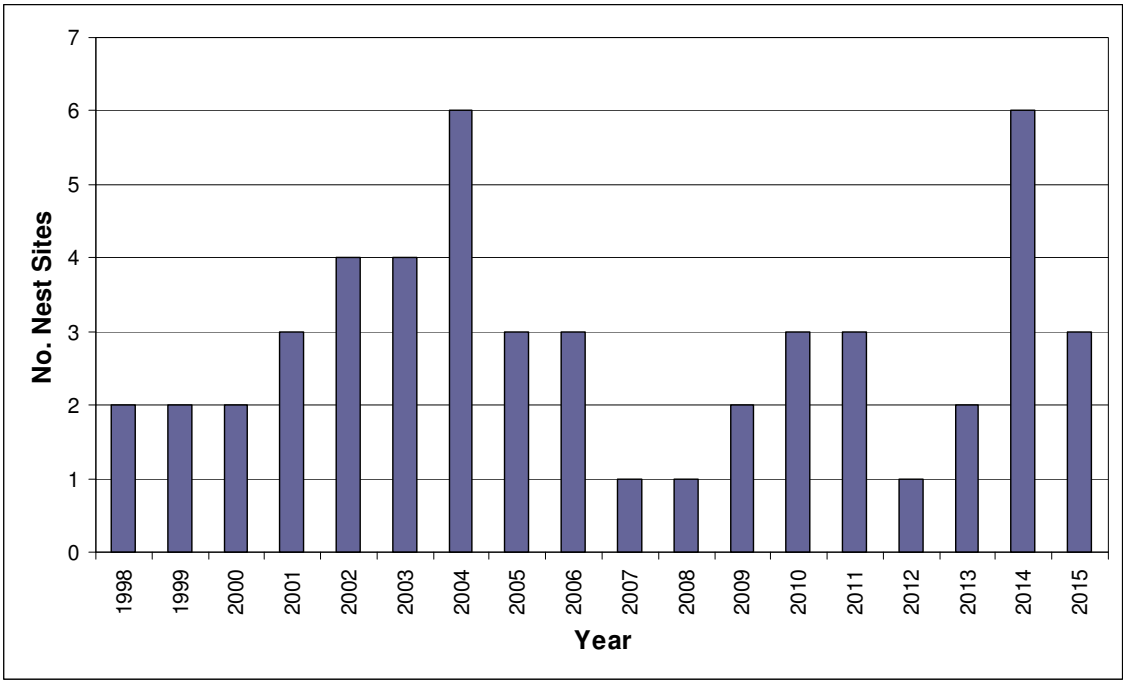
Nest success (fledging of young) has been evaluated each year from data collected on a volunteer basis and as time and resources have allowed; therefore, results are conservatively estimated and may be higher than observations indicate. Over all years, estimated nest success has varied from 0 fledglings in 2012 to 15 fledglings in 2000, with a mean per year of 4.2 (median: 4.0). The number of successful nests has primarily been a function of the number of established nests in that particular year; however, the level of disturbance and predation were also contributing factors.

Heron nest monitoring data gathered from 1998 - 2015 suggest that seasonal colony formation and the processes of nest initiation, establishment and abandonment are highly variable. To date, volunteer observations have been associated with nests that are accessible and near to human settlement and; therefore, relatively easy to observe. It is possible that more secluded nests may be present in the larger crown or private forested lands, particularly on the north side of the island, that have not been detected. Some inland areas and shores are accessible by boat only. The results provided here are; therefore, conservative.

4.2 Nest Sites

Nest sites are specific areas where one or more nests are present. The largest group of nests has historically been established in the east of the island, within several adjacent trees of a deciduous stand in Crippen Park, northwest of the Library. This is also the site with the most consistent annual attendance. Most pairs have nested in urban developed areas of the east side of the island; however, the few nests in other areas of the island have been found in quiet and less disturbed interior (e.g., Tunstall Bay) or coastal (e.g. Galbraith Bay) stands. Behavioural observations during the nesting season indicate that herons nesting in these west and interior areas are more sensitive and appear less habituated to human activities than those nesting in the eastern sites. The number of island nest sites across all years has varied from one to six (Chart 3) with a mean of 2.8 per year (median: 3.0). All have been located in proximity (within 0.6 km) to creeks, lakes, ponds and/or the marine foreshore.

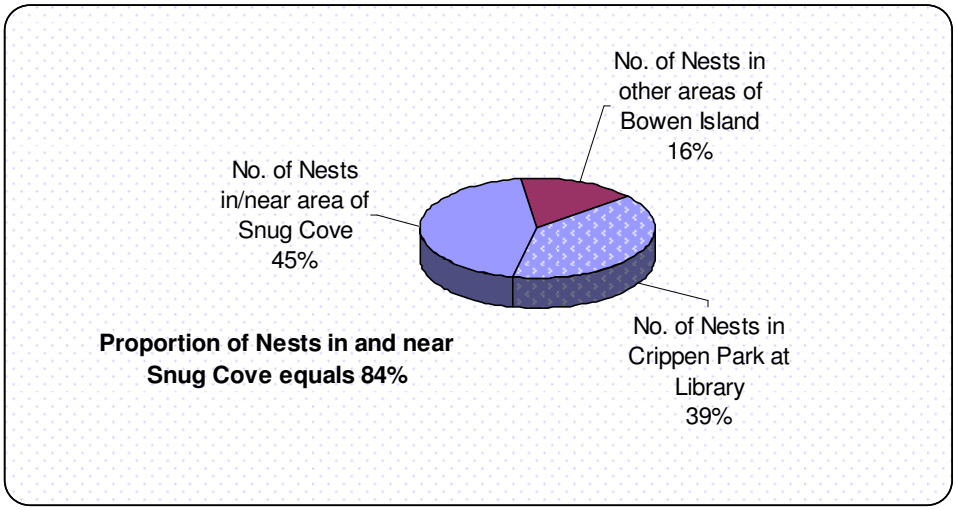
Chart 3 Numbers of Great Blue Heron Nest Sites* Observed (1998 – 2015)



* One or more nests are present at each site

The east region of Bowen Island, and also the most densely populated area, is also where most nests are annually concentrated. Snug Cove has accommodated 84% of all nests over the years with the Crippen Park site near the Library as most active (Chart 4). Other regions of the island, i.e., Tunstall Bay and Sealeigh Park in the west, and Galbraith Bay in the north, support only 16% of established nest sites.

Chart 4 Proportions of Great Blue Heron Nests in Regions of Bowen Island



4.3 Nest Site Characteristics

The Snug Cove area and Galbraith Bay nest site are located within the Coastal Western Hemlock Dry Maritime Biogeoclimatic Subzone (CWHdm) where mature forests are typically dominated by Douglas-fir, western redcedar (*Thuja plicata*) and western hemlock trees. Western nest sites are located in the Coastal

Western Hemlock Very Dry Maritime Subzone Eastern Variant (CWHxm1) where less hemlock is present and cedar is uncommon. All sites fall within the previously mapped Bigleaf Maple - Western Sword Fern – Spiny Wood Fern vegetation associations within these subzones (Shoji et al. 2000) which is represented on approximately 26% of the island landscape. All nests have been located at low elevation (15 m – 90 m ASL) relative to interior portions of the island, on a range of shallow to steep slopes, and with varying aspects (often south-facing) depending on site conditions. Photographs of selected sites are shown in Appendix 2.

It is evident, from year to year, that herons need more than just a few trees from which to select the ideal nesting sites; conifer stands (Chart 5) and especially mature Douglas-fir and red alder trees are important. Over all years, nests have been located primarily in small to large coniferous stands dominated by Douglas-fir, followed by small deciduous or mixed-species stands dominated by red alder and bigleaf maple; however, in earlier years there appeared to be a preference for deciduous stands, most notably in sites within Crippen Park. Preferred nest trees have included Douglas-fir, red alder, and bigleaf maple (Chart 6). On few occasions nesting has been in Sitka spruce, western redcedar and bitter cherry trees, the latter two being tree species rarely documented in other areas of the south coast as well. Some red alder and bitter cherry first used at the Library site have become decadent over time and died or fallen down so that recent nesting has been in large bigleaf maples. Nests have typically been built 20 to 30 m high in the canopy, with aspects (nest orientation) assumed to be related to position of canopy openings and bearing to marine foraging areas. In terms of structural stage, herons have typically selected trees of large diameter and height, relative to what was available in the surrounding stand although characteristics have varied, with moderate to high canopy closure. Some single nests are in isolated trees; others are in small groups in the same or adjacent trees. Most sites include nests constructed primarily in the larger mature trees of the site.

