

# YELLOW-BREASTED CHAT

*Icteria virens*

Original<sup>1</sup> prepared by Martin Gebauer

## Species Information

### Taxonomy

The Yellow-breasted Chat is the only species of the Tribe Parulini (i.e., wood warblers) in the genus *Icteria* (Sibley 1996). According to Sibley (1996), an additional 119 species of wood warbler are found in the Tribe Parulini worldwide. Although placed in the family Parulidae, its relationship to other avian groups has been controversial over the years, being first described by Linnaeus in the thrush genus *Turdus* (Cannings 2000). Two subspecies of Yellow-breasted Chat are recognized: *I. virens virens* that occurs in southeast Canada and the eastern United States and *I. virens auricollis* that occurs in western North America (Cannings 1998).

### Description

The Yellow-breasted Chat is the largest warbler occurring in British Columbia. Upper parts, including the wings and tail, are a uniform greyish olive-green colour, whereas the throat, breast, and underwing coverts are bright yellow. Remaining underparts are white with sides tinged with buffy grey. A bold white stripe from the bill back over the eye is distinct. White patches are also present under the eye and from the base of the bill back over the jaw. Lores are black in males and grey in females. The Yellow-breasted Chat often sings at night, similar to some of the mimic thrushes, and has the lowest voice of any American wood warbler (Aslop 2001). The unmusical song is comprised of a jumble of harsh, clucks, rattles, whistles, and squawks (Godfrey 1986; NGS 1999). Yellow-breasted Chats inhabit dense thickets and brush and are retiring and shy, making them very difficult to observe.

Their loud song is often the only indication an observer has of their presence in an area.

### Distribution

#### Global

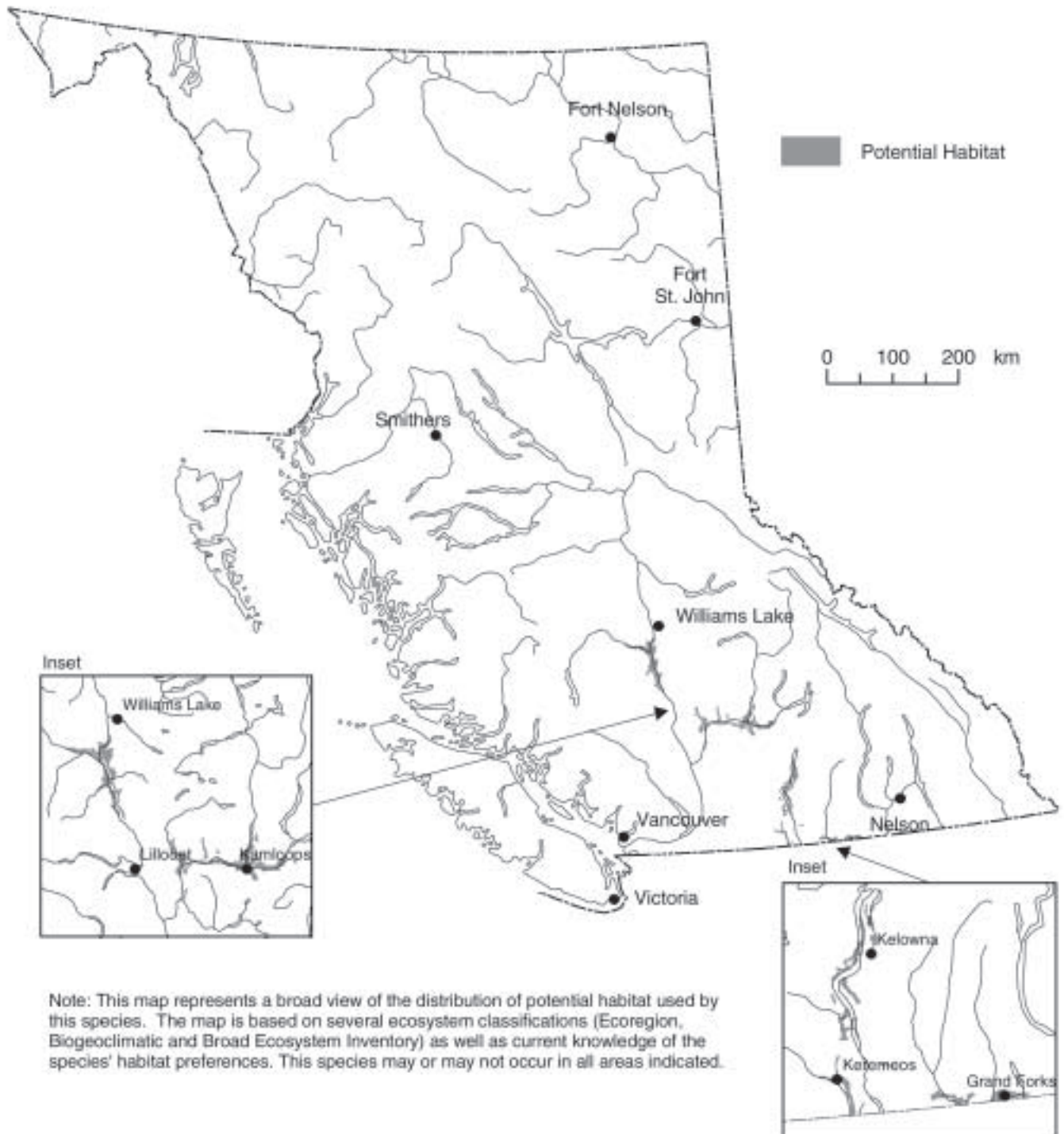
The Yellow-breasted Chat breeds from southern British Columbia, southern Alberta, southern Saskatchewan, and southern Ontario south through most of the United States to west and central Baja California and the central Mexican mainland (Howell and Webb 1995; Campbell et al. 2001). It winters from southern Baja California, southern Texas, and Florida south to Panama (Howell and Webb 1995; Sauer et al. 2000).

