



Land-based Pre-count Versus Complete Nest Survey of Wetland-nesting Birds at Sudeten Marsh, Peace River, British Columbia

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Abstract

The alarming loss of wetlands in North America, mainly through agricultural conversion, and the apparent decline in some wetland-dependent species of birds over the past century has prompted a recent interest in establishing monitoring programs. In the mid-1970s, a personal wetland-monitoring program was established in British Columbia to assess the diversity and populations of wetland-nesting birds and provide accurate information for identifying long-term trends. At least 680 provincial wetlands have been surveyed completely by myself and others with whom I worked with over the 40-year period by wading and canoeing. Results from surveys at Sudeten marsh are the first to be published.

During six “in-marsh” surveys between 1978 and 2008, 22 species of wetland-nesting birds were initially recorded on the marsh, of which 12 species (54%) were actually confirmed nesting. A total of 248 nests was found. Red-winged Blackbird (*Agelaius phoeniceus*) accounted for 71% of all nests and Common Grackle (*Quiscalus quiscula*) 13%. For some species, like Ring-necked Duck (*Aythya collaris*), the number of nests located was significant for British Columbia. The value-added information collected contributed some of the first details for dimensions and other aspects of species’ nests and allowed a calendar to be constructed for various components of the nesting chronology for 12 species. Combined, the nesting birds spend at least 134 days each year on Sudeten marsh.

Results indicate a lack of correlation between pre-survey counts and “in-marsh” surveys. For example, some species detected on pre-counts were not found nesting and some species found nesting were not detected in pre-survey tallies. Therefore, observations from short visits to marshes can be misleading if it is assumed that a particular species is nesting.

INTRODUCTION

In the mid-1960s, while collecting birds’ eggs under a federal scientific permit in marshes in the Richter Pass area between Keremeos and Osoyoos, British Columbia (see Campbell and Meugens 1971), I soon realized that what I initially heard and saw at a marsh were very different than what I actually found nesting when I later searched the marsh for nests (Figure 1). Shortly after I began working for the BC Provincial Museum in January, 1973 I initiated a more intense and personal research project to survey and monitor breeding populations of waterbirds in palustrine wetlands in the Province (Figure 2). The long-term goal was to produce a catalogue for the province similar to one published by the provincial museum for seabirds by Drent and Guiguet (1961). Some of the wetland nest counts were published in *The Birds of British Columbia* (Campbell et al. 1990a, 1990b, 1997, 2001) but comparisons between species and nesting evidence initially observed with those actually found from direct “in-marsh” searches were not included.



Figure 1. This North American songster is a good indicator of the general health of cattail and bulrush marshes because of its invertebrate diet. A male Marsh Wren mates with more than one female in a breeding season and may build up to 27 nonbreeding “dummy” nests (usually 5-6) that are not used by the female to lay eggs. In a marsh with six territorial males at least 30 nests could be checked before eggs are found. *Photo by Alan D. Wilson.*

Although results vary between wetlands and years, one of the purposes of this article is to chronicle the two methods: inventorying and monitoring species from initial land-based observations (Figure 3) that include songs and calls followed by direct “in-marsh” nest searches for species. I did not use recorded playback of songs or calls. The results are dramatic and revealing. I estimate that I surveyed and monitored about 680 fresh-water wetlands, marshes, and swamps in this manner during nearly 1,500 visits since the early 1970s. The major emphasis has been on wetlands on the southern coast and the interior of the province.

Complete surveys of many large and small wetlands in British Columbia are achievable, and although time-consuming, may produce information that better depicts the true nesting diversity and composition of breeding birds, and contributes greatly to the regional life history cycle for wetland-nesting species. The objectives of wetland research should be to:



Figure 2. Since the late 1960s about 680 fresh-water wetlands have been completely surveyed and monitored for marsh-nesting birds in British Columbia, including six nest searches between 1978 and 2008 in this dense growth of cattails at Sudeten marsh. *Photo by R. Wayne Campbell, 22 June 2008.*

- Provide reliable information on the population status of marsh-dependent birds for individual wetlands in British Columbia to accurately assess trends over time;
- Develop a calendar of nesting activity and sensitivity for wetlands throughout British Columbia to plan for management and conservation activities;
- Highlight the general lack of consistency in species and numbers recorded on pre-survey counts with those actually found nesting; and
- Obtain value-added information to fill in gaps for species' life histories.



Figure 3. Often it is assumed that many of the birds seen or heard at a wetland during a short visit are probably nesting. In this photo Eileen Campbell is recording species at Boundary Lake in northeastern BC, before venturing into the lake to search for nests. Photo by R. Wayne Campbell, Boundary Lake, BC, 8 June 2005.

LOCATION AND DESCRIPTION

This unnamed, small, roadside marsh (Figure 4), hereafter referred to as Sudeten marsh, is located about 1.5 km south of Toms Lake and immediately north of Sudeten Heritage Park, west of the Dawson Creek – Tupper Highway in the southern Peace River country of northeastern British Columbia (10U 684833E 6159072N). It is about 160 m long and 68 m at its widest point and includes a band of dense emergent vegetation, mostly cattails (*Typha latifolia*), along the south and east sides and small shore patches elsewhere. Sedges (*Carex* sp.) and horsetail (*Equisetum* sp.) occupy the entire north end. The area of open water is about 116 m by 56 m (Figure 5). The area of the entire marsh is about 0.85 ha and open water about 0.5 ha. The elevation at water edge is 732 m.