Chart 5 Nest Tree Stand Types 1998 - 2015

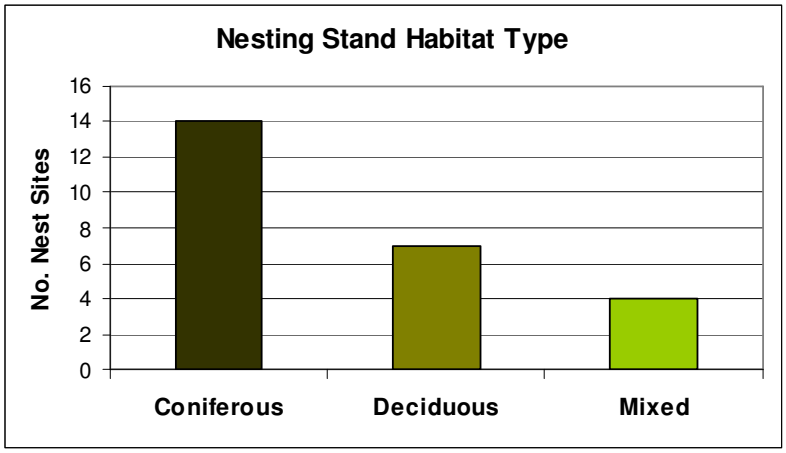
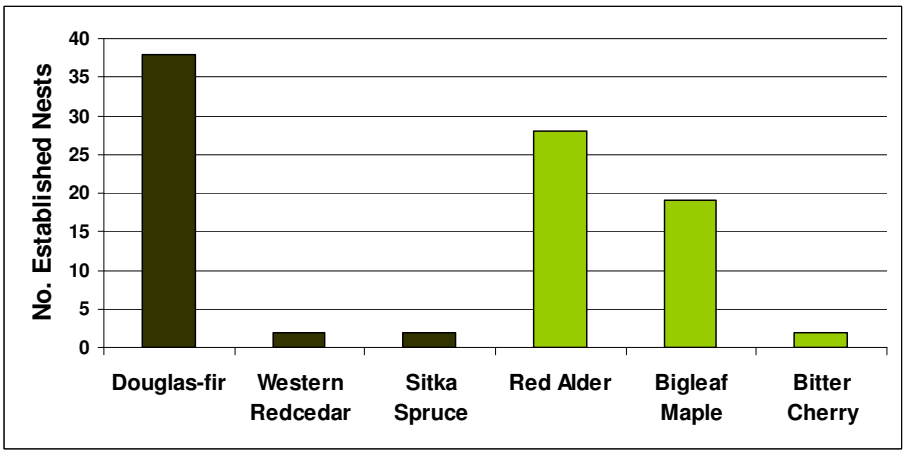


Chart 6 Preferred Nest Tree Species 1998 - 2015



To sustain the local breeding population of Great Blue Herons and contribute to regional conservation of the species, it would be important to promote the protection of existing suitable on-island nesting and foraging habitats, and a reasonable surplus of candidate nesting sites, i.e., stands of large mature deciduous and coniferous trees in proximity to the marine foreshore. Especially, since the dispersed nesting strategy appears to be influenced by potential human disturbance and eagle predation, the future for herons on Bowen Island may require the maintenance of an urban/rural landscape with flexibility in nesting options.

Small nesting colonies are common on the Sunshine Coast and Vancouver Island (SCCP 2011). A colony separated by a large radius from other colonies should be afforded extra protection because it may occupy the only suitable breeding habitat in the area and; therefore, represents the only source of breeding herons. Nest trees should be protected for many years to ensure breeding pairs can return to nest again, which is typical behaviour for herons, especially where preferred sites are limited. For example, the Crippen Park Davies Creek nest site was unused for a 12-year period prior to 2015 when five nests were again established there. Small numbers of chicks have fledged in most years with relatively high success in some years. Both adult and juvenile herons are observed throughout the winter season in many habitat types on Bowen Island, including private ponds and meadows, which suggests sufficient food resources are available, and which is supported by mapped forage fish spawning areas (BCMCA 2014). Although this small colony of Great Blue Herons may appear too isolated to sustain itself; adults and young are known to disperse many kilometers during the overwintering period. This island population may be important to other south coast and lower mainland colonies, supplementing breeding pairs at other sites, and contributing to the regional gene pool.

4.4 Nest Disturbance and Predation

The effects of human disturbance to Great Blue Herons vary in response to a number of factors, including the region, stage of the nesting cycle, degree of habituation to local disturbance, size of the colony, type of habitat surrounding the colony, and nature of the disturbance (i.e., type, timing, magnitude, frequency and duration) (Bowman and Siderius 1984, Vennesland 2000, Vennesland and Butler 2004). The degree of response is also somewhat variable. Herons in natural settings tend to be more sensitive to disturbance than those in more developed areas (Vennesland and Norman 2006). Herons will often temporarily leave (flush) or may abandon the nest when disturbed by people. Sensitivity to disturbance (i.e., alarm or flushing behaviour, tendency to abandon a nest) appears to decrease as the nesting period progresses (i.e., adults become less prone to abandon nestlings than eggs) (Vos et al. 1985) and as the opportunities for re-nesting decreases (Vennesland 2000). Abandonment is most likely to occur between the courtship period and hatching time. Adults tend not to develop a strong attachment to the nest until young are present (Bowman and Siderius 1984). Herons which have nested in developed areas appear, over time, to become more tolerant of repeated or regular mechanical disturbances, e.g., vehicle traffic or ferry noise (Carlson and McLean 1996, Vennesland 2000); for example, the Stanley Park nesting colony persists in an area of high human activity. There tends to be a greater reaction to human-induced ground disturbance than disturbances from vehicles, air or water (Vos et al. 1985, Vennesland 2000). High levels of human activity near nest colonies have been linked to increased rates of eagle disturbance (Vermeer et al. 1989, Vennesland 2000).

Eagle populations in the Pacific Northwest have been steadily increasing, presumably due to their recovery from past persecution and the detrimental effects of pesticides (Blood and Anweiler 1994, Buehler 2000); consequently, their negative impact on Great Blue Heron populations is also increasing (Vennesland 2000, Vennesland and Butler 2004). Bald Eagle depredation of Great Blue Heron adults, juveniles and nestlings has frequently been reported in coastal BC and is a principal cause of reduced breeding productivity and increased abandonment of colonies (Norman et al. 1989, Butler et al. 1995, Butler 1997, Vennesland 2000, Vennesland and Butler 2004, Chatwin et al. 2006).

On Bowen Island, few nests fledge young in most years and some nests have failed due to various environmental and/or human induced factors. Reduced breeding success has been primarily associated with the number and intensity of eagle attacks and, secondarily, human disturbance events that have resulted in nest abandonment and subsequent chick mortality from eagle and crow depredation. The few significant human disturbance events have included the use of heavy equipment and chain saws, tree cutting, tree limbing, large community celebrations and, in one particular case, movie filming that included night lighting and explosions. These events have imposed substantial sensory disturbance to nesting adults, leading to flushing and eventual nest abandonment, after which, exposed nests were subject to bald eagle and crow harvesting of both eggs and hatchlings. The mortality of young after such a significant disturbance is a clear

violation of the BC *Wildlife Act*, e.g., a landowner on Vancouver Island was recently convicted of such an offence (Vennesland, R., pers comm. June 2016).

As with other heron colonies in BC, bald eagle predation has been a major contributing factor in overall low recruitment. Adults have sometimes successfully defended nests but ultimately the result has most often been nest failure. Eagle attack bouts, usually leading to chick mortality, have ranged from few to no events in some years to more commonly occurring persistent daily harvests at each site until few to no nestlings remain within the colony. Eagle predatory behaviour typically begins with low flyovers mid-season, to several hours of perching in nearby trees or adjacent branches, and finally to direct attack bouts as chicks reach later stages of development. In some years, the harvest of nestling herons has resulted in loud, drawn-out and dramatic disturbance events that have triggered community outcry and gallant public efforts to protect the nests. During these events, nestlings have hopped out of nests, fallen out of nests and nest trees, or have been dropped to the ground or in the ocean by eagles during flight. There have been a several successful rescues by local residents, biologists and veterinarians with subsequent care by Burnaby Wildlife Rescue; however, most nestlings have died during these attacks. In 2015, eagle disturbance was reported at two of the three nest sites with resulting chick mortality; and, across all years, eagle predation has been the primary cause of breeding failure. Periodic monitoring of both heron and eagle nests to track overlapping habitat use would contribute to regional species population studies and may facilitate future management planning.

5 Heron Nest Site Management

5.1 Regulatory Framework

Municipal

The Bowen Island Municipality adopted a revised policy in April 2016, *Heron Policy No. 16-020* (Appendix 2) that facilitates adherence to federal and provincial laws using professional reliance to provide clear guidance for actions or works in the vicinity of active heron nests. Implementation of the revised policy requires, in general, two steps as follows:

Step 1 (Policy Schedule "A" flowchart) – Determine whether (a) breeding activity has been initiated or concluded within a given year's breeding season (typically February 1 – August 31) by contacting a representative of the Bowen Island Municipality, and (b), if so, whether it has been initiated or concluded within 200 m of the proposed action. If breeding activity is established, a QEP should evaluate the nest status and, if required, create a management plan that addresses the proposed actions by mitigating disturbance, establishing best management practices, and monitoring heron behaviour for signs of disturbance. If breeding activity has yet to be initiated (or has been concluded), work should be permitted to proceed; however, if breeding activity is observed at any point, the actions should be halted and a QEP consulted for further advice.

Step 2 (Policy Schedule "C" flowchart) – Evaluate disturbance in proximity to active nests as low, moderate (category type a or b), or high as per the Policy, Appendix 1.

- High disturbance activities should be performed outside of the typical nesting period or not within 1000 m of active nests. Where this is not possible, e.g., due to safety or practical concerns, consult a QEP to determine if a management plan can be developed to mitigate disturbance.
- To the extent practical, avoid actions classified as low or category (a) moderate disturbance activities within the 'primary' activity buffer, i.e., 60 m of an active urban nest and 200 m of an active rural nest (Figure 2). If actions are proposed within the primary activity buffer, retain a QEP to develop a management plan.
- Retain a QEP to develop a management plan if activities within 200 m of urban or rural active nests are classified as category (b) moderate disturbance and likely to introduce intermittent or novel sources of noise (e.g., heavy equipment and associated activities, pressure washer, leaf blower, nail gun, compressor, chainsaw, asphalt/concrete cutting saw, and other loud power tools).
- Do not conduct any activity directly under (as defined by the drip line of the tree) an active nest or nest tree. If major work must occur within this buffer, e.g., due to safety concerns, retain a QEP to monitor the nest for signs of disturbance during the activity.

- Avoid temporary lighting or new lighting regimes within 200 m of any active nest.
- Trees containing nests (active or inactive) cannot be removed without regulatory approval.

The comprehensive content of Heron Policy No. 16-020 along with Appendices 1 to 4, and Schedules A to D, can be found on the Bowen Island Municipality website. Figures 2, 3 and 4 display preliminary 'primary' buffers applied at historical nest sites in Snug Cove, Tunstall Bay/Sealeigh Park and Galbraith Bay.

Metro Vancouver Regional Parks (i.e., Crippen Park, Bowen Island)

Metro Vancouver is committed to working with municipalities to maintain regional biodiversity. The Regional Parks Plan (2011), Strategy 1.1.3 states that Metro Vancouver will "Restrict public access to sites that are too environmentally sensitive for human use while seeking ways to provide off site interpretation and education opportunities." The Parks and Greenways Plan aims to manage and protect regionally significant landscapes and critical habitats for wildlife.