#### British Columbia

The Yellow-breasted Chat breeds in the extreme southern portions of the province in the Okanagan and Similkameen valleys (Cannings et al. 1987; Campbell et al. 2001). Singing males are occasionally reported from Creston and the Thompson and Fraser River valleys, as far north as the Chilcotin River (Fraser et al. 1999). A possible historic breeding population at Ashcroft has been extirpated (Campbell et al. 2001). Two singing males were recently reported singing in the Pavilion area of British Columbia but evidence of breeding was not confirmed (Cannings 2000). Chats occur irregularly in the lower Fraser Valley with one breeding record at Mission in 1966 (Cannings 2000). Recent unconfirmed reports suggest that a small breeding population has become established near Mission and Chilliwack (MOF and MELP 1998). A singing male was observed at Colony Farm regional park, Coquitlam on 23 June 2001 (C. Bishop, pers. comm.).

<sup>1</sup> Volume 1 account prepared by J. Cooper.

# Yellow-breasted Chat (*Icteria virens*)



### ***Forest regions and districts***

Coast: Chilliwack

Southern Interior: 100 Mile House (possible),  
Cascades, Central Cariboo, Kamloops, Kootenay  
Lake, Okanagan Shuswap

### ***Ecoprovinces and ecosections***

CEI: suspected in FRB

GED: likely in FRL

SIM: possible in SCM

SOI: OKR, NOB, SOB, SOH, possible in THB

### ***Biogeoclimatic units***

BG: xh, xw

CWH: dm

PP: dh, xh

### ***Broad ecosystem units***

BS, CF (hedgerows), CR

### ***Elevation***

In British Columbia, the Yellow-breasted Chat occurs from sea level to 70 m elevation on the Coast and between 250 and 800 m elevation in the Interior (Campbell et al. 2001).

## **Life History**

### **Diet and foraging behaviour**

Insects are the primary food source during the breeding season, with berries becoming a more important food source in summer. Young are fed exclusively insects (Ehrlich et al. 1988). Petrides (1938) found that food brought to young in Washington, D.C., consisted primarily of caterpillars. Yellow-breasted Chats forage in the foliage and lower branches of low shrubs and herb layers of thickets (Cannings 1995). Chats are the only warbler species known to hold food with their feet (Aslop 2001).