Water depth ranged from 0.5 m to 1.1 m in cattail stands and from 23 cm to 36 cm in sedge habitats. Maximum depth in open water was 2.4 m. These values changed very little over the 30 years of surveys.

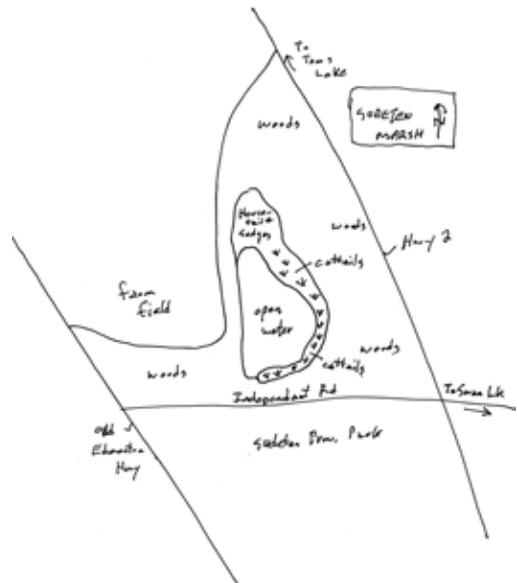


Figure 4. Field sketch of location and description of an unnamed marsh north of Sudeten Heritage Park, British Columbia, the site of marsh-nesting waterbird surveys between 1978 and 2008.



Figure 5. Sudeten marsh is a small productive wetland nestled in a stand of mixed trembling aspen and willows in farmland, where 12 species of wetland-associated birds were found nesting between 1978 and 2008. *Photo by R. Wayne Campbell.*

METHODS

The loss of 54% of the original emergent wetland habitat in the conterminous United States since that Nation's settlement and the apparent decline in many marsh-dependent birds has prompted the recent establishment of monitoring programs in North America (Tiner 1984, Tate 1986, Eddleman et al. 1988, Stedman and Dahl 2008, Conway 2011). The primary objectives were to determine the status and distribution and identify population trends for secretive (i.e., focal) marsh species. Recently, Conway (2011) developed protocols that would make data collection more consistent among locations and result in the gathering of more reliable information. The Marsh Bird Monitoring Program is based on permanently spaced point counts and taped playback calls for secretive species such as rails, bitterns, and grebes.

These surveys do not count all individuals occurring or nesting in a particular wetland and remain as estimates of abundance or density that require further statistical analysis to determine variations in detection probability (see Legare et al. 1999). The survey approach also provides little “value-added” information that can be critical in management and conservation activities (Figure 6).



Figure 6. Besides determining species composition and nesting population, “in-marsh” surveys provide value-added information that may include nest composition and dimensions, nest substrate, stage of incubation and nestling development, and mortality and predation. With Marsh Wrens, for example, the number of “dummy” nests per territory can be ascertained. *Photo by R. Wayne Campbell.*

The survey methodology for Sudeten marsh was basic and did not vary from other wetlands I have surveyed over the past 40 years. All animals, including amphibians, reptiles, birds, and mammals, seen and/or heard were recorded for 15 minutes (Figure 7). This included birds flushed from the marsh as well as those that became later exposed once the initial observer disturbance was quelled. All observations were maximum totals. For many female blackbirds, and a few other species, detection varied with the time of survey depending on incubation their duties and feeding forays for nestlings.



Figure 7. A pre-count of marsh birds heard and seen on Sudeten marsh on 14 June 2004 suggested that five wetland-dependent species may be nesting, including an adult American Coot feeding a chick. Later, a complete search determined that 10 species were actually nesting and 41 nests were tallied. *Photo by Alan D. Wilson.*

The pre-survey count was made from a single vantage point at the south end of the marsh near the top of a slope. This was followed by a thorough “in-marsh” nest search of emergent vegetation and open water. Sudeten marsh was surveyed with chest waders (Figure 8) and each visit lasted between 2½ and 3½ hours, depending if a scribe was available to record information from shore. More extensive beds of cattails were surveyed in a 2-m linear strip to assure completeness. Nest materials were noted and each nest was measured and a sample of the stage of incubation for eggs was determined using the water test (see Campbell and Preston 2001, p. 21). Nestlings, grebe chicks, and ducklings were also aged (see Campbell et al. 2013, p. 94 and 96). Other information recorded included predation (see Campbell 2011), parasitism, egg-dumping, mortality, the occurrence of runt eggs, and general condition of the wetland.

RESULTS WITH VALUE-ADDED INFORMATION

During six complete “in-marsh” surveys of Sudeten marsh between 1978 and 2008, 22 species of primary and secondary wetland associated birds were recorded, of which 12 species (54%) were confirmed nesting (Tables 1 and 2). Primary species are dependent on wetlands for nesting such as diving ducks, rails, and some blackbirds. Secondary species only occasionally breed in wetlands such as Blue-winged Teal¹, American Robin, Song Sparrow, and Brown-headed Cowbird. Of the nesting species, females and/or adults of two species (Canada Goose and Brown-headed Cowbird) were never heard or seen. In addition, six common marsh-nesting species (Redhead, Lesser Scaup, Ruddy Duck, Eared Grebe, Marsh Wren, and Yellow-headed Blackbird) were seen but not found nesting.

