Columbia Wetlands Waterbird Survey 2015-2017

Progress Report

Written by Rachel Darvill, CWWS Program Biologist
Goldeneye Ecological Services
PO Box 663, Golden, BC, V0A1H0

December 2017

ABSTRACT

This report presents interim findings on the Columbia Wetlands Waterbird Survey (CWWS) project, a five-year coordinated bird count initiated in 2015. A major goal of the CWWS is to mobilize citizen-scientists in an educational opportunity to collect baseline inventory waterbird data within the Columbia Wetlands ecosystem. The resulting baseline data is working to augment understanding of waterbirds using the Columbia Wetlands habitat during periods of bird migration. Since 2015, the CWWS has collected inventory data at over 100 survey stations on more than 120 bird species, of which 14 species are listed as 'at-risk.' Preliminary data suggests that a high abundance of waterbird species occurs at specific sites during migration periods, and that some at-risk waterbird species concentrate at specific sites during migration. The CWWS has initiated the process of identifying threats to bird habitat in the Columbia Wetlands ecosystem. Recommendations to alleviate threats will be forthcoming during the remaining two years (2018-2019) of the project. The CWWS has resulted in a successful deployment of important diverse educational opportunities utilizing outreach methods thereby increasing the ecological literacy of community members in the region as it relates to wetland ecology and migrant birds.

Table of Contents

List of Figures

List of Tables

ACKNOWLEDGEMENTS

This project sincerely acknowledges the enthusiasm, dedication and volunteerism provided by the following individuals: Alana Jung, Alicia Grills, Alli Banting, Alysia Daciw, Alyssa Salloway, Andrea Smillie, Angela Hurd, Anna Elkins, Anna Urban, Anne Rose, Annette Boelman, Annette Luttermann, Todd Keith, Barb and Kevin Stromquist, Bill Hamilton, Blaire Smith, Bob Littlejohns, Bob Toothill, Brenda Elder, Brent Desruisseaux, Brian Wesley, Carol Hoar, Carmen Dolinsky, Carol Luttmer, Catherine and Chad Parent along with their three children, Chad Gennings, Corinna Strauss, Crisanna MacLeod, Darcy Monchak, Dave Gilbride, Dave Pick, David Gibson, Dawna-Lea Ringer, Denisse Daroch, Mark Frobb, Donna Mendes-Frobb, Doug Leighton, Elaine Prefontaine, Ellen Zimmerman, Erwin Perzinger, Gail Berg, Ganna Andrianova, Gareth Thomson, Gerry Wilke, Gloria Lowe and her grade 8 students, Greg Scott, Heather Mitchell, Hildegard and Peter Gerlach, Ian Dewey, Jackie Miles, Jeanette Goulet, Jennifer Reimer, Jessie King, Jo Ellen and David Floer, Joan Dolinsky, John Jenkins, John Pitcher, John Zehnder, Jono Leonard, Joyce Hutchinson, Judy Malone, Justin Telfer and his daughter, Kalista Pruden and her children, Kaori Maruyama, Kerri Lautamus, Laura Kroesen, Lee Bedford, Loni and Norm Funnell, Lynn Pick, Maddison Depater, Mady Wassik, Marie-Josee Labrecque and her four children, Marilyn Kelly-McArthur, Mary Jacobson, Mary McGovern, Matthew Findlay-Line, Meg Langley, Marek Klokeid, Michelle Cartmell, Michelle Flaa, Michelle Rievaj, Nancy Wilson, Tom Dance, Nesta Becker, Nick Hubenig, Nola Alt, Pat Martin, Patty and David Meadows, Randy Hopkins, Rhonda and Infinity Smith, Rob Smart, Ross Prather, Scott Weir, Sean Rapai, Shanna Frederick, Sharon Carlton, Sheila Hemus ,Shelagh Wrazej, Steve and Lynda Conway, Susan Wanamaker, Thea Rodgers, Thelma Brown, Tiffany Martin, Tracy Flynn, Valerie Davidson and her granddaughters, Verena Shaw, Warner and Diane Einer, Wayne Manzer, Wolfgang and Irene Vogt.

Specific acknowledgement is extended to Dianne Cooper, the project eBird reviewer and advisor on various species accounts, Jan Pindroch for volunteering his GIS expertise to work on the project, and the Columbia Basin Watershed Network and Selkirk College Geospatial Research Station for work on generating the map of the CWWS study area. The project acknowledges the many agencies and individuals providing support to the project over the past few years including Environment and Climate Change Canada Canadian Wildlife Service (Dr. Mark Drever and Dr. Andre Breault), Ducks Unlimited Canada (Dr. Bruce Harrison), Bird Studies Canada, BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (Peter Holmes), Windermere Rod and Gun Club, Columbia Wetlands Stewardship Partners, BC Wildlife Federation Wetlands Education Program, and the Canadian Intermountain Joint Venture.

This project has been generously funded through the financial support of the following organizations: Columbia Basin Trust, Wildlife Habitat Canada, Regional District of East Kootenay's Local Conservation Fund, Columbia Shuswap Regional District, James L. Baillie Memorial Fund of Bird Studies Canada with funds raised through the annual Great Canadian Birdathon. The project also acknowledges the financial support of the Province of British Columbia Gaming Grant, as well as the financial and the in-kind contributions of community members Steve and Lynda Conway.

1. INTRODUCTION

1.1. Background

A previously released 2016 report entitled 'The State of North America's Birds' reported that common bird populations were in decline and that one-third of all North American bird species would require urgent conservation action (North American Bird Conservation Initiative, 2016) to preserve population numbers, an observation that extends globally. The Columbia Wetlands are considered to be an important migration stopover habitat for birds (used for resting, feeding, drinking) (Kaiser, McKelvey & Smith, 1977), and a vital component of the Pacific Flyway. Several at-risk bird species require the Columbia Wetlands for breeding and stopover habitat. Other wildlife species, including several imperilled species including the Painted Turtle (*Chrysemys picta)* and North American Badger (*Taxidea taxus*) additionally inhabit this ecosystem (British Columbia Ministry of Forest, Lands, Natural Resources and Rural Development (BC MFLNRO), n.d.).

The Columbia Wetlands have been identified as a Ramsar site under the Ramsar Convention, recognizing this ecosystem as a wetland with international significance. The Convention's mission recommends and encourages: "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world" (Ramsar, 2014). Approximately 60% of the Upper Columbia River floodplain has been designated as a Wildlife Management Area (WMA) (BC Hydro, 2014), with the BC MFLNRO as the land managers. By definition, a WMA is an area of land designated under section 4(2) of the *Wildlife Act* for the benefit of regionally to internationally significant fish and wildlife species or their habitats.

While the WMA status is important; according to the International Union for Conservation of Nature (IUCN) Protected Areas Categories, this classification of conservation area (i.e. VI: Managed Resource Protected Area), offers the lowest form of protection for a conservation area (IUCN, 2017). The Columbia Wetlands and its habitat value to birds continue to remain under cumulative stress from a variety of threats. For instance, climate change is expected to have broad ongoing negative impacts across Bird Conservation Region 10: Northern Rockies (where the Columbia Wetlands is located), particularly in alpine and wetland habitats where there will be more fluctuating water levels from severe weather events (Environment Canada, 2013). Specific species of marsh bird including the Pied-billed Grebe (*Podilymbus podiceps*) and Red-necked Grebe (*Podiceps grisegena*)) are especially sensitive to fluctuating water levels during the breeding season.

Anthropogenic pressures continue to be important in the Columbia Valley (e.g. valley-bottom development, transportation corridor) with agriculture as a special concern as use of fertilizers and the effect of domestic animal manure contribute to pollution and nutrient excess (Hooda, Edwards, Anderson, & Miller, 2000; Sharpley et al., 1998). Kaiser, McKelvey & Smith (1977) reported a specific event identifying a slough in Brisco that became eutrophic due to agriculture and domestic effluent.

Livestock grazing additionally results in depletion of native wetland vegetation encouraging introduction of invasive species, and compaction of soils owing to increased traffic (Harrison et al., 2010).

1.2. Important Bird and Biodiversity Area status – a conservation tool

The Columbia Wetlands Waterbird Survey (CWWS) is a five-year (2015-2019) coordinated bird count, and a project of the Golden Branch of Wildsight. The primary goal of the CWWS is to collect baseline inventory bird data utilizing citizen-scientists. There is a growing body of literature that speaks to the high quality datasets that citizen-science projects can produce, often equal or greater to the quality of professionals (Kosmala, Wiggins, Swanson, & Simmons, 2016). The CWWS helps maintain international Ramsar responsibilities by addressing one of the three pillars under the Convention's mission; "working towards wise use of all wetlands". To achieve this, the Convention recommends contracting parties to develop programs covering wetlands inventory, monitoring, research, training, education and public awareness (Ramsar, 2014).

The CWWS data will be presented to assist nomination of the Columbia Wetlands to the 'Important Bird and Biodiversity Area' (IBA) program. The IBA program is a global initiative that works to conserve and monitor a network of sites that have been identified as critical bird habitat (Bird Studies Canada, n.d). If achieved, IBA status will provide the Columbia Wetlands with a more prominent conservation status. There are a number of criteria set out by IBA program coordinators that are utilized to identify and document IBA sites. Once an area is identified as an IBA site, the site becomes part of an international network resulting in more care and attention from the IBA caretakers and research scientists, more opportunities for funding, and support for communication materials for public dissemination.

Identifying and conserving IBA sites serves to safeguard migratory flyways bringing awareness to the value of nature and the recognition that survival of migrant bird populations will depend on our ability to locate and protect future critical habitats (Runge at al., 2015). Although non-regulatory, IBA has significant value at a community level as a cornerstone for conservation planning and stewardship. To date, conservation plans have been written for more than 100 of Canada's IBA sites (Couturier, 2012). Across Canada, conservation activities within the IBA program have been directed to a diverse range of activities including protection of breeding, stopover and winter habitat sites, assessment and report of threats to habitat and bird species and various educational projects relating to youth involvement and sustainable tourism. Increasingly, the IBA program is thought to represent a broader biodiversity conservation approach with both federal and provincial agency support (Couturier, 2012).

While the Columbia Wetlands are widely recognized as providing important habitat for birds (BC FLNRO, n.d.; Environment Canada, 2014; Harrison et al., 2010; Kaiser, McKelvey & Smith, 1977), there remains a lack of data available to demonstrate that one or more bird species meet the standard IBA criteria. Much of the bird data available for the wetlands is dated. Kaiser, McHelvey and Smith (1977) reported that historic IBA thresholds to meet IBA criteria were exceeded for Trumpeter Swans. However, there

have been no recent counts for swans to see if current thresholds are exceeded. Similarly in 1967, Demarchi and Smith reported that single day counts exceeded the historic IBA threshold for American Coots, but again there has been no recent count data on American Coots to see if current thresholds to trigger IBA could be achieved.

In 2014, following Wildsight's application for the Columbia Wetlands to be nominated as an IBA, Bird Studies Canada (BSC) and BC Nature (provincial partners for the IBA program in British Columbia) responded that since 1977, no data was available to document that threshold(s) for IBA criteria had been met or exceeded. Therefore, the Columbia Wetlands was not able to be designated with IBA status. However, both BSC and BC Nature have encouraged Wildsight to monitor bird populations in the Columbia Wetlands "particularly at times and locations where highest numbers of birds are most likely to be observed." BC Nature has stated that regular bird counts for at least five consecutive years would be required in order to acquire the requisite data for consideration into the IBA program. Accordingly, based upon that communication and also based on personal communication with bird biologists at Environment and Climate Change Canada Canadian Wildlife Service (ECCC CWS), the Columbia Wetlands has the potential to meet criteria for achieving IBA status, but baseline bird data is required. In pursuit of this objective, the CWWS project is working to fulfil data gaps.

1.3. CWWWS Research Questions

The CWWS project aims to acquire baseline data on waterbirds within the Canadian Intermountain Joint Venture (CIJV) region, as this data is lacking for the Columbia Wetlands. The following are the research questions guiding the five-year CWWS project:

- What are the single day counts for all waterfowl species and for other priority wetland bird species in the Columbia Wetlands, and do any species trigger the designation of IBA status for the Columbia Wetlands?
- Where are the most significant staging areas in the Columbia Wetlands for waterbirds during spring and fall migrations?
- What are the greatest habitat threats to those areas identified as significant bird habitat (staging areas) and what are the best actions (i.e. securement, enhancement, stewardship, education) to alleviate threats?

2. STUDY AREA

The Columbia Wetlands (UTM: 0534506; 5650169) is a vast wetland ecosystem that stretches for approximately 180 kilometers. The CWWS study area within the Columbia Wetlands is approximately 20,000 hectares in size and the survey station polygons cover approximately 8,000 hectares or 40% of the study area (Figure 1). The research area is a continuous mosaic of diverse wetlands, aquatic and riparian habitats, open water (including Columbia Lake, Lake Windermere), river channels and extensive

marshes. This continuous wetland ecosystem is located in the Columbia Valley, within the Rocky Mountain Trench of southeastern British Columbia.

These extensive wetlands of the upper Columbia River are one of the longest continuous wetlands in North America and are the only remaining natural portion of the Columbia River within Canada, supporting significant biodiversity values. It is a vital component of the Pacific Flyway, providing nesting, feeding and resting sites which are used intensively by numerous bird species. Several ungulates find vital habitat here, especially in winter. Cougar (*Puma concolor*), Wolf (*Canis lupus*), Coyote (*Canis latrans*), Black Bear (*Ursus americanus*), Grizzly Bear (*Ursus arctos*), Beaver (*Castor Canadensis*), Muskrat (*Ondatra zibethicus*), many small mammals, fish and amphibians also use the area, along with a number of imperiled and critically-imperiled bird species (BC MFLRNO, n.d.) (Table 1).

Currently, Environment Canada's Canadian Wildlife Service manages four units in the Columbia National Wildlife Area (Wilmer, Spillimacheen, Brisco, and Harrogate Units) and there are areas of private lands in the Columbia Wetlands. The MFLNRO is responsible for the Columbia Wetlands Wildlife Management Area (WMA), which comprises nearly 17,000 hectares within the wetland complex. Approximately half the Columbia Wetlands are within with the Regional District of East Kootenay (RDEK), Areas F and G; the other half is within the Columbia Shuswap Regional District (CSRD) Area A. The communities located adjacent to the Columbia River wetlands include: Canal Flats, Fairmont Hot Springs, Windermere, Invermere, Village of Radium, Edgewater, Brisco, Spillimacheen, Harrogate, Parson, Nicholson, Golden and Donald. The communities of Invermere and Golden have the largest human populations, supporting a combined population of over 11,000 residents. Additionally, those two communities have a significant population of part-time vacation residents.

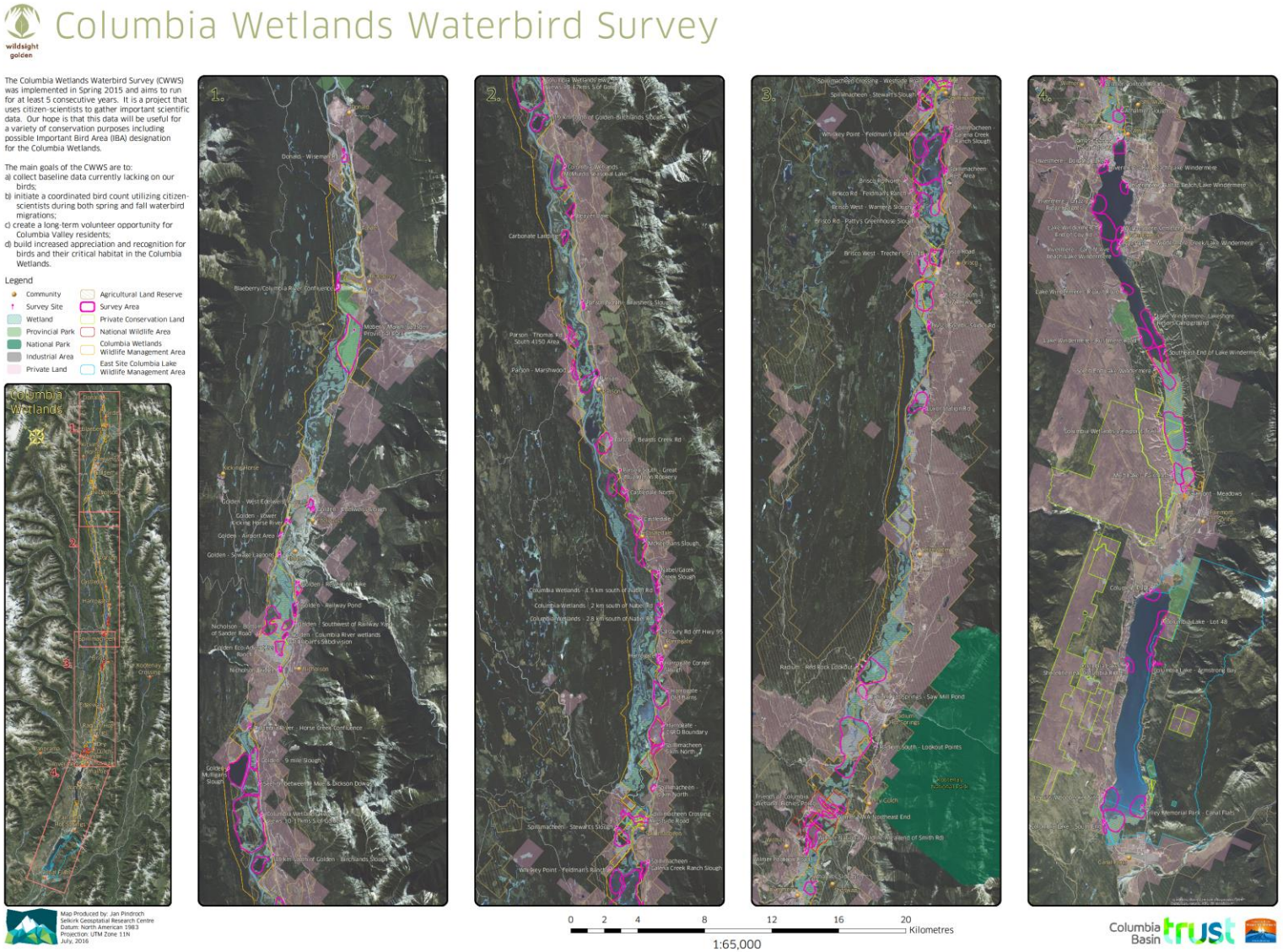

Figure 1. The Columbia Wetlands Waterbird Study Area, outlining survey station polygons.