### **Reproduction**

Dates for 19 clutches in British Columbia ranged from 15 May to 02 July, with 58% recorded between 15 June and 25 June (Campbell et al. 2001). Of nine nests observed by Bishop (pers. comm., 2001) in the south Okanagan in 2001, seven (77%) had clutch dates ranging from 10 June and 20 June, and one

clutch was observed on 04 July 2001. Size of 16 clutches ranged from one to four eggs with 88% having three or four eggs (Campbell et al. 2001). Bishop (pers. comm., 2001) found six of nine nests (66%) in the south Okanagan contained clutches of three to four eggs. Clutches of three to four eggs were also most common in an intensive study of chat populations in southern Indiana (Thompson and Nolan 1973).

Incubation period is reported as being 11–12 days (Ehrlich et al. 1988; Aslop 2001). Dates for 12 broods in British Columbia ranged from 29 May to 31 July (Campbell et al. 2001). In the south Okanagan in 2001, dates for eight broods ranged from 07 June to 12 July (C. Bishop, pers. comm., 2001). Sizes of five broods in British Columbia ranged from one to three young (Campbell et al. 2001). The fledgling period is approximately 9 days (Ehrlich et al. 1988), although Bishop (pers. comm., 2001), reported one nest with a fledgling period of 11–12 days. In southern Indiana, Thompson and Nolan (1973) found that 31 of 39 breeding pairs attempted second broods. The spread of clutch initiation dates (i.e., 12 May to 23 June) in the Okanagan Valley (Cannings et al. 1987) suggests that chats may attempt to raise two broods per season in British Columbia as well (Cannings 1995). Bishop (pers. comm., 2001) had concrete evidence of a second brood in one nest in the south Okanagan in 2001, and noted regular singing and flight displays in males following fledging of a first brood.

Yellow-breasted Chats are frequent hosts of Brown-headed Cowbird (*Molothrus ater*) throughout their range (Friedmann 1963, as cited in Campbell et al. 2001). Thirteen percent of 23 nests found in British Columbia (Campbell et al. 2001) and 31% of 42 nests in Missouri were parasitized by cowbirds (Burhans and Thompson 1999). Bishop (pers. comm., 2001) indicated that as many as 55% (5/9) of nests observed in the south Okanagan in 2001 appeared to have been parasitized by cowbirds. Interestingly, young appear to be fledged at a similar rate from parasitized nests as unparasitized nests (Burhans and Thompson 1999), and growth rates do not appear to be reduced in parasitized nests

(Thompson and Nolan 1973). However, two parasitized chat nests in British Columbia were deserted before hatching (Campbell et al. 2001) and Bishop (pers. comm., 2001) found that 40% (2/5) of nests with cowbird presence were depredated early in the nesting cycle.

### Site fidelity

Thompson and Nolan (1973) found that no females and only 11% of breeding males returned to their study area in southern Indiana in the years following first capture, suggesting that site fidelity in chats is low. Banding of 22 adult and chick chats in the south Okanagan in 2001 (C. Bishop, pers. comm., 2001) will provide interesting data if banded birds are recaptured in 2002.

### Home range

A survey of known chat territories in the south Okanagan in 2000 detected singing male chats in territories estimated to be 0.1–24 ha (Bezener 2001). Bishop (pers. comm., 2001) found that territory size of 25 pairs in the south Okanagan ranged from 0.2 to 5.64 ha, with a mean territory size of 0.99 ha. In southern Indiana, Thompson and Nolan (1973) found that mean territory size ranged between 1.12 and 1.58 ha. Dennis (1958) reported breeding territory sizes of 1.25–2.5 acres in Virginia (i.e., ~0.5–1.0 ha).

### Movements and dispersal

Most Yellow-breasted Chats arrive in southern British Columbia in mid-May (Cannings et al. 1987), but some arrive as early as late April (Campbell et al. 2001). No discernible autumn movements have been noted since reports of birds drop sharply once birds stop singing (Campbell et al. 2001). Most birds have likely left the province by early August soon after young have fledged (Cannings et al. 1987).