¹Scientific names of birds mentioned in the text and Tables 1, 2, and 3 are listed in Appendix 1.



Figure 8. Early nest searches of marshes with emergent cattails and bulrushes were completed without chest waders. *Photo by Andrew C. Stewart, Stump Lake, BC, 28 May 1995.*

Table 1. List of marsh-nesting birds recorded during land-based pre-count surveys and “in-marsh” nest searches in the marsh north of Sudeten Heritage Park, Peace River, British Columbia, in 1978, 2004 and 2005.

Species ¹	DATE					
	June 27, 1978		June 14, 2004		May 28, 2005	
	Pre-count ²	Nest Count ²	Pre-Count	Nest Count	Pre-Count	Nest Count
CAGO	0	0	0	1 nest (4E)	0	0
MALL	3♂	0	0	0	1♂	0
BWTE	2♂	0	0	0	1♂, 1♀	0
CITE	1♂	0	0	0	0	0
REDH	1♂, 1♀	0	0	0	1♂, 1♀	0
RNDU	3♂	1 nest (8E)	0	3 nests (7E, 8E, 9E)	3♂, 2♀	2 nests (6E, 8E)
LESC	2♂, 1♀	0	0	0	1♂, 1♀	0
BUFF	0	0	0	0	1♂	0
PBGR	0	0	1H	1 nest (6E)	0	0
HOGR	2AD, 2Y	1 nest (MT)	2AD	2 nests (4E, 6E)	2AD	1 nest (2E)
EAGR	2AD	0	0	0	0	0
SORA	0	0	0	1 nest (9E)	1H	1 nest (5E)
AMCO	2AD, 2Y	1 nest (MT)	1AD, 1Y	2 nests (MT, 6E), 1 brood (1Y)	2AD	1 nest (5E)
MAWR	1H	0	0	0	2H	0
AMRO	0	1 nest (4E)	0	0	0	0
COYE	0	0	0	1 nest (4E + 1E BHCO)	1H	0
SOSP	0	1 nest (4E)	0	0	0	0
RWBL	6♂, 9♀	21 nests (MT-5, 1E-1, 3E-2, 4E-3, 2Y-5, 3Y-4, 4Y-1)	7♂, 3♀	26 nests (MT-13, 2E-2, 3E-3, 4E-7, 5E-1)	6♂, 3♀	22 nests (MT-10, 1E-5, 2E-3, 3E-3, 4E-1)
YHBL	1♂	0	0	0	1♂, 1♀	0
COGR	0	0	1♂	3 nests (MT-2, 4Y)	1♂1♀	2 nests (5Y, 6Y)
BHCO	0	0	0	1 nest (1E + 4E COYE)	0	0

¹Four-letter code follows Campbell et al. (2007): AMCO, American Coot; AMRO, American Robin; BWTE, Blue-winged Teal; BHCO, Brown-headed Cowbird; BUFF, Bufflehead; CAGO, Canada Goose; CITE, Cinnamon Teal; COGR, Common Grackle; COYE, Common Yellowthroat; EAGR, Eared Grebe; HOGR, Horned Grebe; LESL, Lesser Scaup; MALL, Mallard; MAWR, Marsh Wren; PBGR, Pied-billed Grebe; REDH, Redhead; RWBL, Red-winged Blackbird; RNDU, Ring-necked Duck; SOSP, Song Sparrow; SORA, Sora, and YHBL, Yellow-headed Blackbird.

²Symbols and letters refer to: ♂ = male, ♀ = female, AD = adult(s), E = eggs, H = heard, MT = empty nest, and Y = young.

Table 2. List of marsh-nesting birds recorded during land-based pre-count surveys and “in-marsh” nest searches near Sudeten Heritage Park, Peace River, British Columbia, in 2006, 2007 and 2008.

Species ¹	DATE					
	June 21, 2006		June 3, 2007		June 4, 2008	
	Pre-count	Nest Count	Pre-Count	Nest Count	Pre-Count	Nest Count
CAGO	0	0	0	1 nest (6E)	0	1 nest (4E)
MALL	0	0	1♂	0	1♂	0
REDH	0	0	1♂, 1♀	0	0	0
RNDU	0	3 nests (9E-1, 8E-2)	0	1 nest (10E)	7♂	3 nests (4E, 6E, 10E)
LESC	0	0	1♂, 1♀	0	0	0
RUDU	1♂	0	2♂	0	2♂	0
HOGR	2AD, 4Y	1 nest (MT)	1AD	1 nest (4E)	1AD	1 nest (4E)
SORA	0	0	1H	1 nest (8E)	0	1 nest (10E)
AMCO	5AD, 11Y	4 nests (MT-3, 8E), 3 broods (1Y, 4Y, 6Y)	1AD	1 nest (6E)	0	0
MAWR	0	0	1H	0	1H	0
AMRO	0	1 nest (4E)	0	0	0	0
SOSP	0	0	0	0	1H	0
RWBL	7♂, 9♀	32 nests (MT-6, 1E-1, 2E-2, 3E-5, 4E-2, 1Y-1, 2Y-3, 3Y-8, 4Y-2, 1E2Y-1, 2E1Y-1)	6♂, 2♀	19 nests (MT-4, 1E-1, 2E-2, 3E-4, 4E-8)	9♂, 5♀	56 nests (MT-10, 2E-2, 3E-6, 4E-18, 5E-9, 1E3Y-2, 2Y-1, 3Y-1, 4Y-7)
COGR	1♂, 2♀	5 nests (MT-1, 4E-1, 2Y-2, 3Y-1)	1♂, 2♀	5 nests (MT-1, 3Y-1, 4Y-3)	3♂, 4♀	16 nests (MT-3, 5E-2, 1E3Y-1, 2E1Y-1, 2E3Y-1, 3E2Y-1, 4Y-3, 5Y-4)