Provincial

Under Section 34 of the BC *Wildlife Act*, it is considered an offence to possess, take, injure, molest, or destroy: (a) a bird or its egg, (b) the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl, or (c) the nest of a bird not referred to in paragraph (b) when the nest is occupied by a bird or its egg." Clause b is applicable year-round whether the nest is occupied or not, in all seasons. 'Molestation' can include any human activity deemed to cause disturbance, including walking or working near the nest or any loud noises from equipment, that cause birds to abandon their active nests.

On private land, the provincial government requests that land users refer to the Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia (Ministry of Environment 2014) to understand how best to protect wildlife and other natural resources. The associated Fact Sheet #11 refers directly to environmental guidelines with respect to Great Blue Herons (Available at: http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare/Fact-Sheet-11-herons.pdf).

To cut or modify heron nest trees, or attempt to relocate a nest, it is a requirement under the BC *Wildlife Act* that a permit be obtained from the BC Ministry of Forests, Lands, and Natural Resource Operations.

Federal

Schedule 1 of the *Species at Risk Act* directly prohibits the killing or harming of threatened or endangered migratory birds and aquatic species anywhere they occur, and all other listed organisms found on federal lands. While Schedule 1 of the SARA lists species that are Endangered, Threatened, Extirpated and of Special Concern, the general prohibitions do not apply to species of Special Concern. The main consequence of a listing as a species of Special Concern is that it is being monitored as a species that may become a threatened or endangered and that a federal management plan be prepared for the species and its habitat.

The federal *Migratory Birds Convention Act*, 1994 (MBCA) Section 12(1h) "prohibits the killing, capturing, injuring, taking, or disturbing of migratory birds or the damaging, destroying, removing, or disturbing of nests". Section 6(a) of the Migratory Birds Regulations forbids the disturbance, destruction, and taking of nests or eggs.

5.2 Habitat Management

In addition to the above regulations, Best Management Practices (BMPs) are prepared for use by local governments, the development community, landowners and environmental organizations as guides to maintaining environmental values during the development of urban and rural lands and to mitigate effects from human activities. With respect to active heronries, the Ministry of Environment *Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in BC* (MOE 2014) recommend the following protective buffers at heron nest sites:

- Establish a *year-round* undisturbed vegetated buffer zone around the nest tree (or outer perimeter of all nest trees; heronry) of 300 m in undeveloped forest, 200 m in rural areas (≤5 ha), and 60 m in urban developed areas (≤1 ha).

- *During the breeding season* (January 15 – September 15) apply a 'quiet' buffer of 200 m in addition to the above.

Other BMPs to protect herons, nest trees and young (Bowman and Siderius 1984, MWLAP 2001, SCCP 2011, Bowen Heron Watch 2013, MOE Develop with Care 2014) also recommend the following measures be established.

5.2.1 Nest Sites

- Retain a QEP experienced in the requirements and sensitivity of this species to assess the unique conditions onsite, and the value and sensitivity of the habitat to be protected, and recommend the appropriate buffer width.
- Identify and clearly mark out a buffer zone around nest sites or heronries (using flags and/or exclusion fencing) where no activities will be permitted (including recreational trails). Buffers left undisturbed with natural vegetation intact (trees, shrubs and ground cover) help to shield the nests and young from exposure to weather, predators (e.g., bald eagles, crows, ravens, raccoons), human activity and pets.
- Manage trees on the edge of the buffer so as to prevent windthrow outside or within the buffer zone.
- Bearing in the mind the recent observations of raccoons and other mammal predators on the island, install barrier cones or metal wraps at the base of nest trees to prevent predator climbing.
- Develop and install signage along buffer perimeters and/or near nest sites warning pedestrians of the sensitivity of potential nesting, brooding and fledgling activity.
- Consider placing numerical brass metal Province of BC Great Blue Heron Inventory Tags on all nest trees to identify them for future reference in the community.
- Protect commonly utilized heron feeding and perching areas including riparian areas, wetlands or coastal marshes, lakes and marine shoreline and inshore habitats.

5.2.2 Construction and Landowner Maintenance

- Establish least-risk timing windows during which particular activities with the potential for a high degree of disturbance are allowed to occur (e.g., construction, road building, community festivals) and require that a permit be obtained for activities that are planned outside this timing window with an onsite environmental monitor or QEP present throughout the event.
- Introduce tree-cutting and land-clearing bylaws to protect natural areas including raptor and heron nest trees. Encourage land-owners to minimize tree clearing to maintain bird roosting and nesting sites.
- Conduct blasting or similar excessive operations no closer than 1000 m from a nest site during the breeding season; otherwise, retain a QEP to establish appropriate distances in specific circumstances.
- Restrict the use of night lighting at or near nest sites during the breeding season (e.g., light standards, construction or residential flood lighting, lights required for night-time filming).
- Where development is proposed in proximity to existing nests, as part of the permitting process, encourage the applicant to explore opportunities to establish covenants, land-use envelopes, road locations and vegetated buffers that will provide on-going habitat protection.
- Establish appropriate penalties and requirements for habitat restoration where protective buffer zones are damaged.

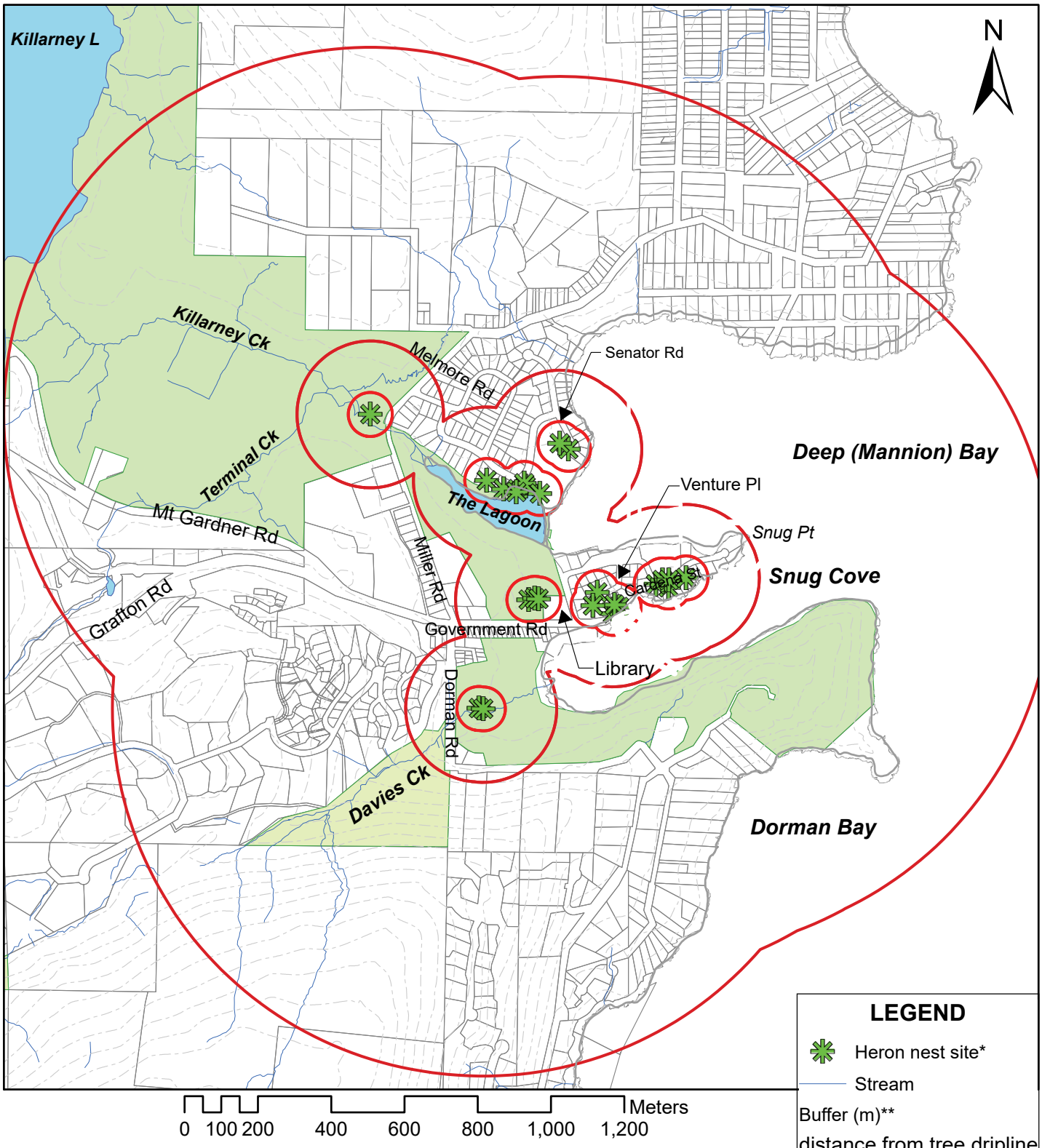
5.2.3 Regional Park Maintenance

- Within Crippen Regional Park heron nesting sites (i.e., northwest of Library parking lot, festival field at Davies Creek, Terminal Creek above Miller Road):
  - Adopt the municipal *Heron Policy No. 16-020* as a minimum protective measure.
  - Reduce the impact of hazard tree removals within or near heron nest buffer zones during the nesting season by conducting a prior habitat impact assessment. Consider pruning rather than tree removal.
  - Maintain existing tree canopy and native vegetation within and adjacent to the buffer zone.

- Limit the removal of understory vegetation and coarse woody debris within the buffer zone to reduce the vulnerability of nesting herons.
- Restrict mowing to outside the sensitive breeding period within 60 m of the nest in urban areas.
- Adjust the width of mown lawn to maintain the required undisturbed vegetated buffer zone.
- Restrict new trail building and human activity within buffer zones by installing exclusion fencing and educational signage.
- Practice appropriate regional park management measures for sensitive habitat.