### Habitat

#### Structural stage

- 3a: low shrub
- 3b: high shrub

### Important habitats and habitat features

#### Breeding

Yellow-breasted Chats breed in dense thickets around woodland edges, riparian areas and overgrown clearings or clearcuts (Annand and Thompson 1997; Twedt et al. 1999; Campbell et al. 2001). Populations in British Columbia are associated with riparian habitats, particularly black cottonwood (*Populus balsamifera*) and water birch (*Betula occidentalis*) stands with dense understorey thickets of rose, willow, and common snowberry (*Symphoricarpos albus*). Chats also occupy dense forest-edge thickets where Columbian hawthorn (*Crataegus columbiana*), trembling aspen (*Populus tremuloides*), choke cherry (*Prunus virginiana*), snowberry, and Prairie Rose (*Rosa woodsii*) provide a dense undergrowth (Campbell et al. 2001). Thickets of rose, snowberry, or Himalayan Blackberry (*Rubus discolor*) in uncultivated corners of fields, orchards, and vineyards also provide some habitat (Campbell et al. 2001). Density of shrub cover is apparently more important than species composition of a thicket. Gibbard and Gibbard (1992) found that chats frequented rose thickets ranging in size from 9 to 195 m<sup>2</sup> and an average height of 1.25 m. Trees growing within or close to the thicket generally did not exceed 6 m in height, and large shrubs were usually 3.5 m in height. In the south Okanagan in 2001, Bishop (pers. comm., 2001) found continuous rose patches around nests ranging from ~0.3 to 135 m<sup>2</sup>. Chats were generally not found in riparian habitats heavily dissected by cattle trails, in areas with overstorey of large trees, and areas with a high level of traffic noise (Gibbard and Gibbard 1992). Bishop (pers. comm., 2001) found that some territories in the south Okanagan were fragmented by current or recent livestock use and were occasionally close to a busy highway (i.e., #97).

Nests are well concealed in dense shrubbery usually 0.6 to 0.9 m above the ground, are often overgrown with vines, and are under a canopy of cottonwood or water birch (Bent 1953; Bryan et al. 2001; Campbell et al. 2001). The heights of nine nests monitored by Bishop (pers. comm., 2001) in the



south Okanagan in 2001 ranged from 0.4 to 1.15 m with the overall average being 0.73 m. The nest is made of coarse leaves, bark, and plant stems, and lined with fine grasses (Godfrey 1986). Most nests in British Columbia were located in rose bushes (Cannings 1995), but snowberry and willow have also been used (Campbell et al. 2001). Burhans and Thompson (1999) found that chats selected larger shrub patches to locate their nests despite increased rates of parasitism. Losses to parasitism were apparently balanced by reduced depredation rates in larger patches. However, Bishop (pers. comm., 2001) found that a number of nests were close to patch edge (range from 0.08 to 10.0 m) with the average being 2.23 m.

### Foraging

Yellow-breasted Chats forage within dense riparian breeding habitats during the nesting season. During migration or on their wintering grounds, they can be found in a wide variety of shrubby thickets and densely vegetated riparian areas (Skagen et al. 1998).

## Conservation and Management

### Status

The Yellow-breasted Chat is on the provincial *Red List* in British Columbia. The British Columbia population of the Yellow-breasted Chat was upgraded from *Threatened* to *Endangered* status in November 2000 (COSEWIC 2002).

## Trends

### Population trends

Breeding Bird Survey results for 1966 to 1999 (Sauer et al. 2000) indicate no significant changes in U.S. population of Yellow-breasted Chat, but significant increases in Canada (12.7%/yr;  $p < 0.01$ ). Significant declines have been observed in several eastern states including Illinois, Maryland, Ohio, Pennsylvania, Tennessee, West Virginia, and Kentucky. Significant population increases have been documented in Georgia, Mississippi, and North Dakota. An analysis of Breeding Bird Surveys in British Columbia for 1966 to 2000 did not reveal a significant trend (Sauer et al. 2000).