¹Four-letter code follows Campbell et al. (2007): AMCO, American Coot; AMRO, American Robin; CAGO, Canada Goose; COGR, Common Grackle; HOGR, Horned Grebe; LESG, Lesser Scaup; MALL, Mallard; MAWR, Marsh Wren; REDH, Redhead, RWBL, Red-winged Blackbird; RNDU, Ring-necked Duck; RUDU, Ruddy Duck; SOSP, Song Sparrow; and SORA, Sora.

²Symbols and letters refer to: ♂ = male, ♀ = female, AD = adult(s), E = eggs, H = heard, MT = empty nest, and Y = young.

Table 3. Range of earliest and latest calculated dates, from nest-building to first flight, for 12 species of birds breeding in Sudeten marsh, Peace River, British Columbia, between 1978 and 2008.

Species ¹	Nests/		NESTING CHRONOLOGY			
	Broods	Nest-building Period	Egg-laying Period	Incubating Period	Fledging Period ²	
CAGO	3	Apr 27 to Jun 6	May 2 to Jun 13	May 8 to Jul 11	Jul 12 to Sep 7	
RNDU	13	May 15 to Jun 18	May 18 to Jun 21	May 25 to Jul 11	Jun 20 to Aug 11	
PBGR	1	May 16 to 19	May 20 to 23	May 24 to Jun 15	Jun 16 to Jul 18	
HOGR	7	May 19 to Jun 5	May 21 to Jun 13	May 30 to Jul 7	Jun 20 to Sep 1	
SORA	4	May 15 to 25	May 21 to Jun 4	May 28 to Jun 30	Jun 21 to Jul 28	
AMCO	9	May 11 to 22	May 14 to May 27	May 17 to Jun 21	Jun 10 to Sep 5	
AMRO	1	June 6 to 13	Jun 14 to 17	June 18 to 29	Jun 30 to Jul 12	
COYE	1	May 31 to Jun 4	Jun 5 to 8	Jun 9 to 20	Jun 21 to Jul 1	
SOSP	1	Jun 9 to 12	June 13 to 16	Jun 17 to 29	Jun 30 to Jul 9	
RWBL	176	May 20 to Jun 25	May 24 to Jun 29	May 28 to Jul 8	Jul 9 to 20	
COGR	31	May 4 to 31	May 11 to Jun 10	May 17 to Jun 23	May 31 to Jul 8	
BHCO	1	n/a ³	unknown	n/a	unknown	

¹Four-letter code follows Campbell et al. (2007): AMCO, American Coot; AMRO, American Robin; BHCO, Brown-headed Cowbird; CAGO, Canada Goose; COGR, Common Grackle; COYE, Common Yellowthroat; HOGR, Horned Grebe; PBGR, Pied-billed Grebe; RWBL, Red-winged Blackbird; RNDU, Ring-necked Duck; SOSP, Song Sparrow; and SORA, Sora.

²Includes first flight dates for non-passerines and independent flight for passerines after leaving the nest.

³n/a=not applicable.

A total of 248 nests for 12 species was found at Sudeten marsh on six complete surveys between 1978 and 2008. Red-winged Blackbird accounted for 71% of all nests and Common Grackle 13%. Combined, the marsh-nesting birds spend at least 134 days each year in the small cattail pond building nests and fledging young. This period does not include time required for pair bonding, courtship, nest-selection, re-nesting, and post-fledging activities.

The enhanced significance of direct “in-marsh” nest searches is the value-added information that can be obtained that contributes to the natural history and conservation of wetland-nesting species. Some of these include reliable population figures and trends; nest details that may include measurements, description of materials, and substrate attachment;

stages of development for eggs and nestlings; causes of mortality and predation; productivity figures; instances of parasitism and egg-dumping (Figure 9); and the general health of the wetland. For example, the nesting chronology for a species, from nest-building to fledging, can be developed after each survey (Table 3). This varies considerably between different regions of British Columbia and with increasing latitude and altitude (Campbell et al. 1990a, 1990b, 1997, 2001). Impacts for a particular wetland, including source water for irrigation and domestic stock drinking, habitat enhancement, seismic activities for oil and gas explorations, timing of weed control, dam-building, and recreational activities, can be mitigated for during less sensitive periods in a bird’s breeding life cycle.