5.2.4 Other Suggestions

- Actively disseminate the Bowen Island Municipality *Heron Nesting Policy No. 16-020*, especially at the start of the breeding season and refer to it in planning and permitting for projects in proximity to heron nesting sites. Make the policy known to maintenance crews and service providers such as BC Hydro, BC Tel, Shaw Cable, BC Ferries, etc.
- Due to the tendency for herons to return to breed at historical nest sites, monitor for several years after nesting last took place. Heron nest trees are protected indefinitely under the BC *Wildlife Act* as long as visible nesting material remains, regardless of when the nest was active. When there are no nest remains, the tree is no longer protected. Proposals to remove a tree that contains heron nest material should be addressed by provincial government.
- Continue to monitor nesting activity and report to agencies whose mandates are to protect heron habitat (e.g., Heron Working Group). Also, the identification and protection of foraging, perching and overwintering sites may be a key component of habitat conservation for Great Blue Herons.
- Implement public awareness and educational programs to foster appreciation for local biodiversity, the value of the Bowen Island heron colony, and its vulnerability to disturbance. Encourage landowners, naturalists, fishers and recreationalists to notify the municipality or Bowen Heron Watch about the locations of nests they discover or may know of.
- Consider an assessment of local bald eagle populations and/or nest sites with subsequent monitoring to facilitate a better understanding of the existing and future impact on this colony of herons.

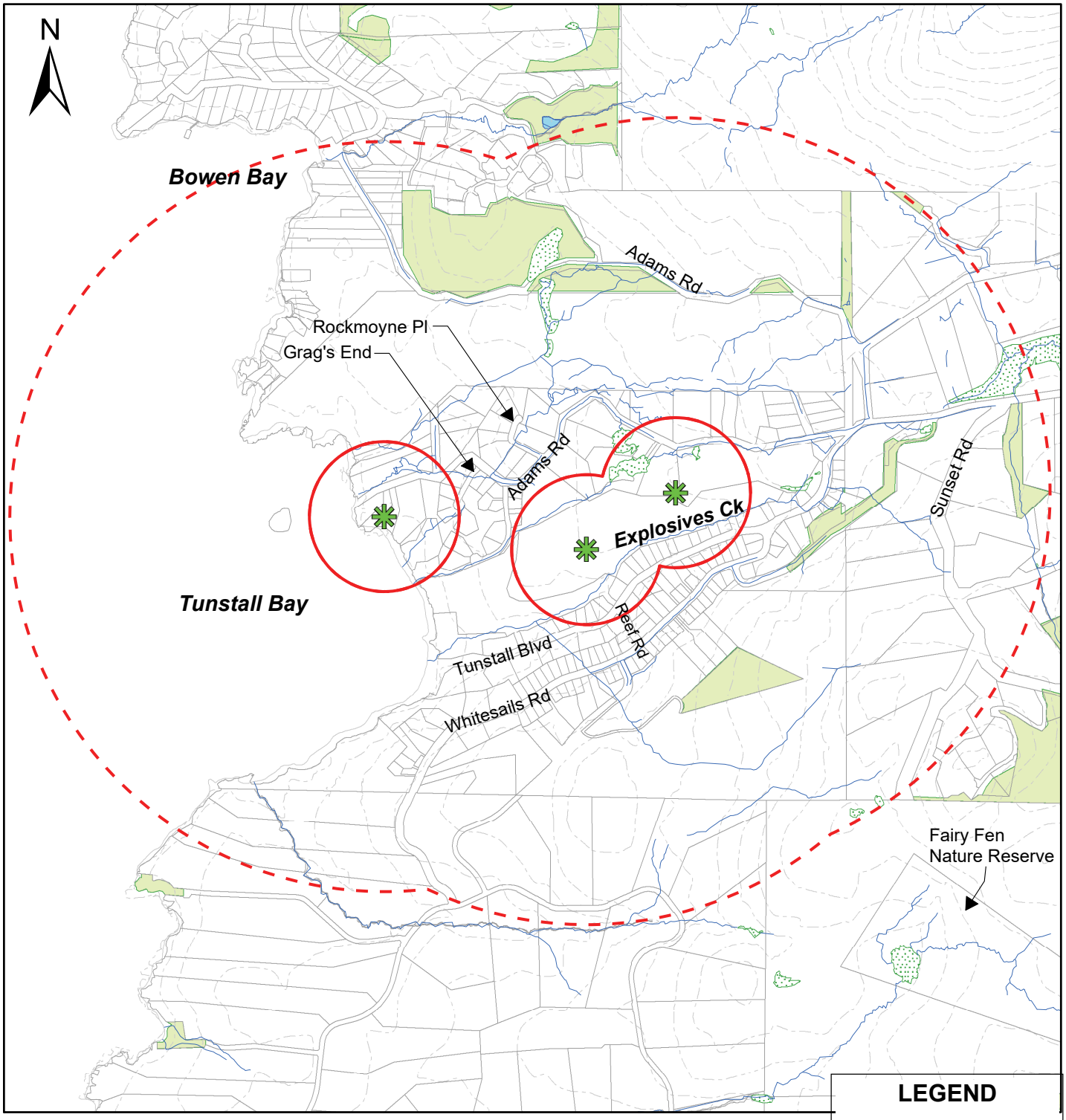


* A heron nest site may contain more than one nest.
** Based on 2016 BIM policy.

FIGURE 2.
Great Blue Heron nesting sites recorded at Snug Cove, Bowen Island, between 1998 and 2015

Prepared by Bowen Heron Watch, a joint project of the Bowen Nature Club and Bowen Island Conservancy.

Base map courtesy of the Bowen Island Municipality GIS. All feature locations are approximate. Elevation contour interval = 20 m.

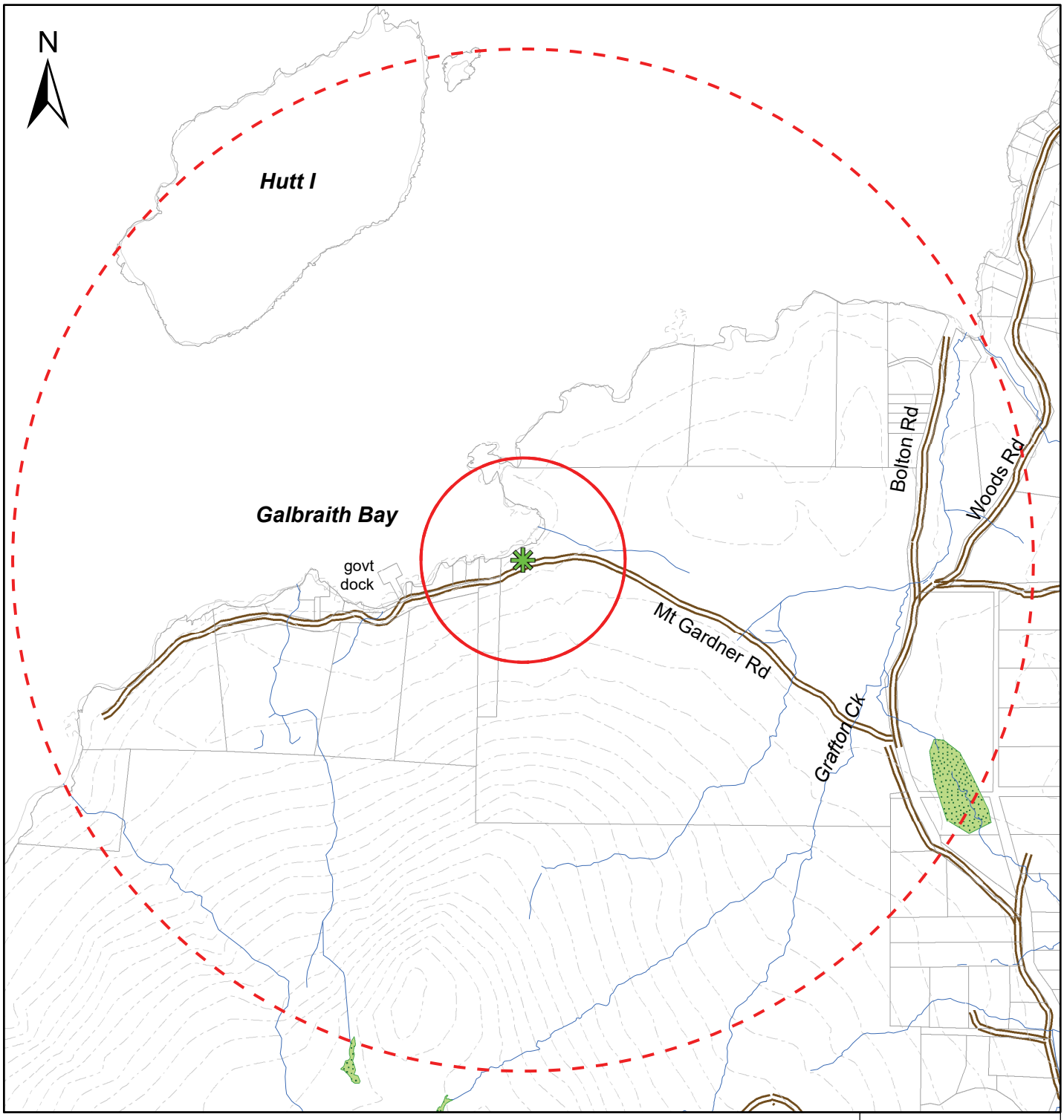


* A heron nesting site may contain more than one nest.
** Based on BIM 2016 Policy
*** Applies to urban areas only

FIGURE 3.
Great Blue Heron nesting sites recorded at Tunstall Bay, Bowen Island, between 1998 and 2015

Prepared by Bowen Heron Watch, a joint project of the Bowen Nature Club and Bowen Island Conservancy.

Base map courtesy of the Bowen Island Municipality GIS. All feature locations are approximate.
Elevation contour interval = 20 m.



* A nest site may contain more than one nest

** Based on BIM 2002 Policy

FIGURE 4.
Great Blue Heron nesting site recorded at Galbraith Bay, Bowen Island, between 1998 and 2015

Prepared by Bowen Heron Watch, a joint project of the Bowen Nature Club and Bowen Island Conservancy.