In British Columbia, Cannings (2000) estimated a stable population of 25–30 pairs. Surveys in 2001 located 36 singing males in the Okanagan (highest count to date), 19 occupied territories, and 9 active nests (C. Bishop, pers. comm., 2001). A 1999 survey in the south Okanagan and lower Similkameen valleys in 1999 yielded 19 singing males, compared with the 15 singing males reported by Gibbard and Gibbard (1992). Although results from the various surveys differed substantially, differences are more likely due to variable survey intensity than to changing populations. Cooperation with First Nations in 2001 permitted surveys on Reserve lands, resulting in new location records (C. Bishop, pers. comm., 2001). Taverner (1922) stated that “the [Okanagan] valley is famous for chats...in spite of their apparent scarcity there were enough of them about to seize upon and occupy any specially

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

AB	BC	CA	ID	MT	OR	WA	Canada	Global
S3B	S1B	S3	S5B, SZN	S5B, SZN	S4?	S4B, SZN	N4B	G5

desirable locality that might be vacant.” Population declines since the early part of the 19th century are largely due to loss of suitable riparian and shrubland habitats due to land development activities (Cannings 1995). Bishop (pers. comm., 2001) suggests that increased livestock use in previously “suitable” Yellow-breasted Chat habitats results in habitat damage through trampling and browsing, and an increase in Brown-headed Cowbird parasitism.

### Habitat trends

Breeding habitat in British Columbia is primarily confined to extensive riparian habitats along the Similkameen River south of Keremeos, the old oxbows of the Okanagan River, and Inkaneep Creek on Osoyoos First Nations lands. Habitats associated with the Okanagan River have been heavily impacted in the last 50 years. An estimated 15% of the pre-European quantity of riparian vegetation suitable for chats remains in southern British Columbia (C. Bishop, pers. comm., 2001). Many riparian habitats were severely altered when the Okanagan River was channelized between 1954 and 1958 (Cannings 2000). Flood control effected by channelization permitted landowners to remove riparian habitats and use the land for agriculture. In the last 10 years, incremental loss of riparian habitat has been small; however, a proposed golf course development on the west side of the Okanagan River in Penticton threatens one or two breeding pairs of chats, representing approximately 10% of the B.C. population (Cannings 2000). Surveys of 119 potential sites only found singing males at 14 sites (Gibbard and Gibbard 1992).

Of 5078 ha of habitat considered suitable for chats in the south Okanagan, ownership includes provincial Crown land (6%), Indian Reserve (45%), private land (44%), and conservation lands (5%) (MELP 1998). Participation of “conservation minded landowners, many of whom desire to enhance and rehabilitate areas for chats, represents a critical link in maintaining viable Yellow-breasted Chat habitats.

## Threats

### Population threats

Pesticide spraying may be a problem in some areas because of the insectivorous feeding habits of Yellow-breasted Chats (Cadman and Page 1994). Approximately 94% of nest failures reported in a study by Thompson and Nolan (1973) were attributed to predators including snakes, Blue Jay (*Cyanocitta cristata*), and Eastern Chipmunk (*Tamias striatus*). One south Okanagan nest with chicks showed indications of snake “punctures” on dead young (C. Bishop, pers. comm., 2001). In several nests in a study by Thompson and Nolan (1973), egg disappearance closely coincided with deposition of cowbird eggs. Bishop (pers. comm., 2001) found that 40% of five nests in the south Okanagan thought to be parasitized by Brown-headed Cowbirds were depredated early.

### Habitat threats

Low elevation riparian habitats are threatened by continuing loss and fragmentation due to agricultural and urban development (Cannings 1995). Any activity that results in the loss or reduction in dense shrubby areas can be detrimental. Livestock grazing, which may result in trampling or damage to riparian thickets, may thus be detrimental (Eckerle and Thompson 2001). Thinning and logging of riparian woodlands is not a significant threat to most chat breeding areas in British Columbia.

## Legal Protection and Habitat Conservation

The Yellow-breasted Chat, its nests and eggs are protected in Canada and the United States from hunting and collecting under the *Federal Migratory Birds Act* of 1917. In British Columbia, it is protected under the provincial *Wildlife Act*.

Protected areas in the south Okanagan include the Vaseux Bighorn National Wildlife Area, South Okanagan Wildlife Management Area, and Inkaneep Provincial Park. According to MELP (1998), 5% (i.e., 260 ha) of potentially suitable Yellow-breasted Chat habitat is currently designated as conservation lands in the south Okanagan.

A comprehensive riparian management plan for neotropical migrants is being developed by the Canadian Wildlife Service.

## Identified Wildlife Provisions

### Sustainable resource management and planning recommendations

Maximize retention and connectivity of riparian habitats and natural grassland communities.

### Wildlife habitat area

#### Goals

Maintain breeding and foraging habitats in areas with aggregations of one or more pairs of Yellow-breasted Chats and selected high suitability historic breeding aggregations.