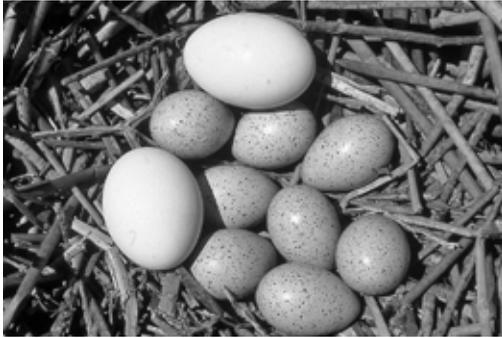


Figure 9. Although Ruddy Ducks commonly lay eggs in the nests of American Coots (shown) and Ring-necked Ducks, no egg-dumping was found at Sudeten marsh. *Photo by R. Wayne Campbell, Douglas Lake, BC, 14 June 2011.*

Some of the value-added information for 12 species of birds breeding at Sudeten marsh includes the following details.

Canada Goose

A pair nested in three of the six years in the dense cattail stand at the southeast corner of the marsh (Table 1, Figure 2). Surprisingly no mate was ever seen on pre-surveys but on two occasions incubating birds were flushed from their nest. Clutch size ranged from four to six eggs and incubation was fresh to eggs pipping.

The nest on 14 June 2004 was a pile of mostly dead, dry cattail leaves, 0.84 m across and 33 cm high, placed on the water among new cattail growth. Incubation was fresh (Figure 10). Calculated dates for the annual nesting chronology in Table 3 were created from details in Moffit (1931), Dow (1943), Kossack (1950), and Mobray et al. (2002). If young were to remain on Sudeten marsh until first flight the entire breeding period could extend from about late-April to September 7, a total of at least 127 days. However, broods of young are usually led away from small breeding ponds within a few days after hatching (M. Phinney pers. comm.).

Phinney (1998) gives egg dates for two complete clutches as 29 and 30 April suggesting that Canada Goose may begin nesting as early as mid-April.



Figure 10. This Canada Goose nest, found on 14 June 2004 at Sudeten Marsh, contained four fresh eggs. Although the adult was flushed, no adults were seen during the from shore observations on the initial visit. By floating the eggs in water the stage of incubation can be determined that allows a breeding chronology to be calculated. *Photo by R. Wayne Campbell.*

Ring-necked Duck

Up to seven males were observed in three different years and only once were females seen; on 28 May 2005, two pairs and a lone male were swimming together. From one to three nests were found every year (Table 3).

All nests ($n = 13$) were constructed over water from 46 cm to 0.8 m deep in stands of dead cattails. Four nests were situated at the periphery of cattails and nine were up to 5 m from the edge. The nests contained from four to 10 eggs with a mean of 7.8 eggs per nest, which is slightly below the mean of 8.5 eggs per nest ($n = 14$) reported by Campbell et al. (1990a) for British Columbia. Most nests were

placed under a dome of bent cattails (Figure 11) and all were constructed of dead cattail leaves arranged in a bowled platform from 10 cm to 20 cm high with an outside diameter between 17 cm and 28 cm. These dimensions are similar to those reported by Mendall (1958) and Sarvis (1972). Surprisingly, no nests were heavily lined with down.

Calculated dates for the annual nesting chronology in Table 3 were created from details in Mendall (1958) and Hohman and Eberhardt (1998). If young remain on Sudeten marsh until first flight the entire breeding period could extend from mid-May to August 11, a total of at least 89 days. The nesting chronology falls within the dates reported by Campbell et al. (1990a) for British Columbia. Phinney (1998) gives an arrival date of 13 April 1992 for the Dawson Creek area.



Figure 11. Breeding information collected for 13 Ring-necked Duck nests found at Sudeten marsh between 1978 and 2008 is new for British Columbia (Campbell et al. 1990a). The pile of wet cattails in this nest suggests egg-laying is complete and incubation is to begin soon when new, dead, dry cattail leaves will be added. A water test confirmed that incubation was fresh. *Photo by R. Wayne Campbell, 14 June 2004.*

Pied-billed Grebe

This species was detected only once. It was heard calling and later found nesting on 14 June 2004. It is well known, however, that Pied-billed Grebe responds to danger by diving and surfacing in vegetation with only its eyes and nostrils above water (Muller and Storer 1999).

The nest was constructed on water anchored by dead cattails at the north end of the marsh in 56 cm of water. A Horned Grebe nest was 24 m away. The nest platform was constructed of decaying plant material and measured 20 cm in diameter and 4 cm high. It contained four eggs, one of which was pipping. The nest was uncovered and the eggs were warm (Figure 12). Phinney (1998) mentions a pair with “four small chicks” on 14 June 1993.



Figure 12. The stained eggs in this Pied-billed Grebe nest, caused when decaying vegetation is used to cover the clutch when feeding or during disturbances, suggest that incubation is advanced. *Photo by R. Wayne Campbell.*

Calculated dates for the annual nesting chronology in Table 3 were created from details in McAllister (1963), Otto (1983), Muller (1995), and Muller and Storer (1999). If young remain on Sudeten marsh until first flight the entire breeding period could extend from about mid-May to July 18, a total of at least 64 days. Phinney (1998) gives an arrival date of 8 May 1995 for the Dawson Creek area.

There are only two records for British Columbia of Pied-billed Grebe and Horned Grebe sharing the same wetland for nesting and both of these are in significantly larger marshes than the Sudeten marsh (British Columbia Nest Record Scheme files; see Campbell et al. 2013).

Horned Grebe

One or two adults, swimming or diving in open water, were observed on each visit to the marsh and single nests, either empty or with eggs, were also found (Tables 1 and 2). The exception was on 14 June 2004 when two adults were recorded and two separate nests, each with eggs, were found (Table 1).