Base map courtesy of the Bowen Island Municipality GIS. All feature locations are approximate. Elevation contour interval = 20 m.

6 References

Bowen Heron Watch. 2013. Heron Colony Protection in Crippen Regional Park – 2013. Memo provided to Metro Vancouver Parks, Markus Merkens. Bowen Island, BC

Bowman, I. and J. Siderius. 1984. Management Guidelines for the Protection of Heronries in Ontario. Ontario Ministry of Natural Resources, MNR#51610

Blood, D.A. and G.G. Anweiler. 1994. Status of the Bald Eagle in British Columbia. BC Min. of Env., Lands and Parks, Wildlife Branch, Victoria, BC. Wildlife Working Report WR-62.

British Columbia Marine Conservation Analysis (BCMCA). 2014. Suitable Forage Fish Spawning Habitat Map. Available at: http://cmnbc.ca/atlas_gallery/bc-marine-conservation-analysis-atlas.

BC Ministry of Environment. 2014. Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia and Fact Sheet #11 Great Blue Herons. Available at: http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare/

BC Ministry of Environment, Lands and Parks – Vancouver Island Region. 2001. Environmental Objectives, Best Management Practices and Requirements for Land Developments, Version 3.0. Available at: http://wlapwww.gov.bc.ca/vir/pa/index.htm

Buehler, D. A. 2000. Bald Eagle. The Birds of North America 506: 1-39.

Butler, R.W. 1997. The Great Blue Heron. University of British Columbia Press, Vancouver

Butler, R.W. 1995. Great Blue Heron, *Ardea herodias*. The Birds of North America, No. 25. The American Ornithologists' Union. eds. A. Poole, P. Stettenheim and F. Gill. The Academy of Natural Sciences of Philadelphia, Washington, DC.

Butler, R.W. 1995. The Patient Predator: Foraging and Population Ecology of the Great Blue Heron in British Columbia. Canadian Wildlife Service Occasional Paper Number 86, Ottawa.

Butler, R.W., P.E. Whitehead, A.M. Breault, and I.E. Moul. 1995. Colony effects on fledging success of Great Blue Herons (*Ardea herodias*) in British Columbia. Colonial Waterbirds 18: 159-165.

Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J. Cooper, G. Kaiser and M.C. McNall. 1990. Birds of British Columbia: Volume 1, Nonpasserines, Introduction and loons through waterfowl. Royal British Columbia Museum, Victoria, BC.

Carlson, B.A., and E.B. McLean. 1996. Buffer Zones and Disturbance Types as Predictors of Fledging Success in Great Blue Herons, *Ardea herodias*. Colonial Waterbirds 19:124-127.

Chatwin, T, S. Bonar and M. Kissinger. 2006. Pacific Great Blue Heron Population and Monitoring on Vancouver Island and the Gulf Islands. Report prepared for the Ministry of Environment and the Heron Working Group.

CDC [online]. 2015. *Conservation Data Centre*. B.C. Ministry of Environment, Victoria, B.C. <www.env.gov.bc.ca/cdc/> Accessed January 2016)

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2008. COSEWIC assessment and update status report on the Great Blue Heron *fannini* subspecies *Ardea herodias fannini* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. Available at: www.sararegistry.gc.ca/status/status_e.cfm

COSEWIC. 2015. Wildlife Species Assessment and Candidate Wildlife Species. Updated July 2015. Available at http://www.cosepac.gc.ca/eng/sct5/index_e.cfm. Accessed January 2016.

Environment Canada. 1994. *Migratory Birds Convention Act*. http://laws.justice.gc.ca/en/M-7.01/C.R.C.-c.1035/text.html

Environment Canada. 2011. *Species At Risk Act*. http://www.speciesatrisk.gc.ca/legislation/default_e.cfm

Environment Canada. 2016. Management Plan for the Great Blue Heron *fannini* subspecies (*Ardea herodias fannini*) in Canada [Proposed]. Species at Risk Act Management Plan Series.

Gebauer, M. B. and I. E. Moul. 2001. Status of the Great Blue Heron in British Columbia. Wildlife Working Report No. 102, British Columbia Ministry of the Environment, Lands and Parks, Wildlife Branch, Victoria

Government of British Columbia. 2011. Section 34 of the B.C. *Wildlife Act*. http://www.qp.gov.bc.ca/statreg/stat/W/96488_01.htm#section34

Gowans, B. and Bowen Heron Watch. 2001. Report on the nesting activities of the Great Blue Heron (*Ardea herodias fannini*). Bowen Island, BC.

Gowans, B. and Bowen Heron Watch. 2003. Heron Nesting Data. Bowen Island, BC.

Kenyon, J.K. 2005. Behaviours influencing the distribution of Great Blue Herons (*Ardea herodias fannini*) in the Strait of Georgia, British Columbia. M.Sc. thesis, Simon Fraser University, Burnaby, B.C.

Kenyon, J.K. 2006. Use of Vanishing Bearings to Locate New Wading Bird Colonies. Waterbirds 29:203-210

Mackintosh, M., Z. Jones, R. Boelens, J. Gray, and D. Epp. 2006. Stanley Park Heronry Management Plan. Stanley Park Ecology Society. Available at: http://stanleyparkecology.ca/news-andresources/publications/stanley-park-management-plans/

Matheson, J. and Bowen Heron Watch. 2002. Report on the Nesting Activities of the Great Blue Heron. Bowen Island, BC.

McClaren, E.L. 2003. Pacific Great Blue Heron Population Inventory and Monitoring Project, Strait of Georgia, British Columbia. Ministry of Water, Land and Air Protection, Nanaimo, BC.

Metro Vancouver. 2011. Regional Parks Plan. Available at: http://www.metrovancouver.org/services/parks/ParksPublications/RegionalParksPlan.pdf

Moul, I.E., R.G. Vennesland, M.L. Harris, and R.W. Butler. 2001. Standardizing and interpreting nesting records for Great Blue Herons in British Columbia, Canadian Wildlife Service Progress Notes No. 217, Ottawa.

Norman, D.M, A.M. Breault, and I.E. Moul. 1989. Bald eagle incursions and predation at Great Blue Heron colonies. Colonial Waterbirds 12(2) 1989: 215-217.

Resources Inventory Committee (RISC). 1998. Inventory Methods for Colonial-Nesting Freshwater Birds: Eared Grebe, Red-necked Grebe, Western Grebe, American White Pelican, and Great Blue Heron. Standards for Components of British Columbia's Biodiversity No. 8. Version 2.0. Ministry of Env., Lands and Parks Resources Inventory Branch, Victoria, B.C.

Shoji, M., S. Lemmon and C. Carl. 2000. Bowen Island Information System. Prepared for Real Estate Foundation, Bowen Island Municipality, Geological Survey of Canada and Capilano College. Bowen Sustainability Project. Bowen Island, BC

South Coast Conservation Program (SCCP). 2011.BC's Coast Region: Species & Ecosystems of Conservation Concern, Great Blue Heron *fannini* subspecies (*Ardea herodias fannini*). Prepared by: P. Zevit and K. Welstead for the South Coast Conservation Program Available at: http://www.geog.ubc.ca/biodiversity/factsheets/

Vennesland 2010. Risk perception of nesting Great Blue Herons: experimental evidence of habituation. Canadian Journal of Zoology 88:81-89.

Vennesland, R.G. 2000. The effects of disturbance from humans and predators on the breeding decisions and productivity of the Great Blue Heron in south-coastal British Columbia. Master of Science thesis, Simon Fraser University, B.C.

Vennesland, R.G. and R.W. Butler. 2011. Great Blue Heron (*Ardea herodias*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/025doi:10.2173/bna.25

Vennesland, R.G. and R.W. Butler. 2004. Factors influencing Great Blue Heron Nesting Productivity on the Pacific Coast of Canada from 1998 to 1999. Waterbirds 27(3): 289-296.

Vennesland, R. G. and D. M. Norman. 2006. Survey Protocol for Measurement of Nesting Productivity at Pacific Great Blue Heron Nesting Colonies. Heron Working Group**.** Available at: www.heronworkinggroup.org

Vennesland, R.G. and K. Summers. 2004. Great Blue Heron Species Account. Identified Wildlife Management Strategy guidelines, Volume 2, B.C. Ministry of Environment, Victoria, BC.

Vermeer, K., K.H. Morgan, R.W. Butler and G.E.J. Smith. 1989. Population, Nesting Habitat and Food of Bald Eagles in the Gulf Islands, In: K. Vermeer and R.W. Butler (eds.). The Status And Ecology Of Marine And Shoreline Birds in the Strait of Georgia, British Columbia. Canadian Wildlife Service Special Publication, Ottawa.

Vos, D.K., R.A. Ryder, and W.D. Graul. 1985. Response of breeding Great Blue Herons to human disturbance in Northcentral Colorado. Colonial Waterbirds 8:13-22.

Appendix 1

Photographs

Photograph 1 Adult Great Blue Heron carrying twigs during nest-building (Courtesy of W. Husby)

Photograph 2 Great Blue Heron nest in a Douglas-fir in Sealeigh Park (Courtesy of A. Whitehead)

Photograph 3 Nesting Great Blue Herons in bigleaf maple at Crippen Park nest site northwest of the Library (Courtesy of W. Husby)

Photograph 4 Three Great Blue Heron nests in a Douglas-fir in Sealeigh Park (Courtesy of A. Whitehead)

Photograph 5 Adult Great Blue Heron nest in a bitter cherry in the Lagoon, Bowen Island (Courtesy of W. Husby)

Photograph 6 Remains of Great Blue Heron eggs found below a nest in Galbraith Bay (Courtesy of A. Whitehead)

Photograph 7 Juvenile Great Blue Heron in the upland riparian area near Dallas Marina (Courtesy of W. Husby)

Photograph 8 Juvenile Great Blue Heron wading in the Lagoon (Courtesy of W. Husby)

Photograph 9 Fledgling Great Blue Heron in flight over Snug Cove (Courtesy of W. Husby)

Photograph 10 Juvenile Great Blue Heron walking along the marine shoreline in Cape Roger Curtis (Courtesy of A. Whitehead)

Appendix 2

Bowen Island Municipality Heron Policy No. 16-020

Bowen Island Municipality

POLICY

Policy Drafted: February 22, 2016 **Policy #16 - 020**
Policy Adopted: April 25, 2016

Heron Policy

DEFINITIONS AND INTERPRETATION:
For the purposes of this policy:

Active Nest – means a nest that is being built or utilized by herons for breeding. Heron will often add woody material to a nest that was built in previous years or a new nest may be constructed at the start of the breeding season.