Table 1. Bird species-at-risk that utilize Columbia Wetlands habitat.

English name	Scientific name	Provincial	BC List	SARA Status	COSEWIC status	Conservation Priority in BC	IUCN Red List Category	IUCN population trend
Western Grebe	***Aechmophorus occidentalis***	**S1B,S2N (2015)**	**Red**	**1-Special Concern (2017)**	**Special Concern**	**1**	**Least Concern**	**decreasing**
Horned Grebe	***Podiceps auritus***	**S4B (2015)**	**Yellow**	**n/a**	**Special Concern**	**4**	**Vulnerable**	**decreasing**
Eared Grebe	***Podiceps nigricollis***	**S3B (2015)**	**Blue**	**n/a**	**n/a**	**4**	**Least Concern**	**unknown**
Tundra Swan	***Cygnus columbianus***	**S3N (2015)**	**Blue**	**n/a**	**n/a**	**4**	**Least Concern**	**unknown**
Great Blue Heron	***Ardea herodias herodias***	**S3? (2017)**	**Blue**	**n/a**	**n/a**	**2**	**Least Concern**	**increasing**
American Bittern	***Botaurus lentiginosus***	**S3B (2015)**	**Blue**	**n/a**	**n/a**	**2**	**n/a**	**n/a**
Rough-legged Hawk	***Buteo lagopus***	**S3N (2015)**	**Blue**	**n/a**	**Not-at-Risk (1995)**	**2**	**Least Concern**	**stable**
Barn Swallow	***Hirundo rustica***	**S3S4B (2015)**	**Blue**	**1-Threatened (2017)**	**Threatened**	**2**	**Least Concern**	**decreasing**
Bank Swallow	***Riparia riparia***	**S4B (2015)**	**Yellow**	**1-Threatened (2017)**	**Threatened**	**5**	**Least Concern**	**decreasing**
Long-billed Curlew	***Numenius americanus***	**S3B (2015)**	**Blue**	**1-Special Concern (2005)**	**Special Concern (2011)**	**4**	**Least Concern**	**decreasing**
Surf Scoter	***Melanitta perspicillata***	**S3B,S4N (2015)**	**Blue**	**n/a**	**n/a**	**4**	**Least Concern**	**decreasing**
American White Pelican	***Pelecanus erythrorhynchos***	**S1B (2015)**	**Red**	**Not-at-risk (1987)**	**n/a**	**1**	**Least Concern**	**increasing**
California Gull	***Larus californicus***	**S2S3B (2015)**	**Blue**	**n/a**	**n/a**	**4**	**Least Concern**	**decreasing**
Peregrine Falcon	***Falco peregrinus anatum***	**S2?B (2010)**	**Red**	**1-Special Concern (2012)**	**Special Concern (2007)**	**2**	**n/a**	**n/a**
Bobolink	*Dolichonyx oryzivorus*	S3B (2015)	Blue	**1-Threatened (2017)**	Threatened	2	Least Concern	decreasing
Common Nighthawk	*Chordeiles minor*	S4B (2015)	Yellow	1-Threatened (2010)	Threatened (2007)	2	Least Concern	decreasing
Olive-sided flycatcher	*Contopus cooperi*	S3S4B (2015)	Blue	1-Threatened (2010)	Threatened	2	Near threatened	decreasing
Rusty Blackbird	*Euphagus carolinus*	S3S4B (2015)	Blue	1-Special Concern (2009)	Special Concern (2017)	2	Vulnerable	decreasing
Swainson's Hawk	*Buteo swainsoni*	S2B (2015)	Red	n/a	n/a	2	Least Concern	stable
Lewis's Woodpecker	*Melanerpes lewis*	S2S3B (2015)	Blue	1-Threatened (2012)	Threatened (2010)	2	Least Concern	decreasing
Black Swift	*Cypseloides niger*	S2S3B (2015)	Blue	Endangered (2015)	n/a	2	Least Concern	decreasing
American Avocet	*Recurvirostra americana*	S2S3B (2015)	Blue	n/a	n/a	2	Least Concern	stable
Red-necked phalarope	*Phalaropus lobatus*	S3S4B (2015)	Blue	n/a	Special Concern (2014)	2	Least Concern	decreasing

Note. Bold indicates at-risk bird species detected at survey stations during Columbia Wetlands Waterbird Surveys (2015-2017).

3. METHODS

3.1. Survey stations

To collect baseline data, the CWWS project coordinated citizen-scientists to simultaneously survey approximately 100 survey stations in the Columbia Wetlands. Surveys occurred during the peak of waterbird migration during spring and fall, so that as many birds as possible could be counted over the large survey area. Due to the inaccessible nature of many potential survey stations within the Columbia Wetlands, the chosen survey stations were specifically identified based on accessibility, potential habitat suitability for waterbirds, local knowledge of bird clustering, private land owner permission, known eBird data, and preliminary waterbird surveys conducted in 2014.

The chosen survey stations encompass a variety of habitat types within the Columbia Wetlands including marshes, lakes, adjacent agricultural fields, the Columbia River main stem, and Columbia River side channels. Since 2015 the numbers of survey stations have expanded, enabling more of the Columbia Wetlands to be surveyed. During the first year of the project, there were approximately 60 survey stations, in 2016 (the second year) there were 84 stations in spring, and 86 in the fall. In 2017, there were 97 stations during spring surveys, and 103 survey stations used in the fall. Due to unforeseen circumstances (e.g. volunteer illness), not all survey stations had bird surveys completed on each of the survey dates.

Most CWWS survey areas were viewed from a single viewing location, whereas other stations required travelling a short distance (50 meters to 2 kilometers). Survey stations were located at varying distances to one another. Many survey stations were located alongside Highway 95 or Westside Road, whereas other stations required forestry roads (e.g. Radium Mill Pond) or walking on foot (e.g. Moberly Marsh, Fairmont Meadows). In most cases, volunteers lived within a relatively short distance to the stations they monitored, helping facilitate consistent monitoring to count waterbirds (Badzinski et al., 2005). Survey station descriptions with directions had been prepared and were forwarded to volunteers ahead of survey dates. Spatial digital polygons for each survey station were generated on Google Earth Pro (Version 7.3.0.3832) and pdf maps were also printed using Google Earth Pro. These spatial maps were included in packages prepared for volunteers prior to the surveys, to ensure a clear understanding of areas to be covered during waterbird surveys.

3.2. Volunteer recruitment and training

Volunteer bird surveyors were recruited utilizing public presentations, social media, eBlasts, newspaper articles, partnering organizations websites, word of mouth, radio interviews, magazine articles, birding fieldtrips, Wings Over the Rockies festival guide, and poster distribution. The CWWS made specific efforts to encourage individuals of all birding ability and expertise to participate. Prior to participating in the waterbird survey, all volunteers were encouraged to attend pre-survey workshops (training modules) to attain competence that would assist in identifying the targeted CWWS waterbird species.

Waterbirds have been defined by the Ramsar Convention as "species of bird that are ecologically dependent on wetlands" (Wetlands International, 2017). All target waterbird species were described in Wildsight Golden's 'Columbia Wetlands Waterbird Survey: Waterbird Identification Guide.' Participants were strongly encouraged to become familiar with at-least all the birds in this guide, and to attend a minimum of one CWWS in-class training module taught by the CWWS Program Biologist.

The CWWS training module described and discussed the CWWS project goals and objectives, identification techniques for target waterbird species, additional bird identification resources, the CWWS survey protocol, the field datasheet that was to be used to record data, the process of online data entry using eBird, and the various techniques for counting flocks. Experienced birders were assigned to monitor birds at survey stations where birds were expected to be present in high abundance. Whereas novice birders were appointed to survey stations with fewer birds expected, or they were partnered with birders designated by the CWWS project as experienced.

3.3. Survey protocol

In the first year of the project (2015), the optimal timing for surveys (i.e. peak abundance of migrant waterbird species present in the Columbia Wetlands) was uncertain and based upon local input; the following survey dates were chosen: April 24, April 29, May 4, and September 29, October 5, October 15, October 25. During 2016 and 2017, three bird counts occurred in the spring (April 3, 10, 16) and three counts during the fall (September 29, October 5, October 15). Surveys took place from 0800-1100hrs on each of the three spring survey dates, and from 1000-1300hrs during the fall surveys to accommodate for early morning fog often seen in the fall.

To avoid double counting, the CWWS coordinated all volunteers to attend specific survey stations to ensure counting birds simultaneously on the same dates and during the same three-hour timeframes. Once at a survey station, all surveyors were required to use either a pair of binoculars and/or spotting scope with tripod enabling the identification of waterbirds to a distance of at least 500 meters or to the edge of the wetland; whichever was closer. The CWWS acquired 13 sets of high optical gear (scope/tripod), which were lent to those surveyors requiring the need of this equipment.

All bird species were to be identified at each station to the best of each observer's ability using both visual and aural detection techniques. Some of the stations required surveying birds at long distances and as this was expected to be an impediment to positively identify birds to a species level, it was recommended that volunteers make best efforts to get as close as they could with bird identification. As an example, if a volunteer knew that they were identifying dabbling ducks (because of the specific dabbling motion, shape and size of bird), but were unable to determine with certainty what specific species were observed; those birds would be counted and recorded as "dabbling duck species".

At each individual station, surveyors recorded total counts for each waterbird species present and noted where the birds were located according to four general habitat categories: lake, wetland, river, or on

land (e.g. agricultural field). Birds that were flying over stations and not directly utilizing habitat (not resting, feeding, hunting, or drinking) within a person's survey area were not counted, as these individual birds or flocks could potentially land at another individual's survey station and subsequently would be counted twice. At each station, surveyors also recorded additional data specifically relating to weather conditions, visibility, and human activity. Based on size of survey stations, expected flock sizes, stations proximity and surveyor experience, some surveyors monitored several individual survey stations within a single three-hour survey period; this was determined prior to survey dates.

The survey time was variable at each survey station as the amount of time spent at each station was dictated by a number of factors; including the size of the survey station area, the degree of individual skill, the familiarity with the provided optical equipment, and the time required to identify, count, and record the varying numbers of waterbirds present. At each survey station, a minimum of five minutes was used to scan for waterbirds. All volunteers were instructed to stay at a survey station for the amount of time needed to count and identify all birds present. The bird survey dates (having been scheduled in advance) occurred regardless of weather conditions on the appointed date.

3.4. Data management

All data collected during the ground-based surveys was entered into the central eBird database by either the volunteers who recorded the information in the field, by a CWWS staff member, or by a CWWS volunteer entering data. Once submitted to the CWWS project, all data was reviewed by CWWS staff and/or by an eBird reviewer. To maintain data integrity, any questionable data (e.g. entries of rare birds) were followed up on by CWWS staff and/or eBird reviewer, with the volunteer(s) who made the observation. The finalized data was submitted online for entry into the publically accessible eBird Canada database program. The CWWS ground-based data was additionally submitted to the provincial data warehouse; the British Columbia Species Inventory Information System (SPI). The total number of bird species recorded on each survey date of 2015-2017 is listed the appendices of this report. Reporting on each species account at each site and on each date is beyond the scope of this project. This data however has been recorded and is available online through the provincial SPI database.

3.5. Aerial surveys

During the spring, the majority of both Trumpeter and Tundra Swan species migrate through the Columbia Wetlands ahead of the majority of most other waterfowl species. Both of these swan species have potential to trigger IBA status for the Columbia Wetlands. A spot aerial count of swans over the entire Columbia Wetlands ecosystem was undertaken on singular flights in both 2016 and 2017. In 2016, a fixed-wing aircraft was utilized for the swan survey on March 23. In 2017, a helicopter was utilized on March 26 as there were no fixed-winged aircraft available in the region at that time. Helicopters are generally thought to be more useful for bird surveys when compared to fixed-wing aircraft because of their lower flight speed and better visibility (Resource Inventory Committee, 1999). In both of these surveys, in addition to the pilot a crew of four people was utilized. Two surveyors

counted all swans off their respective side of the aircraft, recorded GPS location and number of swans seen at each location. All data was entered into an excel database and locations were recorded onto a Google Earth Pro .kmz file.

The CWWS survey station polygons covered approximately 40% of the Columbia Wetlands total study area, so approximately 60% of the ecosystem was not surveyed through ground-based surveys. To count waterbirds within part of the inaccessible habitat not surveyed through the regular waterbird survey counts, an additional spot aerial fall survey was conducted on October 8, 2017. This aerial survey initiated in the Town of Golden travelling south along the Columbia River to the VIllage of Radium, covered a stretch of wetlands approximately 99 kilometers long. Given the expense of the aerial survey, the surveyed area did not cover any of the wetland area south of Radium nor did it cover any of the wetland habitat located north of Golden. This aerial survey comprised a crew of four people plus the pilot, with two surveyors estimating flocks off each side of the helicopter and recording GPS locations at each observation point. Photographs were taken of the larger flocks, to enable more accurate flock size estimates to be made subsequent to the flight. This data as well has been recorded in an excel database and locations have been logged into Google Earth Pro to create a .kmz file. The final count from this aerial survey comprised only those bird counted in locations not part of the ground-based CWWS surveys stations.

4. RESULTS

4.1 Columbia Wetlands Waterbird Survey 2015

4.1.1. Spring surveys in 2015

A total of 38 people participated in waterbird surveys with 176 surveys/checklists completed over the three survey dates. There were 15,253 individual birds counted during the three dates. The highest single day count occurred on April 24 where 6,262 individual birds were recorded on 61 checklists, with 77 different species including species recorded as grebe species (sp.), duck sp., hawk sp., etc. (Table 2). The highest count for an individual species was for American Coot (*Fulica Americana*) at 861 individuals on April 24 (Appendix 1). The second highest species count was on April 24 with 846 American Wigeon (*Anas Americana*) (Appendix 1). The third highest abundance for an individual species also occurred on April 24 with 726 Mallard (*Anas platyrhynchos*). A large number of birds were not identified to species level, for instance, 765 individual birds were recorded as unknown duck sp. on April 24.

The highest overall species abundance was recorded on April 24, 2015 at the large shallow open water wetland patches located between Brisco and Spillimacheen (0546084; 5633382) where 824 individual birds were sighted; 580 of these birds were recorded as unknown dabbling duck species (sp.). Other high species abundance counts occurred at Mulligan's Slough (0507643; 5670294) near Nicholson with 612 birds and at McMurdo Slough (0515652; 5666148) near Parson with 483 birds. Appendix 1 provides

data on the number of each individual species identified on each of the spring 2015 CWWS spring survey dates.

4.1.2. Fall surveys in 2015

During the four fall waterbird surveys, 47 volunteers participated and a total 39,335 individual birds were recorded (Table 2). The highest single day count occurred on October 5 with 14,084 birds recorded on 54 checklists. The highest abundance for an individual species occurred on October 5 with 3,386 American Coot (*Fulica Americana*) (Appendix 2). The second highest species count was for American Wigeon (*Anas Americana*) at 2,308 individual birds. The third highest count for a species was for Mallard at 2,256 individuals (*Anas platyrhynchos*). Appendix 2 provides data on the number of each individual species identified on each of the spring 2015 CWWS fall survey dates.

The survey station with the highest overall species abundance occurred was the Columbia National Wildlife Area (Wilmer Point) as seen from the Richies Point (565911; 5600974) on October 5 with 3,593 individuals (2,500 American Coot, 1,000 American Wigeon). From this same location, the second highest species abundance was also recorded on September 29 with 1,983 individuals (1,250 American Coot, 227 American Wigeon). Other survey stations with high overall species abundance counts included the open water wetland patches located between Brisco and Spillimacheen (0546084, 5633382) on October 15 with 1,370 individuals (490 waterfowl sp., 348 American Coot), and on October 5 with 993 individuals (360 waterfowl sp., 280 American Coot).

High species abundance also occurred at McMurdo Slough (515652; 5666148) on October 5 with 1,103 individuals (862 recorded as Mallard), McMurdo Slough (515652; 5666148) on October 15 with 1,086 individuals (886 recorded as Mallard), Althalmer Slough (568927; 5597787) with 920 individuals and at Radium Red Rock Lookout (562502; 5609260) on October 5 with 918 individuals (520 unknown waterfowl sp.) Mulligan's Slough (0507643; 5670294) on the west side of the Valley located south of Golden also had a high count of 900 obtained on October 15, 2015.

4.1.3. Outreach and communication activities in 2015

The CWWS engaged 133 elementary students and 43 high school students in bird watching activities, and 12 'Wings Over the Rockies' participants went on a three-hour long CWWS bird program. Several community collaborations and project linkages with waterbird-related agencies either formed or grew, and 439 people were directly reached through public presentations or training opportunities. Nearly 20 training sessions and presentations were given due to the high number of requests. A complete list of outreach and communication activities that took place in 2015 can be found in Appendix 3. Also listed in this appendix are the specific media releases that occurred, the presentations that were given by CWWS Program Biologist, as well as outreach materials developed as part of the CWWS program. All educational events and presentations listed indicate the number of people that were reached through these opportunities.

Table 2. Number of species, individual birds, and checklists submitted during the 2015, 2016 and 2017 CWWS.