Seven nests were located. All were constructed over water, 0.8 m to 1.1 m deep, anchored among cattails, and within 3 m from open water. Six of the

nests were completely covered with damp decaying vegetation when found (Figure 13). Nest diameters ranged between 29 cm and 34 cm (mean 32 cm). These dimensions are less than those reported by Palmer (1962). Nest heights, measured above water, ranged between 3.2 cm and 5.7 cm (mean 3.8 cm), both higher than dimensions published by Stedman (2000).

Calculated dates for the annual nesting chronology in Table 3 were created from details in Palmer (1962), Fjeldså (1973), Ferguson and Sealy (1983), and Stedman (2000). If young remain on Sudeten marsh until first flight the entire breeding period could extend from about May 19 to September 1, a total of at least 106 days, which is within the period reported by Campbell et al. (1990a). Phinney (1998) gives an arrival date of 27 April 1994 and 1995 for the Dawson Creek area.



Figure 13. The 15-minute pre-count survey allows nesting Horned Grebes on Sudeten marsh to cover their nest and eggs with wet marsh vegetation so the clutch is not visible (left). Value-added information from “in-marsh” surveys, such as nest descriptions and measurements and clutch size, often contributes to the life history of the species and is helpful in conservation activities. *Photos by R. Wayne Campbell.*

Sora

Sora was heard twice and found nesting in four of the six years of surveys (Table 3). All nests were in dense stands of dead cattails in the northeast portion of the marsh. All nests were well concealed under bent stems and leaves of cattails and were constructed over water and composed entirely of a loosely arranged pile of dead cattail leaves (Figure 14). Dimensions were: outside diameters ranged from 18 cm to 23 cm (mean 20 cm) and heights ranged from 13 cm to 25 cm (mean 20 cm). These measurements are higher than those reported by Pospichal and Marshall (1954) for Minnesota. One nest bowl measured 12

cm. No dummy nests that serve as feeding or resting platforms were found as suggested by Pospichal and Marshall (1954).

Calculated dates for the annual nesting chronology in Table 3 were created from details in Walkinshaw (1940), Pospichal and Marshall (1954), Kaufmann (1987, 1989), and Melvin and Gibbs (1996). If young remain on Sudeten marsh until first flight the entire breeding period could extend from about 15 May to 28 July, a total of at least 75 days (Table 3), which is well within the breeding period reported by Campbell et al. (1990b). Phinney (1998) gives an early arrival date of 2 May 1995 for the Dawson Creek area.



Figure 14. Soras begin egg-laying as soon as nest-building begins and add eggs until the final basket of loosely woven dry cattail leaves is attained. *Photo by R. Wayne Campbell, 28 May 2005.*

American Coot

From one to four pairs of American Coots nested in five of the six years. All but one nest was located in cattails along the east side of the marsh in 0.8 m of water. The other nest was quite exposed in a narrow band of cattails on the west side in 46 cm of water. Interior nests, up to four metres inside the cattails, had a clear path to open water. All nests ($n = 9$) were floating baskets of interwoven dead cattail leaves from 33 cm to 41 cm (mean 36 cm) in outside diameter (Figure 15) anchored to cattail stems. Nest heights above water ranged from 15 cm to 25 cm (mean 22 cm). No nests had ramps and no nonbreeding nest platforms were found (see Gullion 1954).



Figure 15. The full breeding cycle for American Coot on Sudeten marsh, from nest-building to first flight, may extend nearly four months, from mid-May to early September. *Photo by R. Wayne Campbell.*

Calculated dates for the annual nesting chronology in Table 3 were created from details in Gullion (1954) and Brisbin et al. (2002). If young remain on Sudeten marsh until first flight the entire breeding period could extend from about 11 May to 5 September, a total of at least 118 days (Table 3), which is well within the breeding period reported by Campbell et al. (1990b). Phinney (1998) gives an arrival date of 18 April 1994 for the Dawson Creek area.

Marsh Wren

One or two Marsh Wrens (Figure 16) were heard singing in cattails on four of the six visits (Table 3) but no new or old nests were found although the habitat appeared suitable for nesting. The dates of visits, from 28 May to 27 June, are within the breeding period for Marsh Wren in British Columbia (Campbell et al. 1997; p. 330, Phinney 1998, p. 42). Phinney (1998) gives an arrival date of May 17, 1992 for the Dawson Creek area.



Figure 16. It cannot be assumed that Marsh Wrens are nesting in a wetland by only observing or hearing the species. I heard birds singing but did not find any nests. *Photo by R. Wayne Campbell.*

American Robin

Although this species is the most widely distributed breeding songbird in British Columbia, and can be found nesting in almost any habitat, there are only six records from cattail marshes, all from the southwest mainland coast (BC Nest Record Scheme files, Campbell et al. 1997, p. 415). A nest found at Sudeten marsh on 27 June 1978 in cattails is the first for the Peace River region (Siddle 2010, p. 194-196, Phinney 1998, p. 43). The nest was securely attached to the stalks of dead cattails and placed 46 cm above water.