Blue-listed – is a provincial designation for wildlife species that are considered to be vulnerable and at risk of becoming a threatened or endangered species.

Breeding Season – means the period of time that heron reproduce. The breeding season commences when heron start to gather (more than one individual bird) in potential nest trees. During the start of the breeding season, heron may be observed carrying twigs in their bills. Once established, a nest tree becomes the focal point for a breeding pair. The breeding pair may be seen inside the nest or situated on a tree limb in close proximity to the nest.

Disturbance – means any activity that may result in heron abandoning an active nest thereby leaving the eggs or nestlings vulnerable to predation. For the purposes of this policy, the term disturbance can also relate to works that physically dislodge a nest from a tree or removal of a nest tree.

Disturbance classifications (i.e., low, moderate and high) have been created and various activities have been slotted into each classification depending upon the potential invasiveness of noise associated with the activity (see Appendix 1).

Drip line – means the outermost circumference of a tree canopy where water can drip straight to the ground.

Habituation – refers to the lack of response by heron to certain stimuli after a period of exposure.

Management Plan – means a plan developed by a Qualified Environmental Professional that may include both mitigation and monitoring measures. In certain cases where the operation of small motorized landscaping equipment is required for vegetation maintenance within 60 m of an urban nest or 200 m of a rural nest, a seasonal management plan may be created by a Qualified Environmental Professional.

Nest Tree – means a tree containing a nest whether or not the nest is in use.

Qualified Environmental Professional (QEP) – means an applied scientist or technologist who is registered and in good standing with a British Columbia professional organization constituted under an Act. The QEP must have experience with species at risk management and must have knowledge of heron breeding and nesting behaviour.

Rural – refers to anywhere on Bowen Island other than in the policy defined urban area (see Schedule "C" & Schedule "D" maps).

Heron nesting in policy defined rural areas of Bowen Island are generally considered more sensitive to noise.

Appendix 3 describes how protection of nesting heron in the policy defined rural area of Bowen Island can be achieved i.e., when a Qualified Environmental Professional should be sought to mitigated the risk of disturbing nesting heron by developing a management plan.

Urban – refers to the area within the Snug Cove Village Boundary and the Deep Bay neighbourhood (see Schedule "C" & Schedule "D" maps).

Heron nesting within the Snug Cove Village Boundary and Deep Bay neighbourhood area have demonstrated habituation to certain noises e.g. ferry traffic.

Appendix 2 describes how protection of nesting heron in the policy defined urban area of Bowen Island can be achieved i.e., when a Qualified Environmental Professional should be sought to mitigate the risk of disturbing nesting heron by developing a management plan.

POLICY OBJECTIVE:

Facilitating adherence to provincial and federal laws pertaining to Pacific Great Blue Heron, *Ardea herodias fannini,* a listed species 'at risk' by providing guidance to the person proposing works during nesting season in the vicinity of active heron nests on Bowen Island.

CONTEXT:

Nesting history and patterns

Pacific Great Blue Heron, *Ardea herodias fannini*, have been designated as a blue listed species by the British Columbia Ministry of Environment.

Long-term monitoring of Bowen Island's nesting heron has led to the following observations:

a. The number of active heron nests varies from year to year
b. The location of active heron nests varies from year to year
c. Apparent nesting success (i.e., fledging of at least one young) is very low in most years (observations of local Heron Watch participants and Qualified Environmental Professional (QEP) suggest that depredation by Bald Eagles, sometimes associated with a disturbance event, is a leading cause of nest failure)

d. The breeding window for heron varies from year to year but typically nesting activities have been noted from February 1 to August 31
e. Habituation to certain human activity and specific noises has been documented in the area defined as urban (Schedule "C" & Schedule "D" Maps)
f. Heron have demonstrated greater reaction to certain noises or disturbance early in the breeding season

PRINCIPLES:
This policy is developed to facilitate adherence to the following principles:

1. Adherence to existing legislation and regulation – Section 34 of the provincial Wildlife Act protects Pacific Great Blue Heron, its nests and eggs during the nesting season (typically from February 1 to August 31). Heron nests and nest trees are protected year-round, whether or not the nest is active.

   Section 34 of the Wildlife Act states: "A person commits an offence if the person, except as provided by regulation, possesses, takes, injures, molests or destroys

   (a) a bird or its egg,
   (b) the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl"

   Heron and their active nests are also protected under the federal Migratory Birds Convention Act and Species at Risk Act.

   'Molestation of wildlife' is an offence under the Wildlife Act. Loud noises from e.g., equipment may be considered 'molestation' if these noises cause the heron to abandon active nests.

   Fines and Penalties associated with Wildlife Act contraventions are attached to this policy in Appendix 4.

2. Minimizing disturbance – The burden of demonstrating that a proposed activity in the vicinity of nesting herons will not contravene legislation falls to the person proposing works or the agency authorizing the activity.

   To minimize the risk of committing an offence under the Wildlife Act, a QEP should be consulted to develop a management plan related to the proposed work in the vicinity of active heron nests.

3. Consistency with the Bowen Island Municipality Official Community Plan (OCP) – The OCP objectives that are directly related to this policy are:

   a. Objective 1 – "To maintain Bowen Island's unique environmental heritage, community identity and sense of place by ensuring that the island's natural landscapes and ecosystems are protected."

b. Objective 2 – "To preserve and maintain biodiversity, which includes wildlife habitats and native vegetation in their natural state, giving special consideration to wildlife, plants, and ecosystems that are considered endangered, threatened, or of special concern."
c. Objective 3 – "To ensure that new development incorporates a 'no net impact' strategy with respect to significant plant, wildlife, and fish habitats."

4. Participatory decision-making – The policy guidance is intended to encourage productive conversations and decision-making among local government, project managers, landowners, and QEP.

IMPLEMENTATION:
Steps necessary to adhere to legislation regarding heron are outlined below. These steps are also outlined in Schedule "A" and Schedule "B" flowcharts.

Step 1 – Determining nest activity (Schedule "A" flowchart)
The first consideration is to determine whether nesting activity has been initiated/concluded on the island. To determine whether or not nesting activity has been initiated on Bowen Island within a given year's breeding season (typically February 1 – August 31), contact Bowen Island Municipality Manager of Parks and Environment for confirmation.

If nesting activity has been initiated at the nest(s) within 200 m of a proposed moderate disturbance action or 1000 m of a proposed high disturbance action a QEP may be required to develop a management plan (see Step 2).

If breeding activity has yet to be initiated (or has been concluded) on the island in a given year or if breeding activity has yet to be initiated (or has been concluded) at the focal nest(s), proceeding with otherwise lawful activities should be permitted.

If nesting activity is noted at any point during the execution of the activity, the activity should be halted and a QEP consulted to determine the best path forward.

Step 2 – Minimizing disturbance at active nests (Schedule "B" flowchart)

For the purpose of this policy, disturbance has been categorized as low, moderate or high (Appendix 1). Any proposed high disturbance activities should be performed outside of the typical nesting period. If delay of a high disturbance activity within 1000 m of active nests is not possible, e.g. due to safety concerns, or practical, consult a QEP to determine if a management plan can be developed that adheres to federal and provincial legislation.

If works that fall into the moderate disturbance category are proposed within 60 m of an active urban nest and 200 m of an active rural nest, a QEP should be retained to develop a management plan.

A QEP should be retained to develop a management plan if activities within 200 m of an urban active nest fall within the moderate disturbance category (b) e.g. heavy equipment and

associated activities, pressure washer, leaf blower, nail gun, compressor, chainsaw, asphalt/concrete cutting saw, and other loud power tools.

No activity should be allowed directly underneath the active nest or nest tree (as defined by the drip line of the nest tree). If major work must occur within this area e.g., due to safety concerns, a QEP should be engaged to watch the nest for signs of disturbance during the activity.

Temporary lighting or new lighting regimes within 200 m of any active nest should be avoided.

CONCLUSION

This policy has been developed in accordance with federal and provincial statutory provisions related to Pacific Great Blue Heron. The onus of proving that a particular activity is congruent with legislation falls to the person proposing the works or the authorizing organization. Therefore, to minimize the risk of committing an offence under the Wildlife Act, a QEP should be consulted to develop a management plan related to the proposed work in the vicinity of active heron nests.

Policy adopted by Council at its meeting held this _____day of _____, 2016.

Murray Skeels	Kathy Lalonde
Mayor	Chief Administrative Officer

Appendix 1

Noise Disturbance Categories and Definitions

1. **Low Disturbance** – Activities that are unlikely to cause undue disturbance at an active nest (e.g., pedestrian activity, unamplified music) if not conducted directly under a nest tree.