#### Feature

Establish WHAs in areas with current breeding concentrations or at historical breeding concentrations in high capability or high suitability habitat.

#### Size

The size of the WHA will depend on the number of breeding pairs. Between 0.1 and 6 ha of suitable habitat should be secured for each breeding pair. Larger WHAs are more likely to maintain features and conditions for nesting.

#### Design

The WHAs should include the entire area of thickets that may be used by chats and degraded riparian areas that can be rehabilitated. When fencing of the WHA is being considered, ensure security of chats from predators by providing space between breeding habitat and fence.

### General wildlife measures

#### Goals

1. Maintain or rehabilitate riparian thicket habitat.
2. Ensure livestock do not fragment or trample thicket habitat.
3. Maintain WHA in a properly functioning condition.

## Measures

### Access

- Do not build new roads and stream crossings unless there is no practicable option.

### Pesticides

- Do not use pesticides.

### Range

- Provide alternate water, forage, and salt licks for livestock to reduce impacts to wetland and riparian habitats.
- Exclude livestock from riparian or associated riparian habitats within the WHA. If there is no other practicable option to prevent livestock use (i.e., changing timing and intensity of grazing), fencing could be required by the statutory decision maker.

## Additional Management Considerations

Rehabilitate riparian habitats damaged by cattle by excluding cattle and revegetating cleared areas with new wild rose thickets and other riparian shrub vegetation (see Bezener 2001). Construct fences between upland areas and riparian habitats to exclude cattle.

Plant wild rose and other shrub species within protected areas, such as Vaseux Lake and Osoyoos Oxbow areas, and inside exclusion fences.

## Information Needs

1. Distribution, relative densities, and population trends.
2. Quantification of critical habitat characteristics, particularly those that support breeding chats.
3. Information on usefulness of fencing riparian areas and testing of riparian community response to fencing treatments in riparian corridors of varying widths.

## Cross References

Fringed Myotis, “Great Basin” Gopher Snake, Lewis’s Woodpecker, Tiger Salamander, water birch–red-osier dogwood