Calculated dates for the annual nesting chronology in Table 3 were created from details in Howell (1942), Kendeigh (1952), and Sallabanks and James (1992). If young remain in the nest on Sudeten marsh until first flight the entire breeding period could extend from about 6 June to 12 July, a total of at least 37 days (Table 3), which is within the breeding period reported by Siddle (2010) and Phinney (1998). The American Robin returns to the Dawson Creek area before mid-April (Phinney 1998).

Common Yellowthroat

A male was heard singing on 28 May 2005 but was not found nesting. A nest was located on 14 June 2004 but birds were not seen or heard. The nest may have been abandoned due to Brown-headed Cowbird parasitism (see Hofslund 1957). It was located in the base of a clump of tall sedges only 7.6 cm above water. The bulky nest was constructed of dead sedges and small plant stems and lined with fine dry grasses. Phinney (1998) describes the species' habitat as "riparian scrub and marshy areas, but it is more common in upland shrubby vegetation, particularly regenerating trembling aspen [*Populus tremuloides*] clearcuts." The nest contained four half-incubated Common Yellowthroat eggs and a fresh Brown-headed Cowbird egg. Common Yellowthroat is not in the list of the host species among the 16 other passerine species found parasitized in the Dawson Creek area (Phinney 1998).

Calculated dates for the annual nesting chronology in Table 3 were created from details in Stewart (1953), Hofslund (1959), and Guzy and

Ritchison (1999). If young remain in the nest on Sudeten marsh until first flight the entire breeding period could extend from about 31 May to 1 July, a total of at least 32 days (Table 3), which is earlier and later than that reported by Campbell et al. (2001, p.147) for the Boreal Plains ecoprovince. Phinney (1998) gives an arrival date of 18 May 1991 for the Dawson Creek area.

Song Sparrow

This species was heard once, on 4 June 2008, and a nest with four eggs, in an advanced stage of incubation, was discovered on 27 June 1978. The nest was near the base of a clump of tall grasses in a narrow patch of dead cattails about 6 cm over water. It was composed of entirely dry coarse grasses and lined with finer grasses. The adult flushed.

Calculated dates for the annual nesting chronology in Table 3 were created from details in Nice (1937), Sogge and van Ripper (1988), and Arcese et al. (2002). If young remain in the nest on Sudeten marsh until first flight the entire breeding period could extend from about 9 June to 9 July, a total of at least 31 days (Table 3), which is within the breeding period reported by Campbell et al. (2001, p. 270) for the Boreal Plains ecoprovince. Phinney (1998) gives an arrival date of April 21, 1993 for the Dawson Creek area.

Red-winged Blackbird

This common species was present on all survey segments and nested in dead emergent cattails surrounding the entire marsh. The main population, however, occupied cattails on the southeast side. While actual numbers of nests varied between surveys, the population increased from 21 nests in 1978 to 56 nests in 2008, an increase of 167 % over the 31-year period. Birds seen in all pre-counts were also found nesting but numbers were not indicators of the breeding population. Red-winged Blackbird is strongly polygynous and as many as 15 females may breed on a territory of a single male. The mean harem size is 5.0 (Yasukawa and Searcy 1995). If it is assumed that all territorial males on Sudeten marsh counted on pre-surveys actually bred and that

each female nested once, then the average number of females per male, by year, would be 3.5, 3.7, 3.6, 4.5, 3.2, and 6.2 respectively. These figures are a bit low but within the normal range and may suggest the use of sub-optimal habitat for nesting.

All nests ($n = 176$; Figure 17) were attached to the stalks of dead cattails in 0.3 m to 1.1 m of water. Nest heights above water, measured from water to bottom of nest, ranged from 20.3 cm to 91 cm (mean 38.6 cm). All nests were compact structures composed of strips of interwoven dead cattail leaves and lined with fine, dry grasses. Outside diameters ranged from 9.5 cm to 14.5 cm (mean 12.0 cm) and nest height from 8.5 cm to 18.5 cm (mean 12.5 cm). These measurements are within those reported by Beer and Tibbits (1950) for Wisconsin, Holcomb and Tweist (1968) for Ohio and Michigan, and Peck and James (1987) for Ontario.



Figure 17. Red-winged Blackbird territories were established in large and small patches of dead cattails surrounding Sudeten marsh and over the six visits between 1978 and 2008 the nesting population more than doubled. *Photo by R. Wayne Campbell.*

Calculated dates for the annual nesting chronology in Table 3 were created from details in Nero (1956, 1984), Holcomb and Tweist (1968), Orians and Beletsky (1989), Martin (1995), and Yasukawa and Searcy (1995). If young remain in the nest on Sudeten marsh until first flight the entire breeding period could extend from about 20 May to 20 July, a total of at least 62 days (Table 3; Figure 18), which is about two weeks longer than reported by Campbell et al. (2001, p. 399) for the Boreal Plains ecoprovince. The later date corresponds with the 4 July date for eggs found by Phinney (1998). Peck and James (1987) give egg dates for Ontario from 25 April to 3 August ($n=641$ nests) with half of those between 26 May and 13 June. Phinney (1998) gives an early arrival date of April 17, 1991 for females in the Dawson Creek area and states that “females arrive at least two weeks after the first males.”