Date	Number of Species	Number of Individuals	Number of Checklists
2015-04-24	77	6,262	61
2015-04-29	90	4,947	59
2015-05-04	98	4,044	56
2015-09-29	50	6,656	54
2015-10-05	77	14,084	54
2015-10-15	69	11,140	54
2015-10-25	69	7,455	63
2016-04-03	79	9,165	81
2016-04-10	84	9,704	80
2016-04-16	85	6,682	77
2016-09-29	81	13,954	78
2016-10-05	75	16,597	85
2016-10-15	76	20,796	85
2017-04-03	81	8,332	99
2017-04-10	84	7,869	96
2017-04-16	91	10,270	96
2017-09-29	81	16,882	95
2017-10-05	87	16,431	95
2017-10-15	77	17,507	95

4.2 Columbia Wetlands Waterbird Survey 2016

4.2.1 Spring surveys in 2016

The CWWS coordinated a total of 75 people to participate in spring 2016 waterbird surveys. There were 238 surveys/checklists completed over the three survey dates, with all checklists submitted and entered into the required databases (i.e. eBird, SPI). In total, there were 25,551 individual birds counted during the three spring surveys. The highest single day count occurred on April 10 where 9,704 individual birds were recorded on 80 checklists, with 84 different species identified (Table 2). However, this count for species diversity includes species recorded as merganser sp., duck sp., etc. The highest count for an individual species during the spring of 2016 was for Mallard (*Anas platyrhynchos)* on April 3 with 1,960 individuals (Appendix 4). The second highest count for a species was on April 10 with 1,954 American Wigeon (*Anas Americana*) (Appendix 4). The third highest count for a species also occurred on April 3 with 1,942 American Wigeon (*Anas Americana*). A high number of unknown birds were recorded (e.g. waterfowl sp., duck sp.), on each of the survey dates and specific numbers can be found in Appendix 4.

The survey station/checklist that had the highest species abundance in spring 2016 occurred on April 10, 2016 at the large shallow open water wetland patches located between Brisco and Spillimacheen (0546084, 5633382) where 1,115 individual birds were sighted. There were 391 American Wigeon (*Anas Americana*) and 340 dabbling duck sp. on this checklist. The second highest species abundance checklist occurred at the same survey station with 1,070 birds where 556 were identified as American Wigeon (*Anas Americana*) and 244 as Mallard (*Anas platyrhynchos*). Appendix 4 provides further information on the number of each individual species identified on each of the spring 2016 CWWS survey dates.

4.2.2 Fall surveys in 2016

During the 2016 fall waterbird surveys, 79 volunteers participated on three survey dates and in total 51,347 birds were recorded with 248 checklists (Table 2). The highest single day count occurred on October 15 with 20,796 individual birds recorded at 85 survey stations/checklists (Table 2). The highest count for an individual species occurred on October 5 with 4,785 American Wigeon (*Anas Americana*) (Appendix 5). The second highest species count was for Mallard (*Anas platyrhynchos*) with 3,989 individual birds on September 29. The third highest count for a species was for American Wigeon (*Anas Americana*) with 3,150 individuals on September 29. It must also be recognized that there were a large number of birds that were unable to be identified to the species level. For instance, on October 15 there were 3,374 recorded as waterfowl sp., with an additional 1,458 recorded as duck sp. Of note, there were additional high counts for Ring-necked Duck (*Aythya collaris*) with 2,135 individuals on October 15 and 2,558 American Coot (*Fulica Americana*) on October 5.

The survey station with the highest species abundance was the Columbia National Wildlife Area, Wilmer Unit as seen from Richies Viewpoint (565911, 5600974) on October 15 with 4,601 individuals. Of these, 1,863 were identified as Ring-necked Duck (*Aythya collaris*) and 1,223 as American Wigeon (*Anas Americana)*. Other survey stations with high species abundance included the south end of Lake

Windermere (576054, 5583970) on October 5 with 2,586 individual birds (2,016 were American Coot; 314 were American Wigeon); Fairmont Meadows (580257, 5577755) on September 29 with 2,144 individuals (2,000 recorded as Mallard); and the area between Brisco and Spillimacheen (546084, 5633382) on October 15 with 1,982 individuals (1550 recorded as unknown waterfowl sp.).

4.2.3. Aerial Swan Survey in 2016

An aerial swan survey took place on March 16, 2016. The flight began in Invermere at 0912 hrs. and ended in Invermere at 1312 hrs. There were 756 adult swans counted at 59 locations. It was not possible to differentiate Tundra Swans from Trumpeter Swans from their air due to the similarities between species and due to the far viewing distance to the birds. No cygnets with grey plumage were seen from the air, although cygnets had been seen in days prior to and after the survey from ground-based locations. Cygnets were thought therefore to be present, but not seen/recorded during this aerial survey. A detailed account of swan counts at specific locations of the Columbia Wetlands can be found in Appendix 6.

4.2.4. Outreach and communication activities in 2016

The 2016 CWWS engaged 187 elementary students in nine bird watching fieldtrips, and 202 additional Columbia Valley residents were engaged through presentations or learning opportunities provided by the CWWS project. Several community collaborations and project linkages with waterbird-related agencies either formed or grew. There were six training sessions provided to volunteers, 11 presentations given to community groups and six events attended with information provided about the CWWS project and birds. All of these outreach activities helped with volunteer recruitment. A complete list of outreach and communication activities that took place in 2016 can be found in Appendix 7. Also listed in this appendix are the specific media releases that occurred, the presentations that were given by CWWS Program Biologist in 2016, as well as outreach materials developed as part of the CWWS program. All events and presentations indicate the number of people that were reached through engagement opportunities.

4.3 Columbia Wetlands Waterbird Survey 2017

4.3.1. Spring surveys in 2017

The CWWS coordinated a total of 83 people to participate in spring 2017 waterbird surveys. There were 291 surveys/checklists completed over the three survey dates, with all checklists submitted and entered into the required databases (i.e. eBird, SPI). In total, there were 26,471 individual birds counted during the three spring surveys. The highest single day count occurred on April 16 where 10,270 individual birds were recorded on 96 checklists, with 91 different species recorded (Table 2). However, this count for species diversity includes species recorded as duck sp., Common/Barrow's Goldeneye, etc.

The highest count for an individual species was for American Coot (*Fulica Americana*) on April 16 with 2,226 individuals (Appendix 8). The second highest count for a species was on April 3 with 1,820 Mallard *(Anas platyrhynchos*) (Appendix 8). The third highest count also occurred on April 3 with 1,942 American Wigeon (*Anas Americana*). Many unknown birds were also recorded (e.g. waterfowl sp., duck sp.), on each of the survey dates and numbers for each species can be found in Appendix 8.

The survey station/checklist that had the highest species abundance in spring 2017 occurred on April 16 at Lake Windermere-Rushmere Road (574620; 5585343) where 1,817 individual birds were sighted, an estimated 1,500 of these were American Coot (*Fulica Americana*). The second highest species abundance checklist occurred at the large shallow open water wetland patches located between Brisco and Spillimacheen (0546084, 5633382) with 1,034 individuals; 471 birds of these were identified as American Wigeon (*Anas Americana*) and 200 as Mallard (*Anas platyrhynchos*).

4.3.2. Fall surveys in 2017

During the 2017 fall waterbird surveys, 88 volunteers participated on three survey dates and in total 50,820 birds were recorded on 285 checklists. The highest single day count in 2017 occurred on October 15 with 17,507 birds recorded at 95 survey stations (see Table 2). The highest count for an individual species occurred on September 29 with 5,070 American Coot (*Fulica Americana*) (Appendix 9). The second highest species count was for American Wigeon (*Anas Americana)* with 4,359 individual birds on October 15. The third highest count for a species was for American Coot (*Fulica Americana*) with 3,965 individuals on October 15. There were also high counts for Mallard (*Anas platyrhynchos*), as well as a large number of birds that were unable to be identified to the species level. For instance, on September 29, 3,364 birds were recorded as duck sp. Appendix 9 provides further data on the number of each individual species identified on each of the fall 2017 CWWS survey dates.

The survey station with the highest species abundance was located at the south end of Lake Windemere (576287; 5585082) where 4,585 individuals were recorded on September 29; 4,183 were identified as American Coot (*Fulica Americana*). Also 2,955 individuals were recorded at the south end of Lake Windermere on October 15 (with 2000 American Coot (*Fulica Americana*)). The south end of Lake Windermere saw another high count with 2,505 birds (2000 American Coot (*Fulica Americana*)) on October 5. The high counts on all three of these dates at this location are largely attributed to large rafts of American Coots (*Fulica Americana*). Other high counts for species abundance were found on September 29 at the large shallow open water wetland patches located between Brisco and Spillimacheen (0546084, 5633382) with 1,839 birds (761 unknown duck sp., 697 American Wigeon), and at the Fairmont Meadows (580257, 5577755) with 1,231 birds (880 duck sp.) on October 15.

4.3.3. Aerial swan survey in 2017

An aerial swan survey took place on March 26, 2017. The flight began in Golden at 1425hrs and ended at the north end of Columbia Lake at 1525hrs. There were 621 adult swans counted at 58 locations (Appendix 10). It was not possible to differentiate Tundra Swans from Trumpeter Swans from their air due to the similarities between these two species and owing to the long viewing distance to the birds. No cygnets were seen during the aerial survey. However, cygnets were thought to be present in the survey area, but camouflaged into the landscape with their grey plumage.

4.3.4. Aerial survey in 2017 at inaccessible locations

An estimated 7,156 birds were counted at 216 inaccessible locations of the CWWS study area (Appendix 11). Most aerial surveyors tend to underestimate flock size, so these numbers are thought to represent conservative counts (USFW, n.d.) There is also a high likelihood that not all birds were seen from the air as they may have been resting or undercover in the large habitat patches of emergent herbaceous vegetation.

4.3.5. Outreach and communication activities in 2017

The outreach and communication activities in 2017 were as follows: volunteer recruitment through CWWS booths at events (3), newsletter creation (1), press releases (4), community newspaper articles (7), social media (ongoing), CWWS brochure printing/distribution (500), presentations (13), and bird walks for the public (2). Six presentations were given by the Program Biologist with focus on delivery towards government agencies (i.e. Regional District East Kootenay Planning and Development Committee, Village of Radium, Town of Golden, Columbia Shuswap Regional District Area A land planners/Area A Director). There were six training modules provided to volunteers. Four elementary classes were taken outside for bird watching field trips to the Columbia National Wildlife Area in Wilmer. For a complete list of outreach and educational activities that occurred, see Appendix 12.

4.4. Species-at-risk reported during 2015-2017 surveys

4.4.1. Species-at-risk reported in 2015

During the spring of 2015 waterbird surveys, there were 54 reports of at-risk bird species totaling 219 individual at-risk birds (Appendix 12). Great Blue Heron (*Ardea herodias herodias*) was the at-risk species recorded most frequently, it was recorded at 32 different survey stations totalling 106 individuals. Additional at-risk species recorded in 2015 were: American Bittern *Botaurus lentiginosus)*, Western Grebe (*Aechmophorus occidentalis*), Tundra Swan (*Cygnus columbianus)*, Horned Grebe

(*Podiceps auritus)*, Bank Swallow (*Hirundo rustica*), Eared Grebe (*Podiceps nigricollis*), and American White Pelican (*Pelecanus erythrorhynchos).*

During the fall 2015 waterbird surveys, there were 67 reports of at-risk bird species, which totalled 243 individual birds (Appendix 12). Great Blue Heron (*Ardea herodias herodias*) was the at-risk species recorded most frequently as it was recorded at 33 different survey stations, totalling 103 individuals. Additional at-risk species recorded in the fall were: American Bittern *Botaurus lentiginosus)*, Western Grebe (*Aechmophorus occidentalis*), Tundra Swan (*Cygnus columbianus)*, Horned Grebe (*Podiceps auritus)*, Bank Swallow (*Hirundo rustica*), Eared Grebe (*Podiceps nigricollis*), American White Pelican (*Pelecanus erythrorhynchos),* California Gull *(Larus californicus),* Long-billed Curlew *(Numenius americanus),* and Surf Scoter *(Melanitta perspicillata).*

4.4.2. Species-at-risk reported in 2016

During the spring of 2016 waterbird surveys, there were 48 reports of at-risk bird species totaling 248 individual birds (Appendix 12). Great Blue Heron (*Ardea herodias herodias*) was the at-risk species recorded most frequently, identified at 31 different survey stations totalling 171 individuals. Additional at-risk species recorded were as follows: American Bittern *Botaurus lentiginosus)*, Tundra Swan (*Cygnus columbianus)*, Horned Grebe (*Podiceps auritus)*, Bank Swallow (*Hirundo rustica*), Horned/Eared Grebe (*Podiceps auritus /Podiceps nigricollis*), California Gull *(Larus californicus),* and Rough-legged Hawk (*Buteo lagopus).*

During the fall 2016 waterbird surveys, there were 58 reports of at-risk bird species, which totalled 328 individual birds. Great Blue Heron (*Ardea herodias herodias*) was the at-risk species recorded most frequently, and were seen at 54 different survey stations totalling 134 individuals. Additional at-risk species recorded were as follows: Western Grebe (*Aechmophorus occidentalis*), Tundra Swan (*Cygnus columbianus)*, Horned Grebe (*Podiceps auritus*), Eared Grebe (*Podiceps nigricollis*), Horned/Eared Grebe (*Podiceps auritus /Podiceps nigricollis),* California Gull *(Larus californicus),* and Surf Scoter *(Melanitta perspicillata).*

4.4.3. Species-at-risk reported in 2017

During the spring of 2017 waterbird surveys, there were 34 reports of at-risk birds species totaling 137 individual birds (see Appendix 13). Great Blue Heron (*Ardea herodias herodias*) was the at-risk species recorded most frequently, recorded at 23 different survey stations and totalling 92 individuals. Additional at-risk species recorded were as follows: Tundra Swan (*Cygnus columbianus)*, Horned/Eared Grebe (*Podiceps auritus /Podiceps nigricollis*), and California Gull *(Larus californicus).*

During the fall 2017 waterbird surveys, there were 73 reports of at-risk bird species, which totalled 216 individual birds. Great Blue Heron (*Ardea herodias herodias*) was the at-risk species recorded most frequently, they were recorded at 36 different survey stations totalling 103 individuals. Also notable,

there were 11 checklists that recorded Western Grebe (*Aechmophorus occidentalis*), totaling 61 individuals of this species. Additional at-risk species recorded were as follows: Tundra Swan (*Cygnus columbianus)*, Horned Grebe (*Podiceps auritus*), Horned/Eared Grebe (*Podiceps auritus /Podiceps nigricollis),* California Gull *(Larus californicus),* Long-billed Curlew *(Numenius americanus), and* Rough-legged Hawk (*Buteo lagopus).* Locations for each at-risk species and numbers recorded at each survey station, during each survey date can be found in Appendix 2.

4.4.4. At-risk grebe species concentrated at specific sites

During the six seasons of waterbird surveys, there was a concentration of some at-risk species at specific sites. All three at-risk grebe species (i.e. Horned Grebe (*Podiceps auritus*), Eared Grebe (*Podiceps nigricollis)* and Western Grebe (*Aechmophorus occidentalis*), that utilize Columbia Wetlands habitat during migration were identified more often on Lake Windermere and Columbia Lake (Figure 2, 3, 4 and 5), when compared to other survey stations. Since both the Eared Grebe (*Podiceps nigricollis)* and Horned Grebe (*Podiceps auritus*) are challenging to differentiate in non-breeding plumage (i.e. during fall waterbird surveys), 15 additional grebe sightings were recorded as Horned/Eared Grebe (*Podiceps auritus /Podiceps nigricollis*). These 15 grebe records are not accounted for in Figures 2, 3, 4, and 5, nor are 45 additional accounts listed as grebe sp.

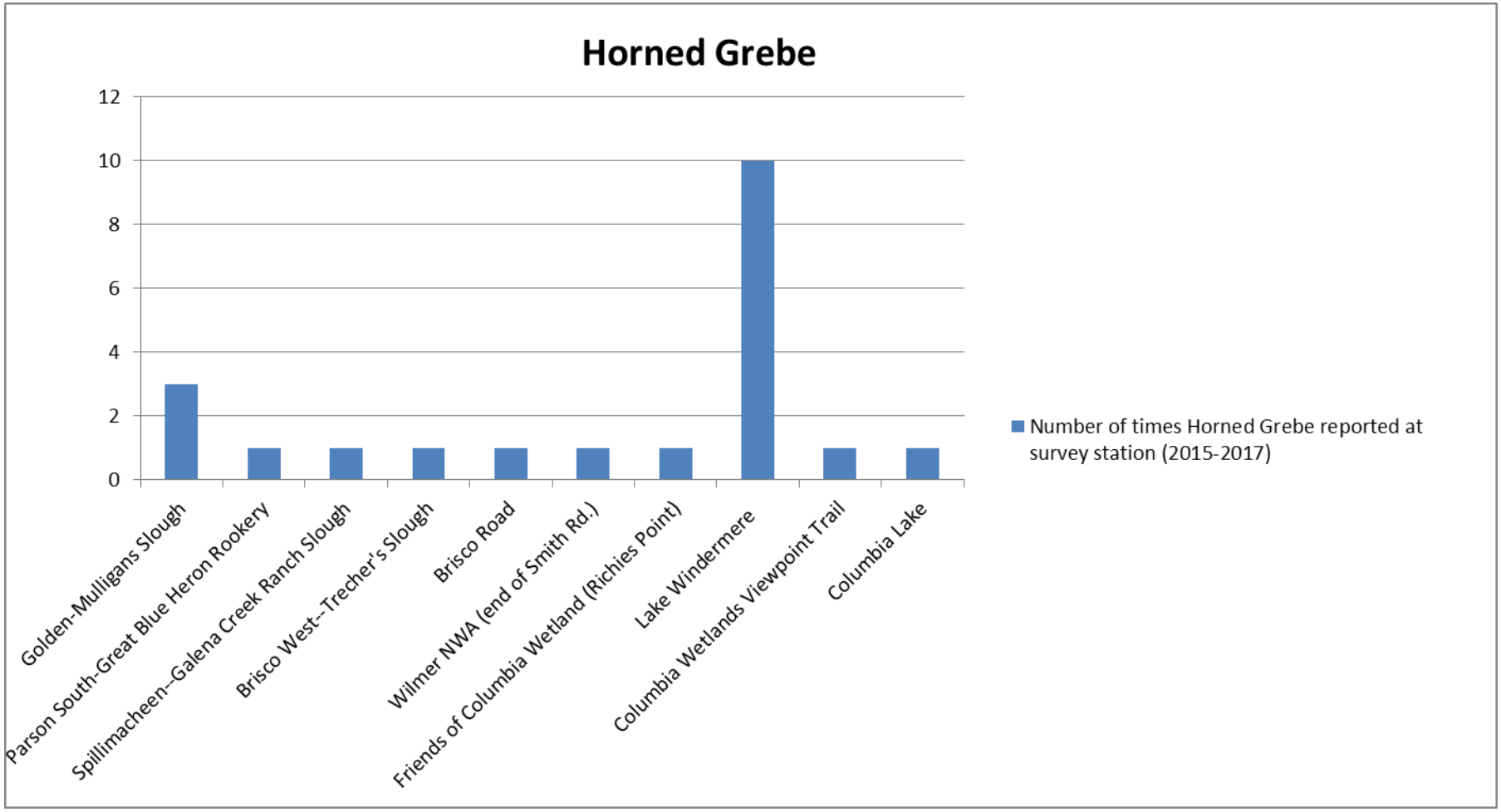

Figure 2. Horned Grebe distribution across CWWS survey stations.
Note: Lake Windermere has 14 survey stations. Columbia Lake has nine survey stations.