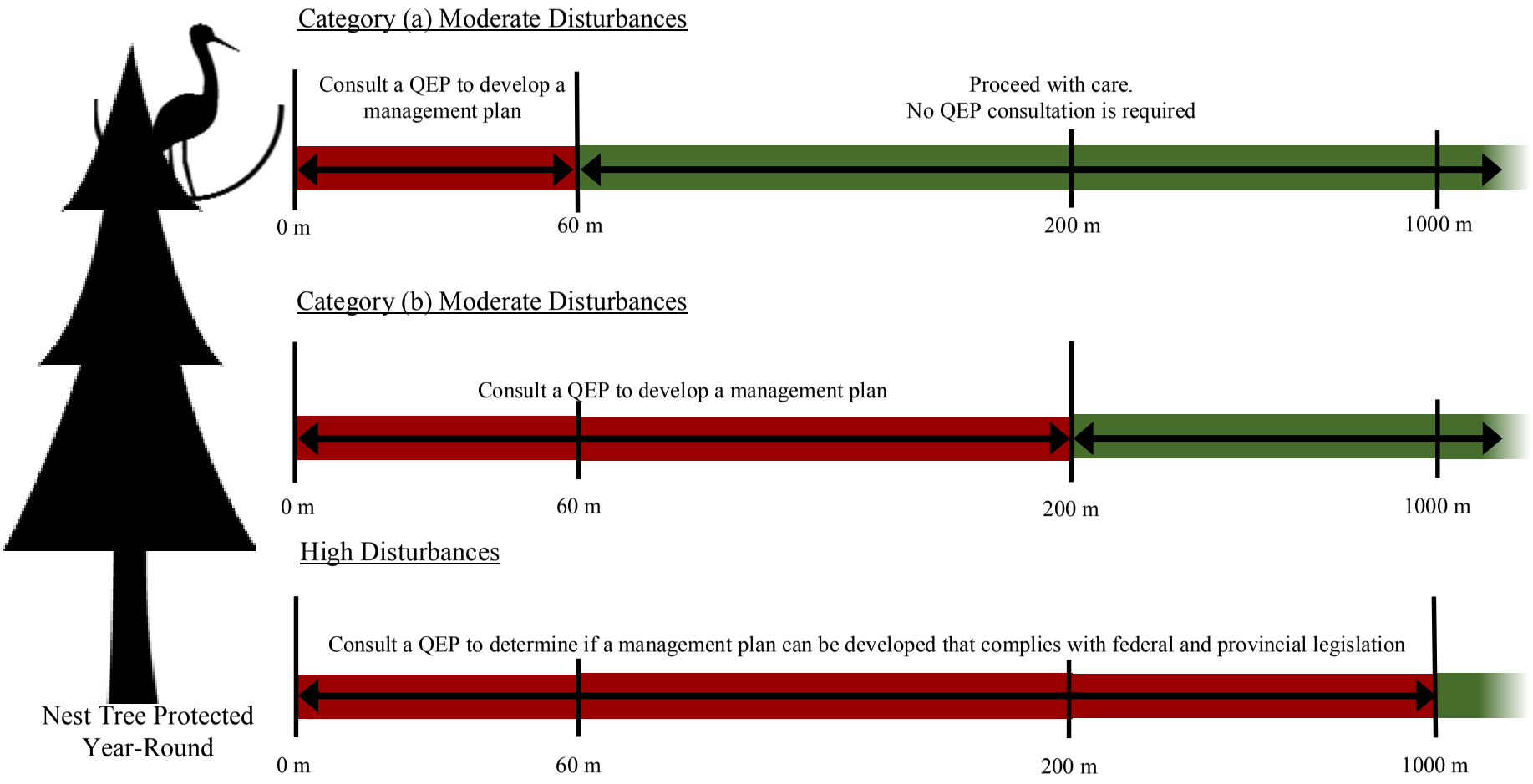
2. **Moderate Disturbance** – Activities that have the potential to cause undue disturbance if conducted in proximity to an active nest but have the potential to be mitigated. The moderate disturbance category is comprised of two categories.

   Category (a) - Small engine landscaping equipment e.g., mowers and line trimmers and general construction activities e.g., hammering. If these activities are proposed within 60 m of an active urban nest (Schedule "A" map) or 200 m of an active rural nest, a Qualified Environmental Professional should be retained to develop a management plan that adheres to federal and provincial legislation.

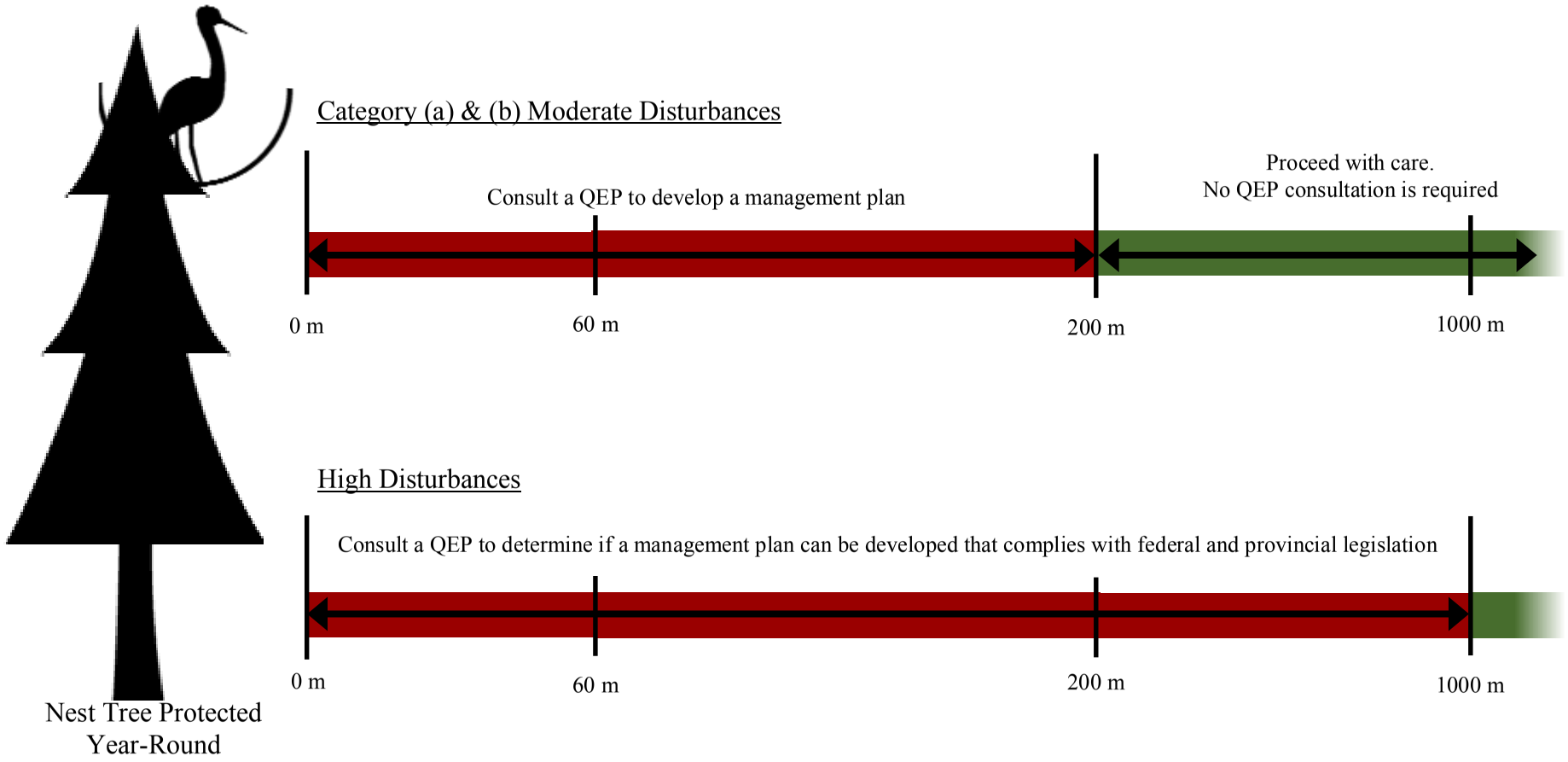
   Category (b) - Heavy equipment and associated activities e.g., digging and dumping of materials, amplifier e.g. electrified sound system for the purposes other than busking, loud power tools e.g., pressure washer, leaf blower, nail gun, compressor, chainsaw, asphalt/concrete cutting saw, and other loud power tools. As works or activities utilizing any one of these items could introduce intermittent or novel sources of noise, a Qualified Environmental Professional should be retained to develop a management plan that adheres to federal and provincial legislation.

3. **High Disturbance** – Activities known to potentially disturb breeding heron even at long distances from active nests (e.g., blasting, fireworks, jackhammers, novel sources of bright lights).

Appendix 2
Protection of Nesting Heron
in Policy Defined URBAN Area of Bowen Island



Appendix 3
Protection of Nesting Heron
in Policy Defined RURAL Area of Bowen Island



Appendix 4

Fines and Penalties under the British Columbian Wildlife Act[1]

Fines and penalties

Section 84 - For the purpose of determining the fines and penalties to which a person is subject on conviction for an offence under this Act,

A person who commits an offence referred to in subsection (1) (b) – Section 34 of the Wildlife Act is liable,

(a) on a first conviction, to a fine of not more than $100,000 or to a term of imprisonment not exceeding one year, or both, and