## References Cited

- Aslop, F.J. III. 2001. Birds of North America, Western Region. Smithsonian Handb. Ser., DK Publishing Inc. New York. 632 p.
- Annand, E.M. and F.R. Thompson III. 1997. Forest bird response to regeneration practices in central hardwood forests. *J. Wildl. Manage.* 61(1):159–171.
- Bent, A.C. 1953. Life histories of North American wood warblers. Washington, D.C. U.S. Natl. Mus. Bull. 203.
- Bezener, A. 2001. SOSCP Riparian Habitat Stewardship Project: riparian fencing project - literature search summary. Draft report prepared for The Nature Trust of British Columbia and Environ. Can., Can. Wildl. Serv., Delta, B.C.
- B.C. Ministry of Environment, Lands and Parks (MELP). 1998. Habitat atlas for wildlife at risk: South Okanagan & Lower Similkameen. Penticton, B.C.
- B.C. Ministry of Forests and B.C. Ministry of Environment, Lands and Parks (MOF and MELP). 1998. Species and plant community accounts for Identified Wildlife, Vol. 1. Part of Identified Wildlife management strategies for the Forest Practices Code of British Columbia. Victoria, B.C. 171 p.
- Bryan, A., S. Austen, and A. Bezener. 2001. Chats in your neighbourhood. Living in Nature Ser., South Okanagan-Similkameen Stewardship Program.
- Burhans, D.E. and F.R. Thompson III. 1999. Habitat patch size and nesting success of Yellow-breasted Chats. *Wilson Bull.* 111(2):210–215.
- Cadman, M.D. and A.M. Page. 1994. Status report on the Yellow-breasted Chat (*Icteria virens*) in Canada. Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Can. Nat. Fed., Ottawa, Ont. 39 p.
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, A.C. Stewart, and M.C.E. McNall. 2001. The birds of British Columbia, Volume 4: Passerines, Wood-warblers through Old World sparrows. B.C. Min. Environ., Lands and Parks, Victoria, B.C., and Can. Wildl. Serv., Delta, B.C.
- Cannings, R.J. 1995. Status of the Yellow-breasted Chat in British Columbia. B.C. Min. Environ., Lands and Parks, Wildl. Br., Victoria, B.C. Wildl. Bull. No. B-81.
- \_\_\_\_\_. 1998. The birds of British Columbia: a taxonomic catalogue. B.C. Min. Environ., Lands and Parks, Wildl. Br. and Resour. Inv. Br., Victoria, B.C. Wildl. Bull. No. B-86. 243 p.
- \_\_\_\_\_. 2000. Update COSEWIC report on Yellow-breasted Chat (*Icteria virens*). Committee on the Status of Endangered Wildl. in Canada, Ottawa, Ont.
- Cannings, R.A., R.J. Cannings, and S.G. Cannings. 1987. Birds of the Okanagan Valley, British Columbia. Royal B.C. Mus., Victoria, B.C.
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2002. Canadian species at risk. Available from: <http://www.speciesatrisk.gc.ca>
- Dennis, J.V. 1958. Some aspects of the breeding ecology of the Yellow-breasted Chat (*Icteria virens*). *Bird-Banding* 29:169–183.
- Eckerle, K.P. and C.F. Thompson. 2001. Yellow-breasted Chat (*Icteria virens*). In *The birds of North America*, No. 575. A. Poole and F. Gill (editors). The Birds of North America, Inc., Philadelphia, Penn.
- Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. *The birder's handbook: a field guide to the natural history of North American birds*. Simon & Schuster Inc., Toronto, Ont.
- Fraser, D.F., W.L. Harper, S.G. Cannings, and J.M. Cooper. 1999. Rare birds of British Columbia. B.C. Min. Environ., Lands and Parks, Wildl. Br. and Resour. Inv. Br., Victoria, B.C. 244 p.
- Friedmann, H. 1963. Host relations of the parasitic cowbirds. Washington, D.C. U.S. Natl. Mus. Bull. 233. 276 p.
- Gibbard, R.T. and M. Gibbard. 1992. Field survey of the Yellow-breasted Chat in the south Okanagan. Report for B.C. Min. Environ., Lands and Parks, Penticton, B.C. 14 p. Unpubl.
- Godfrey, W.E. 1986 *The birds of Canada*. 2nd ed. Natl. Mus. Can., Ottawa, Ont.
- Howell, S.N.G. and S. Webb. 1995. *A guide to the birds of Mexico and northern Central America*. Oxford Univ. Press, New York, N.Y.
- National Geographic Society (NGS). 1999. *Field guide to birds of North America*. Washington, D.C.
- NatureServe Explorer. 2002. An online encyclopedia of life [Web application]. Version 1.6. Arlington, Va. Available from: <http://www.natureserve.org/explorer>
- Petrides, G.A. 1938. A life history study of the Yellow-breasted Chat. *Wilson Bull.* 50:184–189.



- Sauer, J.R., J.E. Hines, I. Thomas, J. Fallon, and G. Gough. 2000. *The North American Breeding Bird Survey, results and analysis 1966–1999*. Version 98.1. U.S. Geol. Surv., Patuxent Wildl. Res. Cent., Laurel, Md.
- Sibley, C.G. 1996. Birds of the world, version 2.0. *In* Birder's Diary V2.5, Thayer Birding Software.
- Skagen, S.K., C.P. Melcher, W.H. Howe, and F.L. Knopf. 1998. Comparative use of riparian corridors and oases by migrating birds in southeast Arizona. *Conserv. Biol.* 12:896–909.
- Taverner, P.A. 1922. Notes on the birds of the Okanagan Valley. Natl. Mus. Nat. Sci., Ottawa, Ont. Unpubl. field notes
- Thompson, C.F. and V. Nolan, Jr. 1973. Population biology of the Yellow-breasted Chat (*Icteria virens* L.) in southern Indiana. *Ecol. Monogr.* 43:145–171.
- Twedt, D.J., R.R. Wilson, J.L. Henne-Kerr, and R.B. Hamilton. 1999. Impact of forest type and management strategy on avian densities in the Mississippi Alluvial Valley, USA. *For. Ecol. Manage.* 123:261–274.

## **Personal Communications**

- Bishop, C. 2001. Canadian Wildlife Service. Delta, B.C.