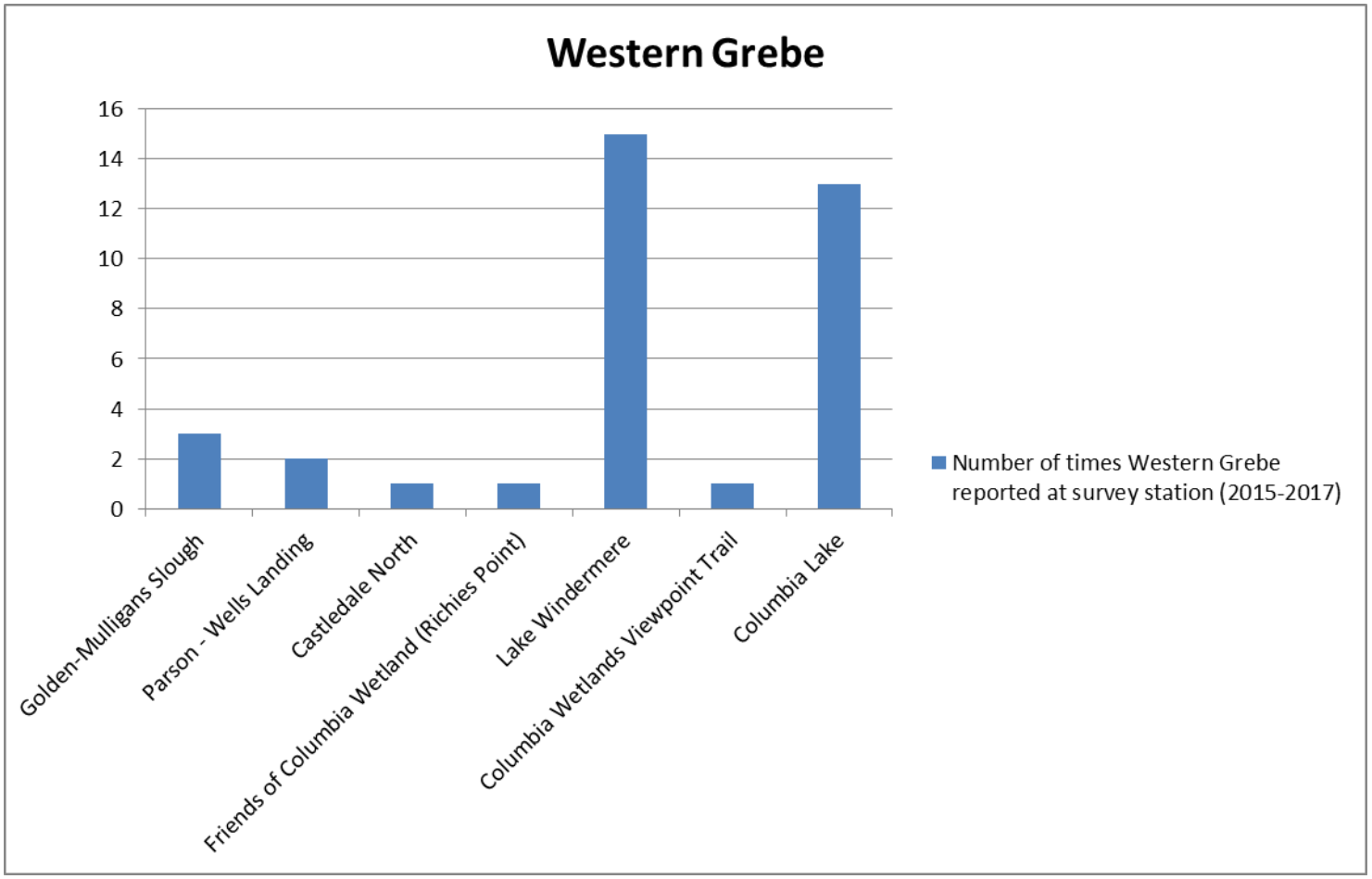

Figure 3. Western Grebe distribution across CWWS survey stations.
Note: Lake Windermere has 14 survey stations. Columbia Lake has nine survey stations.

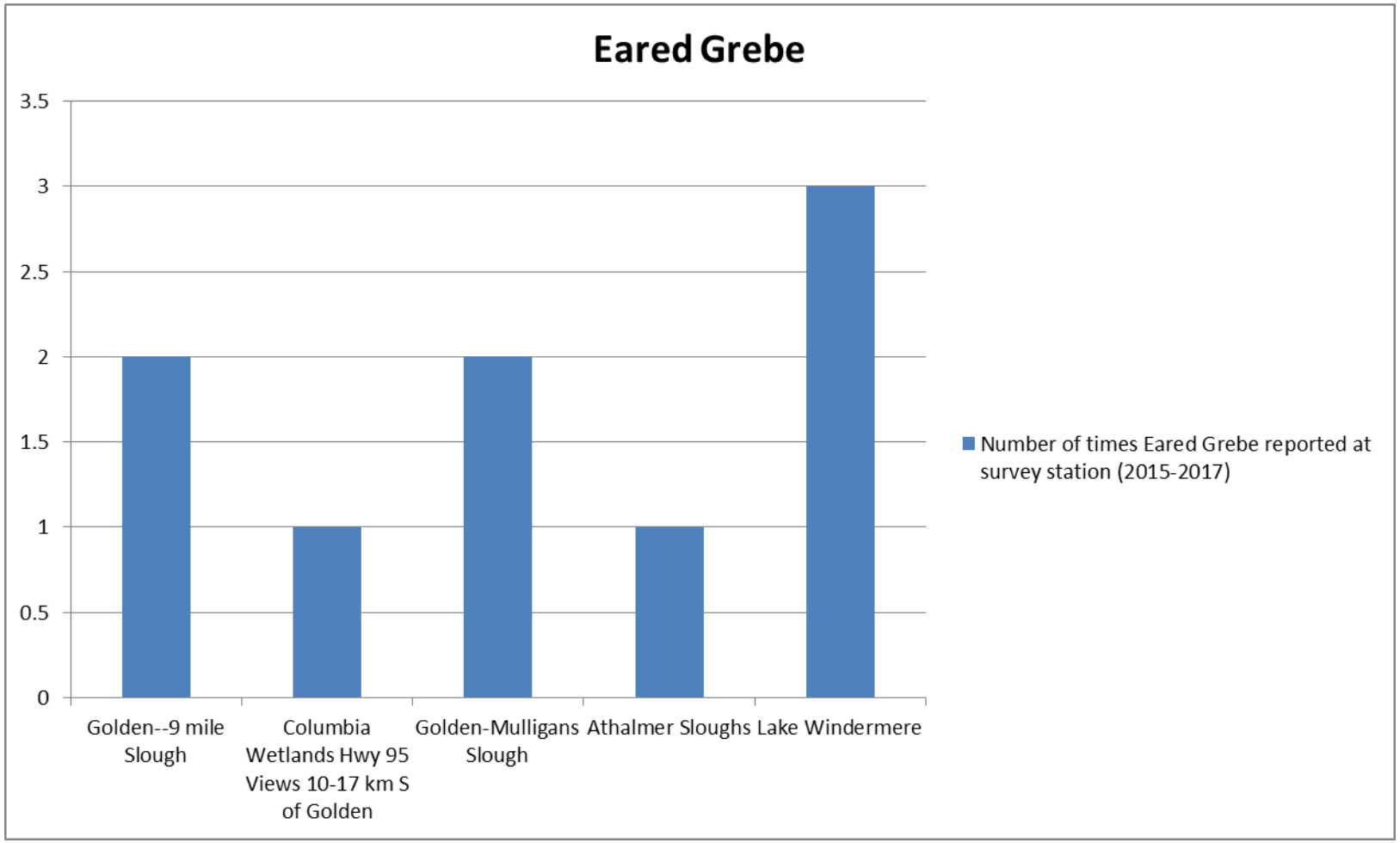

Figure 4. Eared Grebe distribution across CWWS survey stations.
Note: Lake Windermere has 14 survey stations.

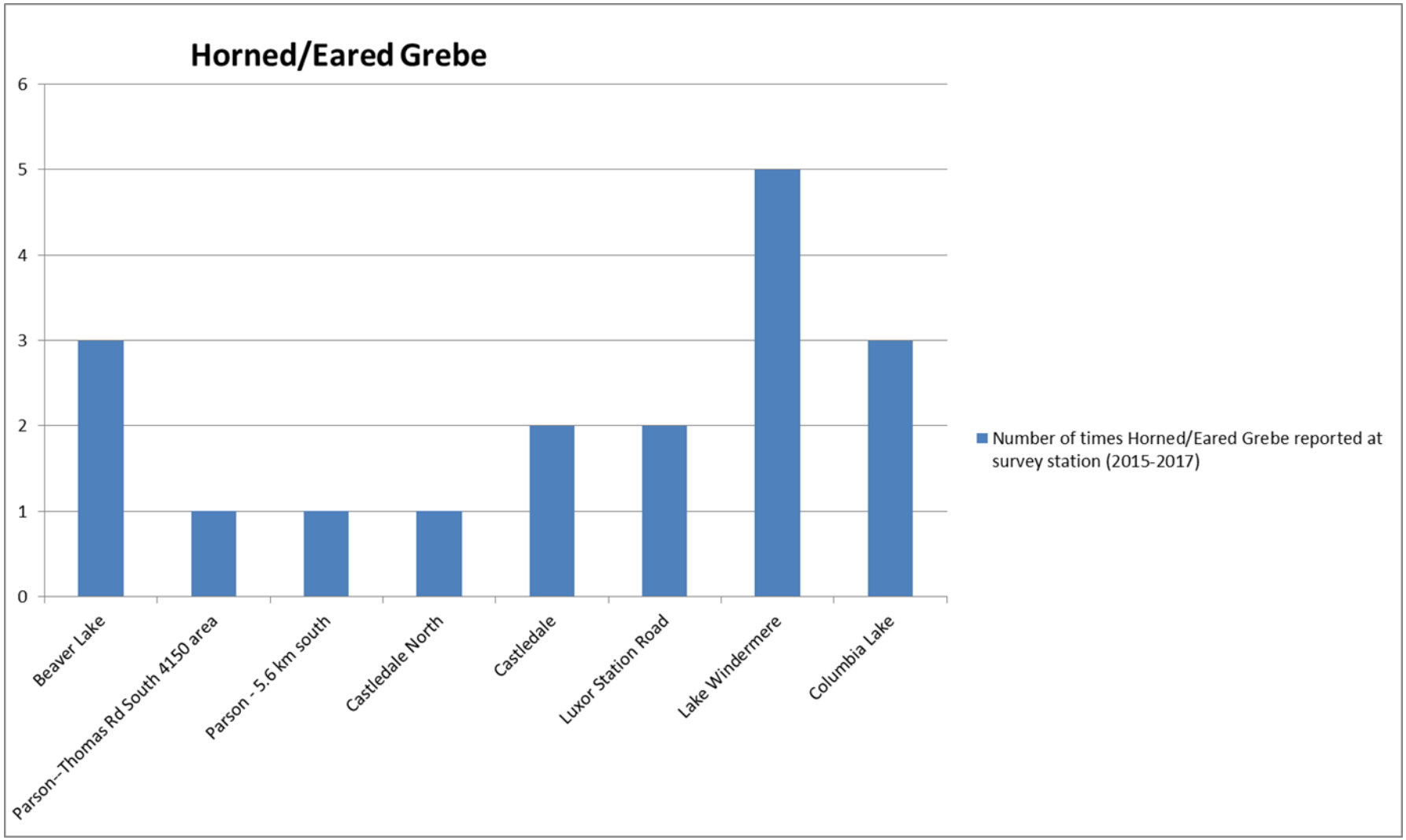

Figure 5. Horned/Eared Grebe distribution across CWWS survey stations.
Note: Lake Windermere has 14 survey stations. Columbia Lake has nine survey stations.

4.5. Preliminary findings on threats to Columbia Wetlands bird habitat

With the Columbia Wetlands situated in a valley bottom, there exist many surrounding land use pressures with increasing rural, urban and industrial developments. At the present time, there are no existent zoning, building restrictions or bylaws in place within CSRD Area A; and Riparian Area Regulations are not in effect in the CSRD Area A with the absence of an Official Community Plan. While Federal restrictions are in effect regulating motorized boating within the Columbia Wetlands including the main stem of the river, there are increasing levels of non-motorized recreational use in the Columbia Wetlands that may be potentially problematic for waterbird species particularly during sensitive periods such as migration and breeding (Korschgen & Dahlgren, 1992; Liddle & Scorgie, 1980).

Threats to bird habitat of the Columbia Wetlands are widespread. They include the potential effects of climate change, air pollution, water pollution, plastic pollution, light pollution leading to bird disorientation during migration, habitat loss, interference of migration flight paths, and introduction of invasive alien species. Local threat effects of hunting and trapping, fishing and harvesting aquatic resources (both unintentional and intentional effects), gathering terrestrial plants (unintentional and intentional), effects from noise disturbance, firewood harvesting, regional transportation corridors (e.g. railway, highway, roads, transmission lines), natural system modification (dams and water management use), fire and fire suppression are also notable.

Logging and agricultural expansion and/or intensification and associated impacts including use of pesticides, fertilizers and clearing of land, result in individual and cumulative effects. Livestock trampling of riparian and emergent vegetation required by marsh birds for nest building material and for food during migration and breeding is problematic (Environment Canada, 2013). Figure 6 depicts some of the impacts (i.e. railway, road, highway, wood preserving plant, rural development, agriculture), that may represent a negative cumulative effect on birds and bird habitat in the Brisco area of the Columbia Wetlands. Pesticide control such as the use of *Bacillus thuringiensis israelensis (Bti)* as a microbial agent to control mosquitoes in the CSRD may additionally have negative effects on the demography of insectivorous birds (including “at-risk” swallow species and Common Nighthawk) with reduction of clutch size and fledgling survival (Poulin, Lefebvre & Paz, 2010).

Figure 6. Photograph taken on October 8, 2017 indicates some impacts could have a negative cumulative effect on bird habitat in Brisco.

5. DISCUSSION

5.1. Columbia Wetlands and potential for inclusion into the IBA program

With the efforts of the waterbird surveys of 2015, 2016 and 2017, the CWWS collected a significant amount of inventory data on over 90 bird species, 14 of which have been designated as species-at-risk. Collection of this data may enable the Columbia Wetlands to become part of the IBA program through "Category 1: Threatened Species," as a site may be designated as an IBA if it is considered to hold significant numbers of a threatened bird species (BSC, 2011). The Canadian IBA criteria guide states that "*B4iii threshold is 20,000 birds (single or mixed species by group; 20,000 seabirds or landbirds or waterbirds); land/water. This criterion is used where species specific data is unavailable; otherwise birds are assessed against i/ii criteria and respective thresholds"* (BSC, 2011). Meeting this criterion, the CWWS data appears to have triggered the global threshold (i.e. 20,000 waterfowl) on October 15, 2016 with 20,796 birds, and the continental threshold (15,000 waterfowl) appears to have been triggered on October 15, 2017 with 17,507 birds recorded.

While this data indicates that bird counts are high in the Columbia Wetlands during periods of migration (especially during fall when juveniles are present), 40% of the ecosystem was surveyed using ground-based survey stations. Data extrapolation is required (and is slated to be completed in 2018 with the assumption that resources will be available) to estimate bird populations for this entire ecosystem thereby potentially triggering specific IBA thresholds for individual species. It is important to recognize that there may be challenges in the CWWS data to trigger IBA status with any given individual species, due in part to the many "unknown waterbird species" recorded in the data; attributed in part to — wind, making the spotting scope unstable for identification, fog and glare off the water, and surveying at great distances; an impediment documented in previous Columbia Wetland studies (Caspell et al., 1979).

A concurrent bird project (entitled the Columbia Wetlands Marsh Bird Monitoring Project) of Goldeneye Ecological Services in partnership with Environment and Climate Change Canada Canadian Wildlife Service is currently underway in the wetlands, inventorying breeding birds. This project also has the potential to have extrapolated species counts (e.g. for Sora (*Porzana carolina*), Pied-billed Grebe (*Podilymbus podiceps*)) that could trigger IBA program status for the Columbia Wetlands. Furthermore, there are isolated breeding populations of Lewis's Woodpecker in the study area that may trigger IBA status.