Figure 18. When nestling Red-winged Blackbirds first leave the nest they are incapable of extended flight and depend on their parents to feed them on territory for another 14 days. *Photo by R. Wayne Campbell.*

Common Grackle

Common Grackle arrived at Sudeten marsh sometime after 1978. Since then a small breeding population has become established, increasing from three pairs in 2004 to 16 pairs in 2008, an increase of 433% (Table 3). Birds seen on five pre-counts were also found nesting but numbers were not indicators of the breeding population. The mating system is typically monogamous (Wiley 1976).

The entire colony nests in cattails along the east side of the marsh and were intermingled with nesting Red-winged Blackbirds. This substrate is a minor component of the breeding habitat throughout its normal range in eastern North America (1.5% of 2,601 nests in North America – Maxwell et al. 1976 and 1.8% of 4,850 nests in Ontario – Peck and James 1967). In British Columbia cattail marsh is the primary nesting habitat for Common Grackles although a small nesting colony became established in conifers near Fernie, in southeastern portion of the Province in the early 1990s (Campbell et al. 2001, Knight and Campbell 2009).

All nests ($n = 31$) were in dense cattails along the east side of the Sudeten marsh attached to stalks of dead cattails (Figure 19) in 0.7 m to 1.0 m of water. Nest heights above water, measured from water to bottom of nest, ranged from 25.4 cm to 91 cm (mean 45.7 cm). All nests were rather compact structures composed of dead cattail leaves (some shredded) and



Figure 19. Adult female Common Grackle incubating in well-concealed nest attached to the stalks of dead cattails. *Photo by R. Wayne Campbell, Sudeten marsh, BC, 4 June 2008.*

lined with fine, dry grasses and occasionally dark horsetail leaves (*Equisetum* spp.). Outside diameters ranged from 16 cm to 23 cm (mean 19 cm) and nest height from 11 cm to 23 cm (mean 17 cm). These measurements are close to those reported by Peck and James (1987) for Ontario.

Calculated dates for the annual nesting chronology in Table 3 were generated from details in Peterson and Young (1950), Jones (1969), Maxwell (1970), Maxwell and Putnam (1972), Howe (1976), and Peer and Bollinger (1997). If young leave the nest on Sudeten marsh just before first flight the entire breeding period could extend from about 4 May to 8 July, a total of at least 66 days (Table 3), which is about one week earlier than reported by Campbell et al. (2001, p. 449) for the Boreal Plains ecoprovince. Peck and James (1987) give the earliest egg date for southern Ontario as 4 April. Phinney (1998) gives an early arrival date of 21 April 1993 for the Dawson Creek area.



Figure 20. Nestling Common Grackles depart their nest between 12 and 15 days and although not fully capable of flight clamber among the cattails waiting to be fed by adults. *Photo by R. Wayne Campbell.*

Brown-headed Cowbird

See Common Yellowthroat account.

Synopsis

Sudeten marsh is a small but very productive habitat for marsh-nesting birds in British Columbia. About one-third of the birds that occur regularly in North America use wetlands for food, shelter, social interactions, resting, and/or breeding during some part of their lives (Kroodsma 1979). Some groups, like bitterns, rails, and grebes, are wetland-dependent and their survival depends on availability of unique and often different habitats during migration, breeding, and wintering. It is noteworthy that about one-half of the 188 species of animals that are federally designated as endangered or threatened in the United States are wetland-dependent species (Niering 1988). Seventeen (9%) are birds whose populations are so low that extinction is imminent.

The impact of human activities in British Columbia has no doubt caused shifts in nesting wetland-dependent species but the trend in provincial populations is unknown because most wetlands have only been sampled and not surveyed completely. It is encouraging that the number of species and the size of the breeding populations at Sudeten marsh have increased over the 31 years of “in-marsh” surveys.

Results from the 15-minute pre-survey count are expected to differ from the 2-3-hour “in marsh” survey as some marsh birds are still incubating/brooding and are inconspicuous and not detected during the initial count period. A longer pre-survey count may yield results more similar to the actual “in-marsh” survey numbers. †

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About the Author

Wayne (see Figure 8) has been wading and canoeing in freshwater wetlands throughout British Columbia for over 50 years and during that time has found over 35,000 nests of marsh birds, details of which have been submitted to the BC Nest Record Scheme.

Appendix 1. Alphabetical list of common and scientific names of birds mentioned in the text and listed in Tables 1, 2, and 3.

American Coot (*Fulica americana*)
 American Robin (*Turdus migratorius*)
 Blue-winged Teal (*Anas discors*)
 Brown-headed Cowbird (*Molothrus ater*)
 Bufflehead (*Bucephala albeola*)
 Canada Goose (*Branta canadensis*)
 Cinnamon Teal (*Anas cyanoptera*)
 Common Grackle (*Quiscalus quiscula*)
 Common Yellowthroat (*Geothlypis trichas*)
 Eared Grebe (*Podiceps nigricollis*)
 Horned Grebe (*Podiceps auritus*)
 Lesser Scaup (*Aythya affinis*)
 Mallard (*Anas platyrhynchos*)
 Marsh Wren (*Cistothorus palustris*)
 Pied-billed Grebe (*Podilymbus podiceps*)
 Redhead (*Aythya americana*)
 Red-winged Blackbird (*Agelaius phoeniceus*)
 Ruddy Duck (*Oxyura jamaicensis*)
 Ring-necked Duck (*Aythya collaris*)
 Song Sparrow (*Melospiza melodia*)
 Sora (*Porzana carolina*)
 Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)