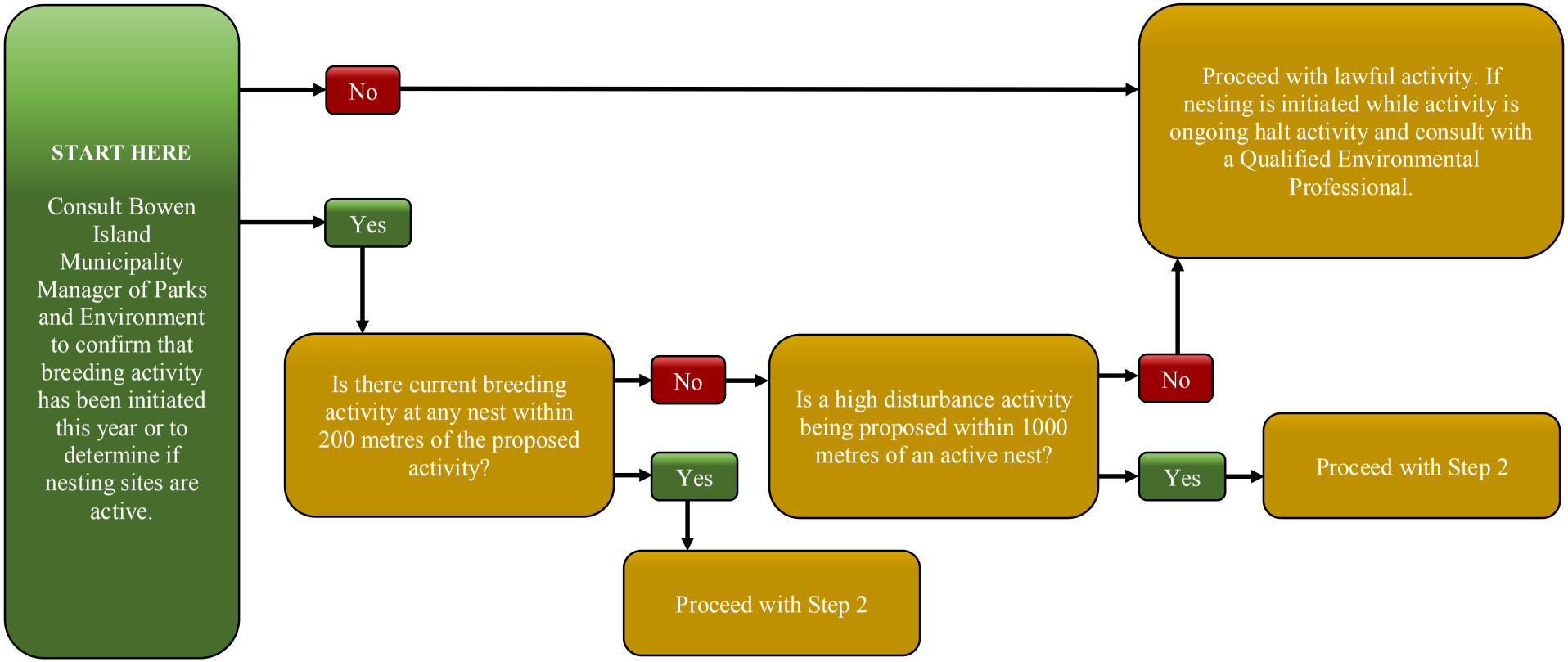
(b) on each subsequent conviction for the same offence or another offence referred to in subsection (1) (b), to a fine of not more than $200,000 and not less than $2,000 or to a term of imprisonment not exceeding 2 years, or both.

[1] These fines and penalties are applicable as of April 4, 2016. But are subject to any changes to the BC Wildlife Act

SCHEDULE "A"

Step 1

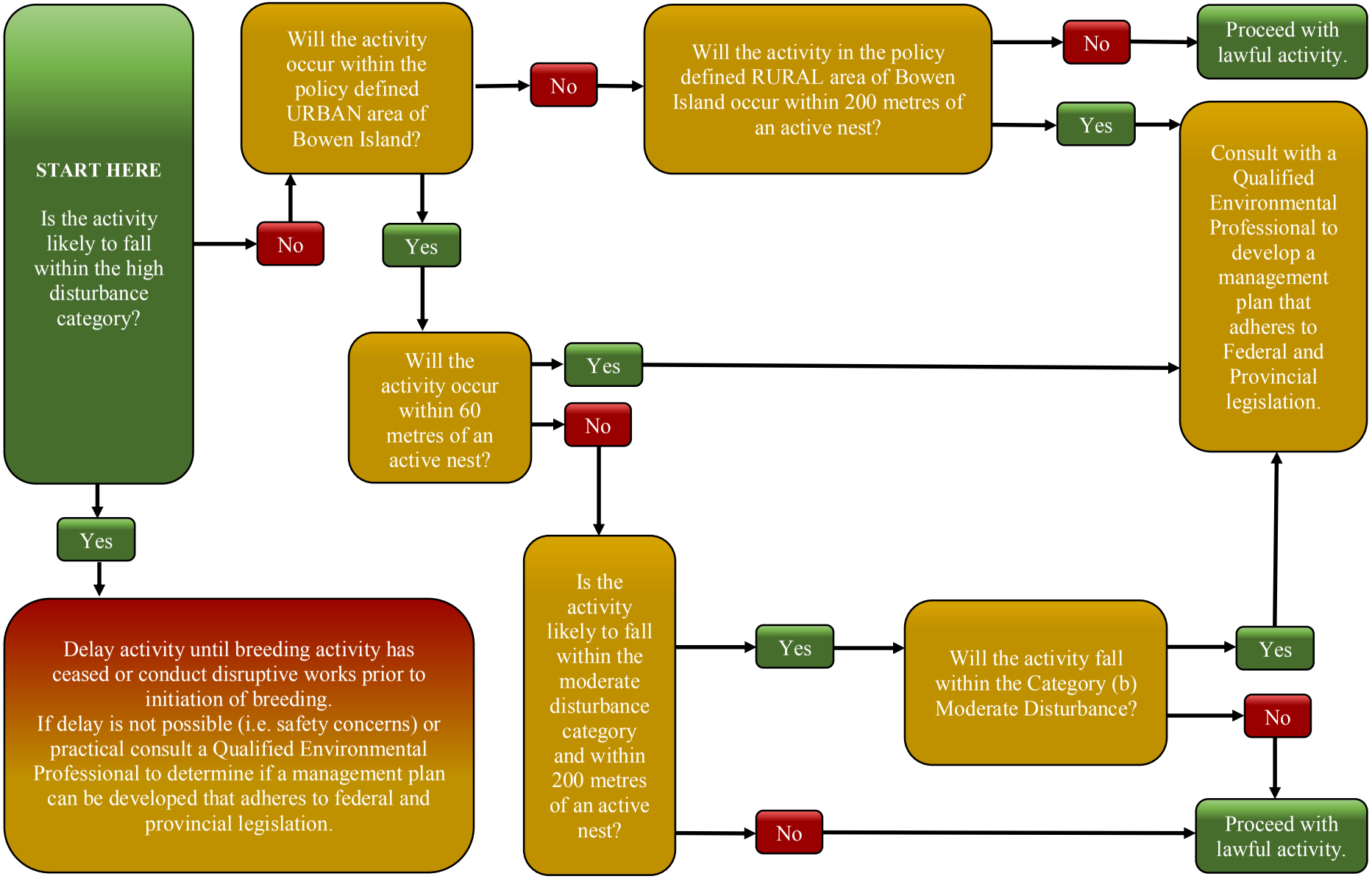
Determine Nest Activity in Any Given Year



SCHEDULE "B"

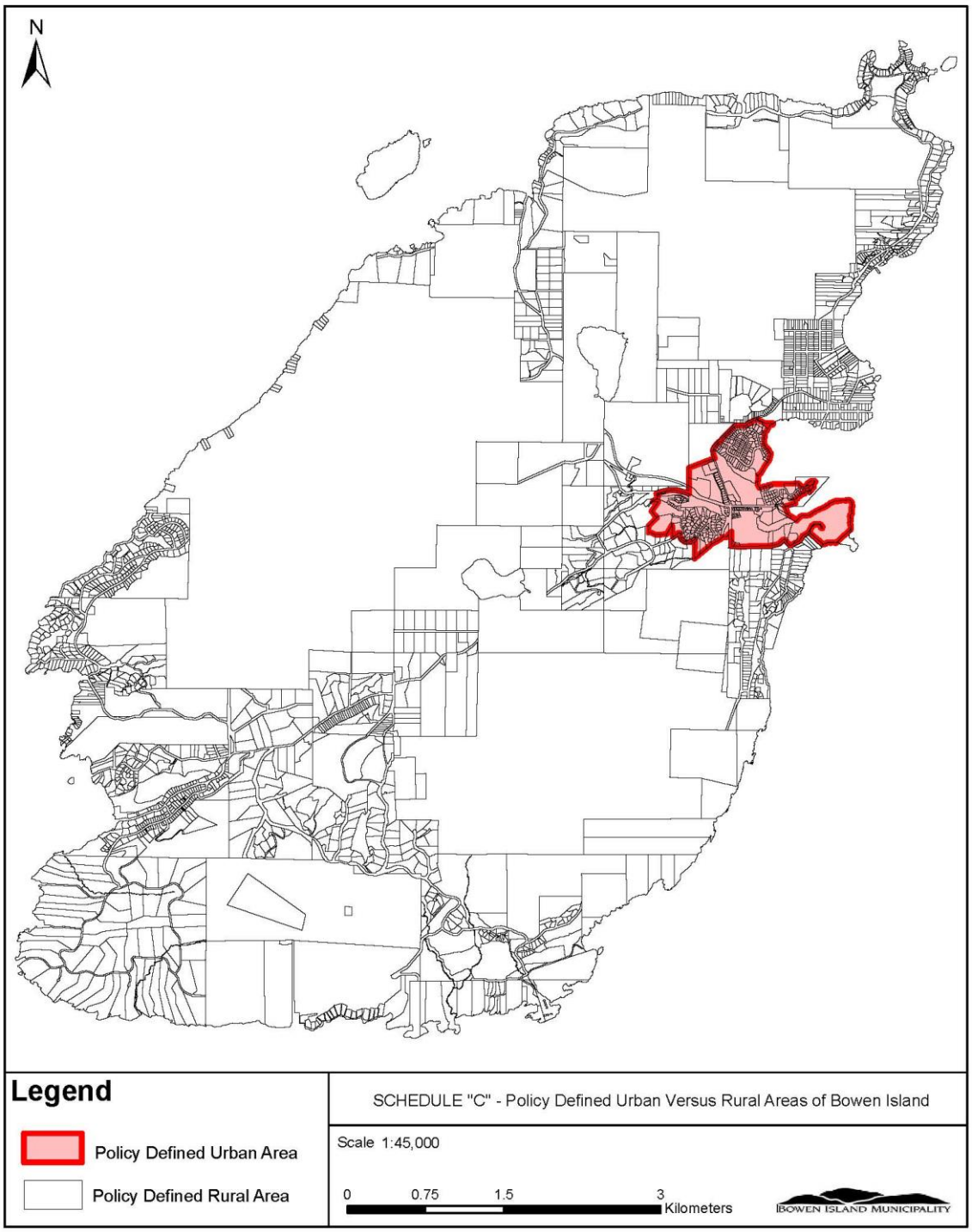
Step 2

Activity Guidance to Minimize Disturbance Potential



SCHEDULE "C"

Policy Defined Urban Versus Rural Areas of Bowen Island



SCHEDULE "D"

Interface Map Urban Versus Rural Areas of Bowen Island