5.2. Findings arising from CWWS data contributions

While recognizing the potential for the Columbia Wetlands to become part of the IBA program, the CWWS project provides additional benefit as evidenced by the collection of data. The CWWS has collected data on 14 at-risk bird species that utilize Columbia Wetlands habitat during migration. This data documents that some at-risk species concentrate at specific sites in this ecosystem. The Great Blue

Heron (*Ardea herodias herodias*) was the most frequently sighted at-risk species recorded during the CWWS survey periods, suggesting that the Columbia Wetlands are important feeding and resting grounds for them, as well as important breeding grounds as previous research has indicated (Machmer, 2008).

Provincially red-listed Western Grebe (*Aechmophorus occidentalis*), appear to concentrate at larger water bodies such as Columbia Lake, Lake Windermere, and Mulligan's Slough near Nicholson. Regular reports on eBird have supported this claim where relatively large (i.e. 220, 150, 100) and smaller flocks of Western Grebe (*Aechmophorus occidentalis*) have been recorded on Lake Windermere during migration periods in the past six years. The Committee on the Status of Endangered Wildlife in Canada has listed the Western Grebe (*Aechmophorus occidentalis*) as a species of 'Special Concern' and has stated that "*[t]hreats to Western Grebes during migration are mostly unknown. Migration routes are poorly understood, stopover sites have not been systematically documented, and virtually nothing is known about fidelity to stopover sites or habitat requirements at those sites"* (COSEWIC, 2014). The data recorded by CWWS will supplement the limited information database identifying the stopover sites utilized by the Western Grebe (*Aechmophorus occidentalis*) in the Columbia Wetlands.

McPherson, Hlushak, Adams and Polzin (2010) stated that "Columbia Lake is an important staging area for many migrating waterfowl and supports a diverse array of breeding waterfowl. The wetland areas at the north and south ends of the lake are particularly important." This report also noted that the remainder of the lake was much less utilized by migrant birds and that species of note on Columbia Lake were Tundra and Trumpeter Swan (McPherson, Hlushak, Adams & Polzin, 2010). The CWWS data however records that middle sections of Columbia Lake (and Lake Windermere) are regularly utilized by at-risk species such as Western Grebe (*Aechmophorus occidentalis*) and Horned Grebe (*Podiceps auritus*) as stopover habitat, and that middle sections of Columbia Lake and Lake Windermere are two of the most important staging areas within the Columbia Wetlands for these grebe species and other birds.

Increasing numbers of birders in the region are using the eBird platform to enter individual bird sightings, which may assist scientists to acquire additional information about birds using the region. This increase in use of this tool may in part be attributed to the CWWS project. The CWWS has promoted the eBird platform for use by the citizen-scientists for entry of their data after waterbird surveys, as well as for personal use outside of coordinated bird survey dates in other locations of the Columbia Wetlands.

The Columbia Wetlands ecosystem is an important stopover or staging habitat (used for feeding, drinking, resting) for a wide variety of migrant birds (Kaiser, McKelvey, & Smith, 1977). During the period of study, the CWWS data suggests that American Wigeon (*Anas Americana*) are the most common waterbird in the wetlands. Mallard (*Anas platyrhynchos*) and American Coot (*Fulica americana*) have also been found in high abundance. This finding concurs with a previous study from 1976-1977, when Canadian Wildlife Service conducted aerial surveys reporting that the "Columbia Marshes support one of the most dense populations of Mallards in British Columbia…" (Kaiser, McKelvey & Smith, 1977).

This report also highlighted the large number of American Coot (*Fulica Americana)* and American Wigeon (*Anas Americana*) that were seen during those surveys.

Previously it was unknown if specific sites in the Columbia Wetlands had a higher abundance of birds during migration, when compared to other sites in the same ecosystem. While Capsell et al. (1979) conducted a study to compare migrant bird uses over various parts of the Columbia Valley specific geographical areas were excluded from the study (e.g. sections between Brisco and Spillimacheen, Mud Lake and Tatley Slough). The CWWS data records that a high overall abundance of bird species is present in multiple geographical areas during migration including at least one of the sites not previously observed during research (i.e. large shallow open water patches located between Brisco and Spillimacheen). This area may contain the highest abundance of waterbirds in the Columbia Wetlands during migration periods. Preliminary data also suggests that there are additional geographical sites that regularly have high numbers of birds including the Althalmer Slough near Invermere, Mulligan's Slough and the south end of Lake Windermere.

6. CONCLUSION

The Columbia Wetlands Waterbird Survey (CWWS) project continues throughout the course of its study to add to the previously known bird population database in what is increasingly recognized to be a significant wetland ecosystem within the Bird Conservation Region 10: Northern Rockies. The existent absence of baseline bird data and identification of habitat threats to birds precludes time sensitive informed decision-making and well formulated management recommendations. Without baseline data, decision-makers are left "to guess" where the most significant habitat parcels are located for birds and projects advancing bird conservation in the Columbia Wetlands will remain compromised.

The CWWS data will be a beneficial benchmark contributing to a database previously lacking in comprehensive documentation of migrant waterbirds. Following completion of this scheduled five-year project and resultant database; subsequent projects addressing bird conservation (e.g. establishment of enhanced nesting opportunities) and promotion of sustainable adjacent land use will contribute to preserving an essential migration path for North American waterbirds. Recognizing the necessary commitment of all stakeholders to ensure success of this objective, the CWWS data will also assist in educational programming that may include planned placement of observation blinds/interpretive boardwalks and other informative programming to help meet the needs of increasing eco-tourism in this region.

The CWWS data assists in maintenance of international Ramsar responsibilities by addressing one of the three pillars under the Convention's mandate; "working towards wise use of all wetlands". The CWWS data has additionally facilitated the maintenance and fulfilment under Columbia Wetlands Wildlife Management Area (WMA) responsibilities by monitoring avian populations and meets the priorities mandated by the North American Waterfowl Management Plan (NAWMP) and the Canadian Intermountain Joint Venture (CIJV) Implementation Plan. If successful, the incorporation into the Canadian IBA program will be a critical accomplishment for conservation planning in an ecosystem that significantly affects Columbia Valley residents.

The CWWS project has throughout the study engaged residents through public education opportunities located within both the Regional District of East Kootenay (RDEK) and Columbia Shuswap Regional District (CSRD); including the recruitment of ecological experts, naturalists and citizen-scientists in the Columbia Valley dedicated to pursuing long-term conservation goals related to biodiversity values of the Columbia Wetlands. By providing an active citizen-science role in the CWWS, regional survey volunteers have already become stakeholders and spokespersons directly engaged in wildlife interaction involving the Columbia Wetlands, making them better informed to make sustainable personal decisions with resultant positive actions. The CWWS has to date and will continue to expand partnerships with local communities, regional and national groups, and in particular with the organizations that bear considerable influence on waterbird and wetland conservation. To further

advance educational opportunities among youth, nature-based birding field trips continue to instruct and inform school-aged children in RDEK Areas F and G, and CSRD Area A of the unique environment they are fortunate to live within.

The year of 2017 was year 3 of an ongoing citizen-science project that is scheduled to continue for at least two more consecutive years (2015-2019). It is the CWWS projects' recommendation that this study continue in pursuit of advancing collection of baseline data on waterbirds in the Columbia Wetlands during periods of migration, ensuring the outcome of a successful IBA application and future habitat protection.

7. REFERENCES

Badzinski, S.S., Cannings, R.J., Smith, T., & Komaromi, J. (2005). An evaluation of survey power and species trends after five years of monitoring. Retrieved from Bird Studies Canada http://bsc-eoc.org/download/BCCWS%205-YR%20Report.pdf on December 11, 2017.

BC Hydro. (2014). Fish and Wildlife Compensation Program. Columbia Basin Riparian and Wetlands Action Plan: Draft. Retrieved from http://www.bchydro.com/content/dam/hydro/medialib/internet/documents/about/our_commitment/fwcp/fwcp-columbia-riparian-wetland-action-plan.pdf

BC Ministry of Forests, Lands and Natural Resource Operations (BC FLNRO). (n.d.). Columbia Wetlands Wildlife Management Area. Retrieved from http://www.env.gov.bc.ca/fw/habitat/conservation-lands/wma/columbia_wetlands/

Bird Studies Canada (n.d.). Important bird areas in Canada. Retrieved from http://www.ibacanada.ca/

Bird Studies Canada (BSC) (2011). Canadian Important Bird Areas Criteria (2nd edition; 2011). Retrieved from https://www.ibacanada.ca/documents/current_Canadian_IBA_Criteria.pdf on December 8, 2017

Caspell, B., Danvers, A., Hutchinson, J., Ostrander, P., Pringle, D. & Udey, D. (1979). Field Report: Fall migration of waterbirds in the Columbia Valley. Prepared for Migratory Bird Population Section Canadian Wildlife Service, Delta, B.C.

COSEWIC. 2014. COSEWIC assessment and status report on the Western Grebe Aechmophorus occidentalis in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 55 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm).

Couturier, A. (2012). Canada's Important Bird Areas. Retrieved from http://www.birdscanada.org/download/BWCwi12.pdf

Demarchi, R. & W.G. Smith. (1967). Spring and fall waterfowl surveys in the Columbia River marches of the East Kootenay. B.C. Fish and Wildlife Branch, Victoria. In Pedology Consultants, 1983. Opportunities for Wildlife and Recreation Development in the Columbia River Wetlands. Prepared for Fish and Wildlife Branch, British Columbia Ministry of Environment, National Second Century Fund of British Columbia, Ducks Unlimited Canada and Canadian Wildlife Service.

Environment Canada (2013). Bird conservation strategy for bird conservation region 10 Pacific and Yukon Region: Northern Rockies. Retrieved from: https://www.ec.gc.ca/mbc-com/B0E2C86B-57E6-419A-B3E9-E1CD1808ADFE/BCR-10-PYR-FINAL-Abridged-Feb2013.pdf

Environment Canada. (2014). Columbia National Wildlife Area. Retrieved from https://www.ec.gc.ca/ap-pa/default.asp?lang=En&n=34F1BF30-1

Harrison, B., Mahony, N., Arner, B., Breault, A., Buffett, D., Harcombe A., Kirkby, J., Moore, K., Page, A. & Tam, T. (2010). Canadian Intermountain Joint Venture. Implementation Plan: Wetlands and Associated Species. North American Waterfowl Management Plan.

Hooda, P. S., Edwards, A. C., Anderson, H. A., & Miller, A. (2000). A review of water quality concerns in livestock farming areas. *Science of the Total Environment*, *250*(1), 143-167.

IUCN. (2017). Protected Areas Categories. Retrieved from: https://www.iucn.org/theme/protected-areas/about/protected-areas-categories

Kaiser, G.W., McHelvey, R.W., & D.W. Smith (1977). Preliminary report on aerial surveys in the Columbia Valley, British Columbia. Canadian Wildlife Services. In Pedology Consultants, 1983. Opportunities for Wildlife and Recreation Development in the Columbia River Wetlands. Prepared for Fish and Wildlife Branch, British Columbia Ministry of Environment, National Second Century Fund of British Columbia, Ducks Unlimited Canada and Canadian Wildlife Service.

Korschgen, C. E., & Dahlgren, R. B. (1992). 13.2. 15. Human Disturbances of Waterfowl: Causes, Effects, and Management. *Waterfowl management handbook*, 12.

Kosmala, M., Wiggins, A., Swanson, A., & Simmons, B. (2016). Assessing data quality in citizen science. Frontiers in Ecology and the Environment, 14(10), 551-560.

Liddle, M. J., & Scorgie, H. R. A. (1980). The effects of recreation on freshwater plants and animals: a review. *Biological conservation*, *17*(3), 183-206.

Machmer, M. M. (2008). Great Blue Heron and Bald Eagle inventory and stewardship in the Columbia Basin (2007-2008). Columbia Basin Fish and Wildlife Compensation Program. Nelson, BC 34pp.

McPherson S., D. Hlushak, I. Adams and M. Polzin. 2010. Columbia Lake Sensitive Habitat Inventory and Mapping. Consultant report prepared for the East Kootenay Integrated Lake Management Partnership. Prepared by Interior Reforestation Co. Ltd., Cranbrook, BC.

Ramsar. (2014). *The Ramsar convention and its mission.* Retrieved from: https://www.ramsar.org/about/the-ramsar-convention-and-its-mission on Friday 1 Dec 2017

Poulin, B., Lefebvre, G., & Paz, L. (2010). Red flag for green spray: adverse trophic effects of Bti on breeding birds. *Journal of Applied Ecology*, *47*(4), 884-889.

Resource Inventory Committee. (1999). Inventory methods for waterfowl and allied species: loons, grebes, swans, geese, ducks, American Coot, and Sandhill Crane. *Ministry of Environment, Lands and Parks, Victoria, BC*, 90.

Runge, C. A., Watson, J. E., Butchart, S. H., Hanson, J. O., Possingham, H. P., & Fuller, R. A. (2015). Protected areas and global conservation of migratory birds. Science, 350(6265), 1255-1258.

Sharpley, A., Meisinger, J. J., Breeuwsma, A., Sims, J. T., Daniel, T. C., & Schepers, J. S. (1998). Impacts of animal manure management on ground and surface water quality. Animal waste utilization: effective use of manure as a soil resource, 173-242.

Wetlands International (2017). *What are waterbirds*. Retrieved from http://wpe.wetlands.org/Iwhatrwb on Friday 1 Dec 2017

8. APPENDICES

Appendix 1. CWWS summarized data from spring 2015 surveys.

Species Name	24-Apr Species Count	24-Apr Sample Size	29-Apr Species Count	29-Apr Sample Size	04-May Species Count	04-May Sample Size
Canada Goose	378	40	425	40	421	33
goose sp.	--		5	1	15	4
Trumpeter Swan	22	7	5	3	7	2
Tundra Swan	2	1	--		6	4
Trumpeter/Tundra Swan	11	3	1	1		
Wood Duck	32	8	34	8	44	7
Blue-winged Teal	2	1	--		1	1
Cinnamon Teal	17	7	46	10	30	11
Northern Shoveler	94	9	382	13	79	7
Gadwall	8	3	38	5		
American Wigeon	846	16	308	16	280	23
Mallard	726	48	495	48	514	49
Northern Pintail	170	12	89	9	142	2
Green-winged Teal	322	14	399	14	70	9
dabbling duck sp.	594	2	90	1		
Canvasback	2	1	--			
Redhead	72	4	12	3	28	3
Ring-necked Duck	411	18	294	18	137	18
Greater Scaup	--		2	1	2	1
Lesser Scaup	9	5	29	3	14	2
Long-tailed Duck	--		1	1		
Bufflehead	131	26	119	21	302	27
Common Goldeneye	93	17	43	14	71	13
Barrow's Goldeneye	--		2	1	--	
Hooded Merganser	89	19	94	22	108	21
Common Merganser	89	12	21	5	84	12
Red-breasted Merganser	2	1	--		3	2
merganser sp.	--		2	1		
Ruddy Duck	9	2	14	2	16	3
duck sp.	765	4	31	2	70	3
waterfowl sp.	3	2	639	10	361	9
Ruffed Grouse	--		2	2	1	1
Common Loon	20	12	16	8	15	10
Pied-billed Grebe	10	7	5	4	9	4
Horned Grebe	1	1	11	1	43	4
Red-necked Grebe	14	6	10	4	78	8
Eared Grebe	--		1	1	11	2
Horned/Eared Grebe					5	1

Western Grebe		1	1	--			11	3
grebe sp.	--				1	1		
American White Pelican							16	2
American Bittern		1	1	--				
Great Blue Heron		41	11		22	6	44	17
Turkey Vulture		12	3		1	1	1	1
Osprey		18	10		22	13	22	15
Golden Eagle	--				2	1	1	1
Northern Harrier		1	1		5	4	1	1
Northern Goshawk							1	1
Bald Eagle		22	13		38	21	33	19
Red-tailed Hawk		2	2		2	2	4	4
Buteo sp.							2	1
hawk sp.							1	1
Sora	--				1	1	1	1
American Coot		861	12		166	9	246	8
Sandhill Crane		3	1		2	2	5	2
Black-necked Stilt	--				1	1	3	1
Killdeer		3	1		6	3	18	12
Semipalmated Sandpiper		2	1	--				
Western Sandpiper							1	1
peep sp.	--				450	1		
Wilson's Snipe		3	3		2	2	2	2
Solitary Sandpiper	--				1	1	1	1
Greater Yellowlegs		4	1		5	1	1	1
Lesser Yellowlegs							1	1
Tringa sp.							3	1
shorebird sp.		1	1	--			4	1
Bonaparte's Gull	--				80	2	15	5
Ring-billed Gull		1	1		8	1	28	3
gull sp.	--				14	1	25	3
Rock Pigeon		2	1					
Mourning Dove							1	1
Belted Kingfisher		4	4		6	5	14	8
Red-naped Sapsucker	--				1	1	6	4
Hairy Woodpecker							1	1
Downy Woodpecker	--				2	1		
Northern Flicker		4	3		4	3	9	7
Pileated Woodpecker		1	1		4	2	1	1
woodpecker sp.	--				2	1	4	4
American Kestrel		3	1		6	3	5	3
Merlin		2	1	--			1	1
Steller's Jay		1	1	--				
Black-billed Magpie		12	5		14	7	16	7
Clark's Nutcracker		3	1		2	1		

American Crow		25	8		43	12	62	15
Common Raven		78	7		15	6	12	6
Northern Rough-winged Swallow		10	1		9	3	68	8
Tree Swallow		20	1		9	2	34	6
Violet-green Swallow		2	1	--			--	
Bank Swallow		10	1		12	2	5	1
Cliff Swallow	--				7	1	10	1
swallow sp.		37	2		42	3	6	1
chickadee sp.		2	2		2	1	4	2
Red-breasted Nuthatch							2	2
Pacific Wren		1	1	--			1	1
Marsh Wren		4	2		6	3	11	3
Ruby-crowned Kinglet		12	7		18	6	16	9
Mountain Bluebird		1	1	--			1	1
bluebird sp.							4	1
American Robin		1	1		5	4	10	4
Northern Waterthrush							2	1
Varied Thrush		2	1	--				
European Starling	--				3	1		
American Pipit	--				4	1		
Orange-crowned Warbler	--				2	1	1	1
Yellow-rumped Warbler		1	1		3	1	11	5
Townsend's Warbler							1	1
Dark-eyed Junco		3	2		4	2		
White-crowned Sparrow	--				39	3	3	3
Vesper Sparrow							3	2
Savannah Sparrow	--				16	1		
Song Sparrow		14	12		16	10	24	11
Lincoln's Sparrow	--				4	1		
sparrow sp.							1	1
Spotted Towhee	--				1	1	1	1
Yellow-headed Blackbird		7	3		4	2	29	6
Western Meadowlark		1	1		5	4	7	4
Red-winged Blackbird		57	14		131	20	177	17
Brown-headed Cowbird		20	1	--				
Brewer's Blackbird	--				4	1	20	2
House Finch		2	1	--				
Purple Finch	--				3	1		
Pine Siskin	--				5	1	2	1

Appendix 2. CWWS summarized data from fall 2015 surveys.

Species Name	29-Sep Species Count	29-Sep Sample Size	05-Oct Species Count	05-Oct Sample Size	15-Oct Species Count	15-Oct Sample Size	25-Oct Species Count	25-Oct Sample Size
Canada Goose	1,006	28	1,294	22	1,188	28	833	26
goose sp.							1	1
Trumpeter Swan	11	3	28	8	9	3	34	6
Tundra Swan	--		4	1	5	1	21	3
Trumpeter/Tundra Swan	6	2	18	2	29	4	17	3
Wood Duck	9	2	13	3			4	1
Blue-winged Teal	27	3	8	2	15	3	2	1
Cinnamon Teal	2	1	--		3	1		
Northern Shoveler	18	3	17	5	11	3	16	4
Gadwall	14	2	34	4	12	2	25	3
Eurasian Wigeon	5	2	12	2	2	1		
American Wigeon	772	14	2,248	21	1,197	17	2,308	22
Mallard	734	33	2,144	38	2,256	38	1,381	38
Northern Pintail	16	3	59	4	35	6	11	2
Green-winged Teal	424	7	794	13	738	10	806	9
teal sp.					2	1	23	1
dabbling duck sp.	--		602	5	1,076	13	200	4
Canvasback	--		1	1	7	2		
Redhead	1	1	--				8	2
Ring-necked Duck	79	7	30	8	42	7	12	1
Lesser Scaup	1	1	16	3				
Greater/Lesser Scaup	--		1	1	24	3	11	3
Surf Scoter					8	1	1	1
White-winged Scoter							2	1
Bufflehead	14	6	98	13	75	10	67	10
Common Goldeneye	21	5	29	10	23	7	21	7
Barrow's Goldeneye	--		4	1	2	1		

Hooded Merganser		10	3		71	8	181	12	119	7
Common Merganser		50	9		48	7	53	8	97	13
Red-breasted Merganser		1	1	--					1	1
merganser sp.	--				2	1			5	2
Ruddy Duck		9	1	--						
duck sp.	--				800	12	744	4	19	6
waterfowl sp.		1,532	14		1,563	9	1,367	13	593	6
Ruffed Grouse	--				1	1				
grouse sp.							1	1		
Wild Turkey		6	1	--						
Common Loon	--				12	6	8	3	3	2
Pied-billed Grebe		28	8		40	16	27	11	16	8
Horned Grebe		3	2		4	3	6	3		
Red-necked Grebe		20	7		20	9	20	7	11	3
Western Grebe		1	1		14	5	28	5		
grebe sp.		1	1		2	1			16	3
Great Blue Heron		19	5		34	11	37	12	10	5
Osprey	--				1	1				
Northern Harrier	--				1	1	4	3	1	1
Accipiter sp.	--				1	1				
Bald Eagle		14	8		12	9	22	14	25	15
Red-tailed Hawk									1	1
hawk sp.	--				2	2	2	2	2	2
Virginia Rail	--				1	1				
American Coot		1,586	4		3,386	8	891	9	226	3
Killdeer	--				2	2				
Long-billed Curlew	--				1	1				
peep sp.		4	1		24	1	85	3	5	1
Long-billed Dowitcher							13	1	10	2
Wilson's Snipe							1	1		

Spotted Sandpiper						1	1		
Bonaparte's Gull						2	1		
Ring-billed Gull		30	3	50	5	151	2	58	3
California Gull	--			15	2	8	1	13	3
Herring Gull	--			2	1			2	1
gull sp.		51	4	109	10	389	10	43	10
Mourning Dove	--			1	1				
Belted Kingfisher		3	3	4	4	6	5	8	8
Red-naped Sapsucker	--			1	1				
Downy Woodpecker	--			1	1				
Hairy Woodpecker	--			1	1			1	1
Northern Flicker	--			7	7	3	3	11	6
Pileated Woodpecker		1	1	1	1	2	2	2	2
woodpecker sp.		1	1	2	2	1	1	1	1
American Kestrel		1	1	--				1	1
Northern Shrike						1	1		
Steller's Jay	--			3	2	1	1	1	1
Black-billed Magpie		6	2	9	7	5	4	14	10
Clark's Nutcracker	--			2	2	3	2	5	3
American Crow		32	8	46	5	41	7	5	5
Common Raven		2	1	18	6	34	9	45	16
Black-capped Chickadee		10	2	6	1	4	3	15	4
Mountain Chickadee	--			7	1	3	2	5	2
chickadee sp.	--			3	3	5	1	8	3
Red-breasted Nuthatch	--			2	2				
Brown Creeper						1	1		
Marsh Wren		5	1	6	3	5	2		
Golden-crowned Kinglet		1	1	--					
Ruby-crowned Kinglet	--			1	1				
Townsend's Solitaire		2	1	7	6	7	6	13	8
American Robin	--			11	4	8	2	4	2

European Starling	--		195	2	200	1	100	1
American Pipit	--		1	1				
Cedar Waxwing	--		20	1				
Yellow-rumped Warbler	--		1	1				
warbler sp. (Parulidae sp.)					1	1		
Dark-eyed Junco	4	2	3	2	4	2	1	1
Song Sparrow	4	4	12	6	3	3	3	3
Western Meadowlark							1	1
Red-winged Blackbird	49	2	32	3			1	1
House Finch					1	1	4	2
Common Redpoll							120	3
Red Crossbill					1	1	6	1
passerine sp.	10	2	9	1				

Appendix 3. List of training, communications and outreach activities during the CWWS in 2015

Training opportunities:

- April 6, 2015 - 14 participants in Golden for CWWS training module presentation
- April 9, 2015 - 12 participants in Invermere for CWWS training module presentation
- April 21, 2015- 5 participants at Radium Mill Pond (Radium) to review protocol outside
- April 22, 2015 -12 participants at Reflection Lake (Golden) to review protocol outside with birds
- May 23, 2015 – 22 participants trained at 'WetlandKeepers' Course in Radium
- Sept 21, 2015 – 9 participants in Golden for training module (2 travelled from Invermere, 1 from Calgary)
- Sept 28, 2015 – 28 students (Grade 8) trained at Golden Secondary School
- October 8, 2015 – 10 students (Grade 10-12) trained at Golden Secondary School

Media:

- Feb-May – Wings Over the Rockies Festival Guide – "Are you Wild Over Waterbirds"
- April 15, 2015 – The Golden Star – "Wildsight's waterbird survey starts this month"
- June 17, 2015 – The Golden Star – "First waterbird survey in area completed"
- Summer 2015 – Wildsight's Wild Times – "Columbia Wetlands Waterbird Survey"
- July 24, 2015 – Columbia Valley Pioneer – "Wetland waterbird survey seeks citizen-scientists"
- Sept 11, 2015 – Golden This Week – "Waterbird Survey initiative looks to protect"
- Sept 25, 2015 – Columbia Valley Pioneer – "Birders urged to participate in survey"
- October 2015 – Kootenay Conservation Program (KCP) featured CWWS Program Manager R.Darvill in the 'Faces and Places' feature in online newsletter.
- November 13, 2015 – Columbia Valley Pioneer – "Over 35,000 birds counted"
- November 16, 2015 – Program Biologist Rachel Darvill had 6-min interview on CBC Daybreak South with Chris Walker about the CWWS.
- November 23, 2015 - Program Biologist Rachel Darvill had 3-min interview on Summit 107 News.

Presentations:

- May 18, 2015 – 28 students - College of the Rockies, Golden campus
- April-May – 133 kids with in-classroom learning sessions about birds/Columbia Wetlands, followed with subsequent fieldtrips outside for bird viewing and learning at Reflection Lake, Golden
- May 25, 2015 – 45 attendees - Columbia Basin Watershed Network (CBWN) member meeting
- June 3, 2015 – 25 attendees - Lake Windermere Ambassadors Watershed Tour
- August 15, 2015- 55 attendees - Columbia Lake Stewardship Society AGM
- August 18, 2015 – 11 people - Area F/G representatives for Regional District of East Kootenay
- August 20, 2015 – 45 people – Board of Directors and public for Columbia Shuswap Regional District (CSRD) Board Meeting
- Sept 18, 2015 – 8 attendees - CSRD Area A Parks Committee – presented idea of public interpretive wetlands boardwalk and possible wetlands interpretive centre

- Sept 20, 2015– 20 educators - Know Your Watershed Educators Training Session – provided information on ideas to involve kids with bird programs, and their potential role in citizen-science

Outreach materials developed

- 30 CWWS Waterbird Field Guides printed (color, waterproof) highlighting 38 waterbirds one is most likely to encounter in the Columbia Wetlands; guide includes CWWS protocol and instructions for data submission.
- Elementary school program developed for in-class session and birding fieldtrips
- Training module for participants
- Powerpoint presentations

Appendix 4. CWWS summarized data from spring 2016 surveys.

Species Name	03-Apr Species Count	03-Apr Sample Size	10-Apr Species Count	10-Apr Sample Size	16-Apr Species Count	16-Apr Sample Size
Snow Goose			3	1	14	1
Canada Goose	812	63	795	63	645	60
Trumpeter Swan	30	9	29	9	14	4
Tundra Swan	45	7	14	2	--	
Trumpeter/Tundra Swan	37	6	9	5	13	4
Wood Duck	47	13	56	12	47	8
Cinnamon Teal					5	2
Blue-winged Teal	7	1				
Northern Shoveler	19	4	17	4	74	9
Gadwall					2	1
Eurasian Wigeon			2	1	--	
American Wigeon	1,942	28	1,954	30	900	22
Mallard	1,960	70	1,401	65	1,220	63
Northern Pintail	105	8	247	15	205	14
Green-winged Teal	101	7	484	13	486	13
teal sp.	31	3	--		2	1
dabbling duck sp.	4	2	430	5	102	6
Canvasback	2	2	4	1	4	1
Redhead	26	4	14	3	8	1
Ring-necked Duck	192	14	272	18	297	22
Lesser Scaup	10	4	172	3	177	5
Greater/Lesser Scaup	131	2	11	1	--	
Bufflehead	78	21	159	25	172	28
Common Goldeneye	369	28	224	31	103	18
Barrow's Goldeneye	10	4	2	1	6	2
Common/Barrow's Goldeneye	1	1	10	3	16	3
Hooded Merganser	115	32	102	19	66	14

Common Merganser	471	26		279	26	238	14
merganser sp.				1	1	4	1
duck sp.	325	8		32	5	206	4
waterfowl sp.	682	6		313	15	159	18
Ruffed Grouse				5	4	3	2
grouse sp.			--			1	1
Common Loon	17	8		15	11	14	11
Pied-billed Grebe	9	7		11	8	14	9
Horned Grebe				4	3	10	2
Red-necked Grebe	15	6		42	13	24	9
grebe sp.	2	1	--			1	1
American Bittern				1	1	--	
Great Blue Heron	37	8		43	10	81	9
Turkey Vulture				1	1		
Osprey	1	1		7	5	10	9
Northern Harrier				5	4	5	5
Sharp-shinned Hawk				1	1	--	
Golden Eagle	1	1					
Bald Eagle	34	18		34	19	34	18
Red-tailed Hawk	5	2		2	2	1	1
hawk sp.	1	1	--			1	1
American Coot	808	9		1,583	10	539	9
Sandhill Crane	4	3		4	3	4	3
Killdeer	12	5		10	7	16	9
Wilson's Snipe				2	1	--	
Greater Yellowlegs				4	2	2	2
Lesser Yellowlegs	1	1					
shorebird sp.				1	1		
Ring-billed Gull	17	2		17	4		
California Gull	1	1					
Herring Gull				1	1		

gull sp.	36	3			13	2
Eurasian Collared-Dove					1	1
Great Horned Owl	1	1	2	2	1	1
Belted Kingfisher	5	4	3	3	11	9
Red-naped Sapsucker			2	1	3	1
Downy Woodpecker			5	4	--	
Hairy Woodpecker			--		3	1
Downy/Hairy Woodpecker			1	1	--	
Northern Flicker	33	19	43	22	30	22
Pileated Woodpecker	11	8	6	4	5	3
woodpecker sp.	4	4	7	6	11	9
American Kestrel	1	1				
Merlin	1	1	4	3	1	1
Say's Phoebe	1	1	2	2	--	
flycatcher sp. (Tyrannidae sp.)			--		1	1
Northern Shrike			1	1	--	
Steller's Jay	3	2	2	1	2	1
Black-billed Magpie	18	8	17	10	23	9
Clark's Nutcracker	1	1	3	1	1	1
American Crow	51	13	112	22	113	23
Common Raven	35	15	31	13	30	10
Northern Rough-winged Swallow	1	1	17	3	2	1
Tree Swallow	114	9	152	12	117	13
Violet-green Swallow	1	1	24	5	19	4
swallow sp.	11	2	43	3	12	3
Black-capped Chickadee	13	8	17	6	25	8
Mountain Chickadee	2	1	9	2	11	6
chickadee sp.	18	7	16	6	12	5
Red-breasted Nuthatch	18	9	21	10	17	11
Pacific Wren	2	1				

Marsh Wren	1	1	4	3	5	4
Golden-crowned Kinglet			--		2	1
Ruby-crowned Kinglet	--		6	5	5	4
Mountain Bluebird			4	3	6	4
Townsend's Solitaire			--		1	1
American Robin	53	19	59	19	52	23
European Starling	27	2	15	3	4	2
Cedar Waxwing	1	1				
Fox Sparrow					2	1
Dark-eyed Junco	22	11	28	13	23	10
Vesper Sparrow	2	1				
Song Sparrow	55	23	62	20	34	16
sparrow sp.			6	1	4	1
Spotted Towhee	3	2				
Yellow-headed Blackbird	2	1				
Western Meadowlark	7	5	11	8	7	6
Red-winged Blackbird	93	22	123	22	97	18
Brown-headed Cowbird			--		2	1
Brewer's Blackbird			--		26	2
House Finch			3	2	2	2
Pine Siskin			14	2	1	1
passerine sp.	1	1				

Appendix 5. CWWS summarized data from fall 2016 surveys.

Species Name	29-Sep Species Count	29-Sep Sample Size	05-Oct Species Count	05-Oct Sample Size	15-Oct Species Count	15-Oct Sample Size
Canada Goose	1,012	43	1,054	46	1,832	41
Trumpeter Swan	39	9	30	6	24	5
Tundra Swan	--		7	1		
Trumpeter/Tundra Swan	27	7	35	5	53	8
Wood Duck	19	6	25	6	7	3
Blue-winged Teal	22	4	2	1	4	1
Northern Shoveler	32	3	9	2	6	2
Gadwall	3	1	17	2	22	3
American Wigeon	3,150	26	4,785	34	3,046	27
Mallard	3,989	54	2,954	65	2,857	61
Northern Pintail	25	3	68	7	50	7
Green-winged Teal	503	15	714	14	1,124	15
teal sp.	20	1	5	2	200	2
dabbling duck sp.	311	12	782	10	1,054	11
Canvasback	1	1	3	1	8	1
Redhead					42	1
Ring-necked Duck	188	10	561	10	2,135	7
Lesser Scaup	4	1	10	3	12	3
Greater/Lesser Scaup	20	2	3	1	2	1
Surf Scoter	--		1	1		
White-winged Scoter	2	1	3	1	2	1
Bufflehead	23	5	27	7	87	10
Common Goldeneye	27	7	25	7	35	9
Barrow's Goldeneye	6	1	--		5	1
Common/Barrow's Goldeneye	18	3	3	1	3	2
Hooded Merganser	25	9	89	13	83	16
Common Merganser	16	4	22	5	34	7
Red-breasted Merganser	4	1	--			
Common/Red-breasted Merganser	7	1	--			

merganser sp.		4	2	--		2	1
Ruddy Duck		7	2	3	1	5	1
duck sp.		1,924	13	623	6	1,458	8
waterfowl sp.		552	13	937	9	3,374	14
Ruffed Grouse	--			2	1		
Common Loon		7	4	18	7	14	9
Pied-billed Grebe		22	13	56	16	36	11
Horned Grebe		126	2	7	2	6	2
Red-necked Grebe		25	10	42	13	54	4
Eared Grebe		2	2	6	2	15	1
Horned/Eared Grebe		12	3	2	1	7	2
Western Grebe		25	1	31	3	103	6
grebe sp.		9	3	18	3	6	3
Great Blue Heron		62	21	47	21	42	13
Osprey		2	2	--		5	3
Northern Harrier		5	4	8	7	6	6
Cooper's Hawk		1	1	--			
Northern Goshawk						1	1
Bald Eagle		29	19	31	19	26	18
Red-tailed Hawk		5	5	4	4	2	2
hawk sp.		1	1	5	3	3	3
American Coot		703	7	2,558	10	2,164	13
Killdeer						1	1
peep sp.		77	4	--		46	2
Long-billed Dowitcher		10	2	--		44	2
Wilson's Phalarope		13	1	--			
Greater Yellowlegs		6	1	--			
shorebird sp.		96	3	2	2		
Bonaparte's Gull	--			1	1	7	1
Ring-billed Gull		86	5	129	12	181	8
California Gull		10	2	41	2	35	4
Herring Gull		5	2	17	2	18	1

gull sp.		124	11		512	17	223	16
Belted Kingfisher		7	6		12	10	12	10
Downy Woodpecker		2	2		2	2	1	1
Northern Flicker		7	6		19	18	17	12
Pileated Woodpecker		2	1		9	8		
woodpecker sp.		1	1	--				
American Kestrel	--				1	1		
Merlin		4	3	--			1	1
Northern Shrike		1	1		2	2	1	1
Steller's Jay							1	1
Blue Jay							1	1
Black-billed Magpie		17	12		17	13	13	8
American Crow		92	11		18	8	26	5
Common Raven		32	10		30	14	15	11
Black-capped Chickadee		18	5		17	5	20	5
Mountain Chickadee		7	2		22	6	3	1
chickadee sp.	--				10	4		
Red-breasted Nuthatch		18	7		25	12	12	5
Marsh Wren		2	1		6	2	2	2
Ruby-crowned Kinglet	--				5	2		
Mountain Bluebird		2	1	--				
Townsend's Solitaire		17	7		14	7	6	5
American Robin		9	3		10	5	1	1
American Pipit	--				15	1		
warbler sp. (Parulidae sp.)		4	1	--				
Chipping Sparrow	--				1	1		
European Starling							5	1
Snow Bunting							1	1
Dark-eyed Junco		32	7		4	4	12	3
White-crowned Sparrow		2	1		1	1	2	1
Song Sparrow		3	1		13	5	1	1
Western Meadowlark		4	1	--				

Red-winged Blackbird	211	2	3	1		
blackbird sp.	--		4	1		
Pine Grosbeak	2	1	--			
Gray-crowned Rosy-Finch					30	1
Pine Siskin	14	5	2	2	2	2
passerine sp.	1	1	1	1		

Appendix 6. Aerial Swan Survey data from March 23, 2016

Location #	Location Name (if possible)	GPS Coordinates	# of Adults
1	Wilmer NWA	50.54918, -116.05485	**21**
2	Radium Mill Pond	50.623677, -116.100911	**2**
3	Red Rock Lookout	50.640422, -116.106172	**1**
4	Mitchell Marsh-westside Snyder Rd	50.797964, -116.251695	**2**
5	300m North of #4	50.799356, -116.255317	**6**
6	Between Snider Rd and Brisco Crossing	50.801154, -116.26006	**2**
7	Between Snider Rd and Brisco Crossing	50.80442, -116.263485	**61**
8	Between Snider Rd and Brisco Crossing	50.803196, -116.267122	**20**
9	Between Snider Rd and Brisco Crossing	50.802536, -116.274081	**12**
10	Between Snider Rd and Brisco Crossing	50.807554, -116.268561	**4**
11	Between Snider Rd and Brisco Crossing	50.808641, -116.270718	**10**
12	Between Snider Rd and Brisco Crossing	50.812201, -116.271782	**3**
13	Between Snider Rd and Brisco Crossing	50.816232, -116.271501	**10**
14	Between Snider Rd and Brisco Crossing	50.818675, -116.274035	**8**
15	South of Brisco Crossing about 1 km	50.820057, -116.280625	**5**
16	About 1 km north of Brisco Crossing	50.835825, -116.304393	**4**
17	About 3 km north of Brisco Crossing	50.849034, -116.311998	**5**
18	Between Brisco and Spilli	50.84667, -116.31973	**2**
19	Between Brisco and Spilli	50.848144, -116.328021	**20**
20	Between Brisco and Spilli	50.856804, -116.322856	**1**
21	Between Brisco and Spilli	50.85742, -116.327749	**8**
22	Between Brisco and Spilli	50.860879, -116.333957	**8**
23	Between Brisco and Spilli	50.86207, -116.34199	**8**
24	Between Brisco and Spilli	50.867366, -116.345842	**6**
25	Between Brisco and Spilli	50.870026, -116.352824	**18**
26	Between Brisco and Spilli	50.876777, -116.349930	**3**
27	Between Brisco and Spilli	50.882343, -116.353972	**2**
28	Between Brisco and Spilli	50.874585, -116.356387	**19**
29	South of Spilli	50.89370, -116.37364	**2**
30	North of Spilli	50.90799, -116.38042	**70**
31	Between Spilli north and Parson xing	50.92924, -116.40125	**14**
32	Between Spilli north and Parson xing	50.93484, -116.41024	**80**
33	Between Spilli north and Parson xing	50.95246, -116.42197	**70**
34	Between Spilli north and Parson xing	50.959371, -116.443575	**8**
35	Between Spilli north and Parson xing	50.97234, -116.45929	**25**
36	Between Spilli north and Parson xing	50.98804, -116.47938	**10**
37	Between Spilli north and Parson xing	51.00530, -116.51034	**2**
38	Between Spilli north and Parson xing	51.03102, -116.57530	**16**
39	Between Spilli north and Parson xing	51.03230, -116.57687	**12**
40	Between Spilli north and Parson xing	51.03763, -116.58501	**2**
41	Between Spilli north and Parson xing	51.04309, -116.59946	**2**

42	Beaver Lk	51.08055, -116.66619	**2**
43		51.13205, -116.76406	**12**
44	Birchlands Creek West	51.15237, -116.80993	**2**
45	Mulligan's Slough	51.19596, -116.88343	**30**
46	Horse Creek	51.21003, -116.89789	**5**
47	Habart	51.26097, -116.93491	**7**
48	Moberly Marsh	51.38687, -117.04053	**2**
49	Lake Windermere - Westside	50.45837, -116.01331	**6**
50	Ruault Rd	50.43819, -115.97233	**4**
51		50.43819, -115.97233	**2**
52		50.39599, -115.91334	**2**
53		50.39135, -115.91142	**1**
54		50.381941, -115.913104	**21**
55		50.37173, -115.89536	**8**
56	Between Columbia & Windermere Lks	50.366985, -115.892838	**21**
57	Between Columbia & Windermere Lks	50.35818, -115.88501	**35**
58		50.35517, -115.893627	**7**
59		50.34779, -115.87741	**5**
	TOTAL SWAN COUNT		**756**

Appendix 7. List of training, communications and outreach activities in 2016.

Bird watching field trips for elementary students:

- April 8th - Bird Watching Fieldtrip for Grade 5/6 Aboriginal students from Lady Grey Elementary - 16 students.
- April 18th- Two birdwatching fieldtrips for Grades 4-6 in Canal Flats – 27 students & 18 students respectively.
- April 20th - Bird watching fieldtrip for Grade 6's at Wilmer NWA – 16 students
- May 15th-June 15th – Bird watching fieldtrips given to six elementary classes in Golden – 110 students

Communications

- Three press releases (PR) were drafted for circulation by local newspapers, regional online newsletters, and social media.
- "Survey Results Records Nearly 26,000 birds!' on Columbia Basin Environmental Educators Network (CBEEN) website: http://cbeen.ca/spring-survey-results-record-nearly-26000-birds/
- 'Columbia Wetlands Waterbird Survey Spring Survey Results' posted on Columbia Basin Watershed Network (CBWN) website and in their 'Columbia Basin News' newsletter: http://cbwn.ca/www/columbia-wetlands-waterbird-survey-spring-survey-results/
- Several CWWS related newsworthy events were posted on the Kootenay Conservation Program (KCP) online newsletter.
- March 16 – PR printed in The Golden Star – "Survey seeking support from Golden birders to help collect data.
- March 18 – PR printed in The Columbia Valley Pioneer – "Wetlands survey recruiting"
- July 6 –PR printed in The Golden Star newspaper– 'Survey got 77 local volunteers to help'
- September 14 –Interview with The Golden Star printed– "Fall waterbird survey hoping to exceed 40,000 count from last year'
- 'November 23 – PR printed in The Valley Echo newspaper – "Waterbird survey results are in – citizen-scientists record more than 51,000 birds!"
- CWWS Spring results' up on Wildsight Golden facebook page with 945 people reached as of June 29, 2016.
- Numerous other facebook posts made about the CWWS and volunteer opportunities.
- CWWS brochure was created in spring 2016. 500 copies were printed and distributed at all events, presentations and in locations spread throughout the Columbia Valley.
- We wrote a magazine article that was printed in Photonews Magazine in April; circulation of over 15,000.
- Ongoing updates to the CWWS webpage hosted on the Wildsight website.
- Three posters developed and distributed for spring waterbird surveys, fall surveys and for the birding fieldtrip that we offered in the late spring to community members.

Training Sessions

- March 14 – Spring CWWS Training Module in Golden - 9 people in attendance.

- March 21 – Spring CWWS Training Module in Invermere – 18 people in attendance.
- March 30 - Field Training for waterbird ID skills and surveying/scope skills: 2 hr Session at Wilmer NWA for 9 CWWS volunteers.
- April 1 -Field Training session for CWWS participants teaching waterbird ID skills and surveying/scope skills at Reflection Lake - 6 people in attendance.
- September 21 – Fall CWWS Training Module in Golden – 14 people in attendance.
- September 22 – Fall CWWS Training Module in Invermere – 11 people in attendance.

Community Presentations

- March 2 - Wildsight Golden AGM – summary presentation on CWWS project – 35 people.
- April 9 - CWWS Potluck and Slideshow - update to CWWS participants at potluck gathering in Parson at volunteer's home- 15 people in attendance.
- April 27 - Presentation to Akisqnuk First Nations to explain CWWS and request permission to access the southeast end of Lake Windermere for waterbird surveys – 4 people.
- May 3 – Windermere District Farmers Institute – 21 attendees.
- May 9- Wings Over the Rockies at Reflection Lake - field trip – 2 attendees.
- May 14 – Wetlandkeepers Workshop ('Map the Marshes') in Golden -24 attendees.
- May 17 – RDEK Area's F & G Directors and Local Advisory Committee; presentation made to request grant in aid – 15 attendees.
- May 19 – Windermere Rod and Gun Club – 18 attendees.
- May 26 – Columbia Wetlands Stewardship Partners AGM – 22 attendees.
- August 31 – Attended a School District 6 Environmental Education Meet and Greet at the Invermere Community Greenhouse. Spoke with two elementary school teachers whom were keen to potentially get their students involved with the CWWS this fall.
- October 19 - Presentation to College of the Rockies (COTR) students (Golden campus) about the CWWS, the ecological significance of the Columbia Wetlands and about the potential for erecting an interpretive boardwalk in the Columbia Wetlands. A boardwalk would help to build low-impact infrastructure ahead of IBA recognition that will bring more tourists to the region looking for birding opportunities – 22 students.
- October 24 – Field trip with COTR students in Parson area, to explore ecological aspects of the wetlands for ideas for interpretive signage on a Columbia Wetlands Interpretive Boardwalk– 22 students.
- November 28 – Working with COTR students. They have developed interpretive signage and they presented on their signs – 22 students.

Events

- May 14- Attended keynote presentation at Wings Over the Rockies birding festival with CWWS booth/table – dozens of people came up to booth.
- May 22 & July 9 – Golden Farmers Market – dozens of people came to booth.
- July 23 - Invermere Valley Appreciation Day- 8 people signed up on volunteer list, several people picked up brochures, and talked to about five more people about the project.
- June 26 –Birding Fieldtrip for community residents at Edelweiss Slough – 4 people.
- September 10 – Salmon Festival in Invermere – dozens of people.

Appendix 8. CWWS summarized data from spring 2017 surveys.

Species Name	03-Apr Species Count	03-Apr Sample Size	10-Apr Species Count	10-Apr Sample Size	16-Apr Species Count	16-Apr Sample Size
Snow Goose	17	2	10	2	53	6
Canada Goose	1,240	80	956	79	811	74
Trumpeter Swan	72	12	69	13	57	18
Tundra Swan	14	5	8	2	15	2
Trumpeter/Tundra Swan	316	22	94	18	38	12
Wood Duck	7	4	63	14	36	12
Cinnamon Teal			--		2	1
Northern Shoveler	11	5	43	9	18	3
American Wigeon	1,324	36	1,226	29	1,376	23
Mallard	1,820	65	1,225	73	1,342	71
Northern Pintail	75	9	122	9	41	5
Green-winged Teal	66	9	197	15	392	17
dabbling duck sp.	186	6	156	6	129	7
Canvasback					15	2
Redhead	4	1	17	2	10	3
Ring-necked Duck	98	9	321	18	298	25
Lesser Scaup	66	5	8	3	49	9
Greater/Lesser Scaup	3	1	91	7	5	1
Bufflehead	58	17	125	33	291	39
Common Goldeneye	297	25	230	35	199	40
Barrow's Goldeneye	32	4	18	6	7	2
Common/Barrow's Goldeneye	8	1	5	2	2	1
Hooded Merganser	55	13	137	27	123	31
Common Merganser	456	25	255	31	181	29
Red-breasted Merganser			--		4	1
merganser sp.			--		5	1
Ruddy Duck			--		1	1
duck sp.	268	11	304	6	732	10
waterfowl sp.	296	7	383	11	397	11

Ruffed Grouse	3	2	3	3	4	3
grouse sp.			1	1	1	1
Common Loon	10	5	9	7	24	14
Pied-billed Grebe	8	4	9	7	15	9
Red-necked Grebe	1	1	2	1	50	11
grebe sp.					1	1
Great Blue Heron	15	4	40	10	36	10
Turkey Vulture	1	1	6	4	1	1
Osprey	4	2	29	17	28	18
Golden Eagle			1	1	--	
Northern Harrier	2	2	5	5	6	5
Bald Eagle	63	31	76	38	62	26
Red-tailed Hawk	6	6	10	8	9	6
hawk sp.	2	2	3	2	2	2
Sora					1	1
American Coot	273	3	360	9	2,226	19
Sandhill Crane	5	3	6	4	6	4
Killdeer	7	4	11	9	12	9
Wilson's Snipe					2	1
Greater Yellowlegs			2	1	--	
shorebird sp.	1	1				
Ring-billed Gull	35	2	18	2	10	3
California Gull	1	1	6	1	--	
gull sp.	2	2	53	6	40	5
Great Horned Owl			1	1	1	1
Great Gray Owl					1	1
Barred Owl	1	1				
Belted Kingfisher			3	3	5	5
Red-naped Sapsucker			2	2	6	3
Downy Woodpecker	1	1	1	1	4	3
Northern Flicker	45	27	62	30	60	29
Pileated Woodpecker	12	7	8	4	7	4

woodpecker sp.	1	1	--		2	2
Merlin	2	2	3	1	--	
Say's Phoebe	1	1				
Northern Shrike	1	1	1	1		
Gray Jay			1	1	1	1
Blue Jay			1	1	26	16
Black-billed Magpie	31	13	29	12	137	32
American Crow	127	35	170	29	54	20
Common Raven	57	19	39	17	21	2
Northern Rough-winged Swallow			--		126	14
Tree Swallow	60	6	104	10	10	4
Violet-green Swallow	160	1	35	4	4	1
Tree/Violet-green Swallow	6	1	7	1	40	6
swallow sp.	35	2	146	5	25	10
Black-capped Chickadee	36	14	27	7	14	7
Mountain Chickadee	11	7	9	5	20	8
chickadee sp.	18	5	11	5	38	20
Red-breasted Nuthatch	40	21	35	19		
Pacific Wren	1	1				
Marsh Wren			6	4	9	5
Golden-crowned Kinglet	1	1				
Ruby-crowned Kinglet	3	3	7	2	26	11
kinglet sp.	5	1	3	1	--	
Western Bluebird	7	1				
Mountain Bluebird	21	7	8	4	9	4
bluebird sp.	1	1				
Townsend's Solitaire	3	2				
American Robin	73	29	79	32	79	24
Varied Thrush			4	4	2	1
European Starling	70	1	2	1	19	1
American Pipit					4	2
Yellow-rumped Warbler			2	2	5	3

Townsend's Warbler					1	1
American Tree Sparrow			3	2	--	
Dark-eyed Junco	31	15	29	11	28	14
Savannah Sparrow			1	1	--	
Song Sparrow	78	33	93	31	104	30
Lincoln's Sparrow					2	1
sparrow sp.	2	1			2	1
Yellow-headed Blackbird					2	2
Western Meadowlark	4	4	10	8	10	10
Red-winged Blackbird	121	30	193	35	172	38
Brewer's Blackbird			2	1	5	2
blackbird sp.			2	1	--	
Pine Grosbeak	1	1				
House Finch	2	1	2	1		
Red Crossbill	5	1	--		2	1
Pine Siskin	25	6	9	3	15	3
passerine sp.	5	3	6	3	5	1

Appendix 9. CWWS summarized data from fall 2017 surveys.

Species Name	29-Sep Species Count	29-Sep Sample Size	05-Oct Species Count	05-Oct Sample Size	15-Oct Species Count	15-Oct Sample Size
Snow Goose	--		4	1	1	1
Cackling Goose	5	1	--	--	--	--
Greater White-fronted Goose	--	--	--	--	5	1
Canada Goose	1,408	45	1,586	58	1,409	42
goose sp.	--	--	--	--	148	2
Trumpeter Swan	38	10	35	9	20	6
Tundra Swan	--	--	--	--	6	2
Trumpeter/Tundra Swan	65	11	50	11	78	9
Wood Duck	23	6	13	7	5	2
Blue-winged Teal	7	3	1	1	24	2
Cinnamon Teal	--	--	2	1	--	--
Blue-winged/Cinnamon Teal	5	1	--	--	1	1
Northern Shoveler	4	2	--	--	2	1
Gadwall	114	4	4	2	2	1
American Wigeon	1,962	28	3,199	37	4,359	36
Mallard	1,460	58	1,839	60	2,664	63
Northern Pintail	27	4	100	6	4	2
Green-winged Teal	486	8	667	13	650	14
teal sp.	6	1	4	1	1	1
dabbling duck sp.	1,406	14	1,581	19	1,315	20
Canvasback	7	2	7	1	--	--
Redhead	--		2	1	--	--
Ring-necked Duck	127	14	289	12	163	9
Greater Scaup	--		3	1	12	2
Lesser Scaup	57	5	23	3	12	2
Greater/Lesser Scaup	5	2	15	4	16	1
Bufflehead	24	10	16	9	32	9
Common Goldeneye	50	12	55	10	58	11

Barrow's Goldeneye	15	2	8	2	14	2		
Common/Barrow's Goldeneye	--		2	1	2	1		
Hooded Merganser	100	14	199	20	124	22		
Common Merganser	37	11	96	12	87	14		
Red-breasted Merganser	--	--	1	1	--	--		
merganser sp.	6	2	--	--	--	--		
Ruddy Duck	--		1	1	--	--		
duck sp.	3,364	24	2,331	17	1,384	13		
waterfowl sp.	233	13	769	6	93	5		
Ruffed Grouse	--	--	2	2	--	--		
Spruce Grouse	1	1	--	--	--	--		
Common Loon	2	2	13	7	2	1		
Pied-billed Grebe	40	14	80	21	11	4		
Horned Grebe	6	3	13	3	--	--		
Red-necked Grebe	20	10	8	6	15	9		
Eared Grebe	--	--	--	--	1	1		
Horned/Eared Grebe	1	1	1	1	10	4		
Western Grebe	5	2	13	5	44	5		
grebe sp.	52	14	16	6	20	4		
Great Blue Heron	43	16	23	10	40	12		
Turkey Vulture	1	1	--	--	--	--		
Osprey	8	6	5	5	--	--		
Northern Harrier	16	13	10	8	21	17		
Sharp-shinned Hawk	--		3	3	--	--		
Bald Eagle	24	18	32	24	21	16		
Red-tailed Hawk	3	3	3	3	1	1		
Rough-legged Hawk	--		1	1	6	5		
hawk sp.	2	2	1	1	4	2		
American Coot	5,070	10	2,556	11	3,965	17		
Killdeer	--		2	1	--	--		
Long-billed Curlew	1	1	--	--	--	--		
Pectoral Sandpiper	--	--	1	1	11	1		

Semipalmated Plover	--		--		--		--		5	1
Long-billed Dowitcher		52		3		58		2	109	3
Greater/Lesser Yellowlegs	--		--		--		--		9	1
Wilson's Snipe		2		1		3		2	--	--
shorebird sp.		80		4		34		1	4	1
Ring-billed Gull		29		6		115		5	201	8
California Gull		20		2		7		1	8	2
Herring Gull		2		1	--				8	3
gull sp.		45		12		81		18	85	13
Belted Kingfisher		8		7		12		10	1	1
Downy Woodpecker	--					1		1	--	--
Hairy Woodpecker		1		1	--				--	--
Northern Flicker		8		7		24		20	7	7
Pileated Woodpecker		2		2		5		4	2	2
woodpecker sp.		1		1		1		1	--	--
Merlin		3		3	--				2	2
Peregrine Falcon		1		1	--		--		--	--
Steller's Jay		1		1		2		2	2	1
Black-billed Magpie		19		14		24		17	18	11
Clark's Nutcracker		1		1	--				--	--
American Crow		117		16		79		11	74	13
Common Raven		24		11		58		18	33	16
Black-capped Chickadee		22		6		24		9	24	6
Mountain Chickadee		3		1		1		1	--	--
chickadee sp.		14		7		8		4	1	1
Red-breasted Nuthatch		11		8		20		13	--	--
Brown Creeper	--					2		1	--	--
Marsh Wren		5		4		6		3	2	1
Ruby-crowned Kinglet		1		1		3		2	--	--
Townsend's Solitaire		15		8		24		11	5	4
American Robin		17		6		15		5	--	--
European Starling		15		1		28		2	--	--

Cedar Waxwing	4	1	--		--		--	
Common Yellowthroat	--		5	1	--		--	
Yellow-rumped Warbler	3	2	2	2	--		--	
warbler sp. (Parulidae sp.)	1	1	--		--		--	
American Tree Sparrow	--		2	1	--		--	
American Pipit	--	--	--		--	2		1
Lapland Longspur	--	--	--		--	10		1
Dark-eyed Junco	3	2	7	4		2		1
White-crowned Sparrow	--	--	8	5		2		1
White-throated Sparrow	--	--	--		--	2		1
Song Sparrow	6	4	20	8		3		2
Lincoln's Sparrow	--	--	1	1		1		1
Swamp Sparrow	--	--	1	1	--		--	
sparrow sp.	--	--	6	3	--		--	
Red-winged Blackbird	2	2	45	3		1		1
House Finch	2	1	2	1	--		--	
Pine Siskin	4	1	9	3	--		--	
passerine sp.	2	2	3	2		15		1

Appendix 10. Aerial Swan Survey Data from March 26, 2017

Location Name	Easting	Northing	# of Adults
South of Golden	503390	5679888	**2**
Between Nicholson and Horse Creek Confluence	506897	5674693	**2**
Horse Creek Confluence area	506832	5673142	**2**
Mulligan's Slough	508166	5671269	**1**
Mulligan's Slough	508648	5670646	**1**
between Mulligan's and Birchlands	509689	5669560	**2**
between Mulligan's and Birchlands	510792	5668629	**3**
between Mulligan's and Birchlands	511056	5668408	**2**
Between Beaver Lake and Braisher's Slough	519661	5661520	**10**
Castledale North area	530655	5652943	**2**
West of Harrogate old barns	539038	5645712	**2**
West of Harrogate old barns	539631	5644975	**7**
West of Harrogate old barns	539788	5644775	**2**
West of Spilli 2 km north	542033	5641593	**2**
West of Spilli 2 km north	542347	5641144	**30**
West of Spilli 2 km north	542479	5640951	**4**
West of Spilli Crossing	543229	5639975	**2**
West of Spilli Crossing	543424	5639556	**35**
West of Spilli Crossing	543967	5638643	**14**
Between Spilli and Brisco	545679	5636125	**2**
Between Spilli and Brisco	545959	5635636	**21**
Between Spilli and Brisco	546906	5634455	**2**
Between Spilli and Brisco	547260	5634054	**4**
Between Spilli and Brisco	547307	5634002	**2**
Between Spilli and Brisco	547564	5633708	**1**
Between Spilli and Brisco	547617	5633649	**4**
Between Spilli and Brisco	548947	5631972	**2**
Trecher's Slough area	550084	5630528	**11**
North of Luxor Station	554521	5624453	**3**
NCC Luxor area	556290	5621500	**8**
North of Edgewater	557325	5619886	**21**
Between Edgewater and Radium	560814	5615276	**2**
Between Edgewater and Radium	561477	5614333	**5**
Between Edgewater and Radium	562447	5612481	**2**
Just north of Red Rock Lookout	562983	5610952	**2**
Just north of Red Rock Lookout	563143	5610550	**39**
Just north of Red Rock Lookout	563232	5610396	**30**
Just north of Red Rock Lookout	563467	5609667	**75**
Northwest of Dry Gulch	565349	5604417	**5**
North of Richies Point	566945	5602052	**2**

North of Richies Point	567028	5601679	**28**
South of Richies Point	566389	5600380	**90**
South of Richies Point	567441	5599080	**18**
James Chabot Park Area	569437	5595554	**2**
Lake Windermere	573408	5587508	**2**
Lake Windermere	574314	5586534	**3**
Lake Windermere	575569	5585166	**5**
Lake Windermere	576055	5584407	**5**
Wetlands between lakes Windermere/Columbia	576623	5583887	**4**
Wetlands between lakes Windermere/Columbia	576791	5583765	**5**
Wetlands between lakes Windermere/Columbia	577885	5581860	**15**
Wetlands between lakes Windermere/Columbia	578130	5581345	**18**
Wetlands between lakes Windermere/Columbia	578521	5580801	**36**
Wetlands between lakes Windermere/Columbia	578910	5580019	**6**
Wetlands between lakes Windermere/Columbia	579502	5578492	**10**
Wetlands between lakes Windermere/Columbia	579627	5578080	**2**
South end Columbia Lk	582702	5558339	**2**
McMurdo Slough	515546	5665967	**2**
		TOTAL	**621**

Appendix 11. Aerial Bird Migration Survey from October 8, 2017

GPS coordinates	Side of Helicopter	Flock size	Species
0505236; 5677957	right	30	waterfowl sp.
0507257; 5673407	right	300	waterfowl sp.
0509486; 5670483	right	260	waterfowl sp.
0509486; 5670483	right	2	tundra/trumpeter swan sp.
0509950; 5669886	right	54	waterfowl sp.
0509950; 5669886	right	12	canada goose
0510008; 5669812	right	30	canada goose
0510743; 5669151	right	15	waterfowl sp.
0511188; 5668827	right	290	waterfowl sp.
0511658; 5668472	right	600	waterfowl sp.
0511658; 5668472	right	30	canada goose
0512247; 5667961	right	41	waterfowl sp.
0517071; 5664318	right	38	waterfowl sp.
0517071; 5664318	right	2	gull sp.
0517461; 5663948	right	30	waterfowl sp.
0518201; 5663373	right	119	waterfowl sp.
0519116; 5662275	right	1	bald eagle
0519116; 5662275	right	1	gull sp.
0519655; 5661772	right	200	waterfowl sp.
0520702; 5660821	right	30	canada goose
0521789; 5659697	right	130	waterfowl sp.
0523742; 5658339	right	12	waterfowl sp.
0525182; 5657282	right	68	waterfowl sp.
0525982; 5656438	right	1	king fisher
0526534; 5655873	right	325	waterfowl sp.
0527313; 5655189	right	360	waterfowl sp.
0527313; 5655189	right	2	tundra/trumpeter swan sp.
0528122; 5654641	right	10	waterfowl sp.
0528122; 5654641	right	6	tundra/trumpeter swan sp.
0528474; 5654410	right	10	waterfowl sp.
0528474; 5654410	right	21	tundra/trumpeter swan sp.
0529035; 5653861	right	18	canada goose
0529324; 5653664	right	145	waterfowl sp.
0529698; 5653361	right	10	canada goose

0529698; 5653361	right	7	waterfowl sp.
0530011; 5653154	right	8	waterfowl sp.
0530787; 5652645	right	15	diving ducks
0531544; 5652212	right	2	waterfowl sp.
0532303; 5651745	right	30	canada goose
0532303; 5651745	right	8	waterfowl sp.
0532778; 5651419	right	13	duck sp.
0533121; 5651198	right	160	duck sp.
0533973; 5650641	right	11	waterfowl sp.
0534284; 5650475	right	3	waterfowl sp.
0534610; 5650274	right	15	waterfowl sp.
0534891; 5650038	right	1	king fisher
0535872; 5649240	right	8	waterfowl sp.
0536078; 5649052	right	9	waterfowl sp.
0537108; 5647992	right	250	duck sp.
0537668; 5647353	right	18	waterfowl sp.
0538067; 5646899	right	4	waterfowl sp.
0538301; 5646601	right	33	waterfowl sp.
0538934; 5645876	right	20	waterfowl sp.
0540980; 5643001	right	1	hawk sp.
0541305; 5642500	right	60	waterfowl sp.
0541305; 5642500	right	3	tundra/trumpeter swan sp.
0541305; 5642500	right	5	gull sp.
0541943; 5641282	right	1	waterfowl sp.
0542031; 5641144	right	1	gull sp.
0543536; 5638908	right	20	waterfowl sp.
0543809; 5638565	right	10	waterfowl sp.
0544054; 5638221	right	200	waterfowl sp.
0544476; 5637655	right	25	waterfowl sp.
0544900; 5637011	right	11	waterfowl sp.
0548413; 5632536	right	25	canada goose
0548413; 5632536	right	5	waterfowl sp.
0549069; 5631723	right	0	waterfowl sp.
0550164; 5630379	right	5	waterfowl sp.
0550471; 5630051	right	15	waterfowl sp.
0551382; 5628739	right	1	bald eagle
0551504; 5628604	right	20	waterfowl sp.
0551731; 5628343	right	30	waterfowl sp.
0552525; 5637311	right	20	waterfowl sp.
0552782; 5627002	right	25	peep sp.
0553295; 5626426	right	25	waterfowl sp.
0553295; 5626426	right	80	canada goose
0554301; 5624984	right	8	waterfowl sp.

0555152; 5623670	right	200	waterfowl sp.
0555478; 5623074	right	40	waterfowl sp.
0556064; 5621995	right	1	bald eagle
0556174;5621758	right	98	gull sp.
0556309; 5621519	right	1	great blue heron
0556309; 5621519	right	1	gull sp.
0556309;5621519	right	20	waterfowl sp.
0556860; 5620634	right	1	bald eagle
0556860; 5620634	right	15	waterfowl sp.
0557579; 5619618	right	5	waterfowl sp.
0557579; 5619618	right	1	gull sp.
0559095; 5617502	right	7	canada goose
0559095; 5617502	right	1	waterfowl sp.
0560475; 5615706	right	14	waterfowl sp.
0562066; 5613275	right	2	waterfowl sp.
0562406; 5612640	right	3	tundra/trumpeter swan sp.
0562575; 5612235	right	30	canada goose
0562575; 5612235	right	6	waterfowl sp.
0562988; 5611336	right	6	waterfowl sp.
0563116; 5611026	right	20	waterfowl sp.
0563228; 5610652	right	10	waterfowl sp.
0563326; 5610336	right	40	waterfowl sp.
0563392; 5610109	right	30	waterfowl sp.
0504084; 5679548	left	2	tundra/trumpeter swan sp.
0506532; 5675616	left	4	waterfowl sp.
0508706;5671256	left	14	waterfowl sp.
0510763; 5669136	left	20	waterfowl sp.
0511224; 5668800	left	20	canada goose
0515385; 5665429	left	1	tundra/trumpeter swan sp.
0517297; 5664111	left	10	waterfowl sp.
0517788; 5663667	left	10	waterfowl sp.
0519404; 5662007	left	10	waterfowl sp.
0520408; 5661097	left	6	waterfowl sp.
0520876; 5660657	left	4	waterfowl sp.
0521232; 5660271	left	3	waterfowl sp.
0521457; 5660021	left	8	waterfowl sp.
0522800; 5658991	left	3	canada goose
0522800; 5658991	left	2	waterfowl sp.
0523193; 5658712	left	2	waterfowl sp.
0524632; 5657698	left	10	waterfowl sp.
0525262; 5657209	left	1	waterfowl sp.

0525481; 5656826	left	4	waterfowl sp.
0525875; 5656510	left	20	waterfowl sp.
0526098; 5656355	left	12	waterfowl sp.
0526526; 5655874	left	20	waterfowl sp.
0527272; 5655229	left	2	waterfowl sp.
0527599; 5654971	left	8	waterfowl sp.
0527640; 5654940	left	6	waterfowl sp.
0527933; 5654758	left	2	waterfowl sp.
0528373; 5654478	left	16	waterfowl sp.
0528836; 5654007	left	11	waterfowl sp.
0528836; 5654007	left	4	mallard
0529020; 5653873	left	29	waterfowl sp.
0529020; 5653873	left	7	mallard
0529907; 5653222	left	20	waterfowl sp.
0530215; 5653018	left	30	waterfowl sp.
0530364; 5652932	left	22	waterfowl sp.
0530603; 5652771	left	30	waterfowl sp.
0531115; 5652463	left	5	waterfowl sp.
0531405; 5652296	left	12	waterfowl sp.
0531507; 5652232	left	18	waterfowl sp.
0532064; 5651896	left	7	waterfowl sp.
0532278; 5651767	left	5	waterfowl sp.
0532759; 5651431	left	20	waterfowl sp.
0533009; 5651264	left	4	waterfowl sp.
0533581; 5650879	left	**1**	waterfowl sp.
0534358; 5650429	left	40	waterfowl sp.
0535197; 5649773	left	1	hawk sp.
0535568; 5649470	left	49	waterfowl sp.
0536192; 5648943	left	1	waterfowl sp.
0536870; 5648261	left	5	waterfowl sp.
0537116; 5647985	left	10	waterfowl sp.
0537191; 5647903	left	30	waterfowl sp.
0537867; 5647142	left	10	waterfowl sp.
0537978; 5647011	left	2	canada goose
0537978; 5647011	left	29	waterfowl sp.
0538335; 5646564	left	10	waterfowl sp.
0538481; 5646369	left	36	waterfowl sp.
0538875; 5645949	left	46	waterfowl sp.
0539599; 5645060	left	4	waterfowl sp.
0539754; 5644883	left	3	waterfowl sp.
0540093; 5644451	left	9	tundra/trumpeter swan sp.
0541163; 5642764	left	29	waterfowl sp.
0543652; 5638767	left	7	waterfowl sp.

0543847; 5638521	left	2	waterfowl sp.
0544077; 5638198	left	1	waterfowl sp.
0544680; 5637329	left	85	waterfowl sp.
0544951; 5636954	left	1	bald eagle
0545338; 5636445	left	69	waterfowl sp.
0547542; 5633681	left	40	waterfowl sp.
0547793; 5633274	left	14	waterfowl sp.
0547995; 5633023	left	20	waterfowl sp.
0548296; 5632677	left	6	tundra/trumpeter swan sp.
0548610; 5632300	left	20	waterfowl sp.
0548890; 5631947	left	15	waterfowl sp.
0549126; 5631651	left	50	waterfowl sp.
0549296; 5631411	left	30	waterfowl sp.
0550520; 5629999	left	20	waterfowl sp.
0550959; 5629363	left	30	waterfowl sp.
0551115; 5629135	left	50	waterfowl sp.
0551293; 5628876	left	220	waterfowl sp.
0551293; 5628876	left	2	tundra/trumpeter swan sp.
0551887; 5628158	left	2	waterfowl sp.
0552070; 5627915	left	20	waterfowl sp.
0552273; 5627649	left	10	waterfowl sp.
0553887; 5625599	left	9	waterfowl sp.
0554017; 5625409	left	30	waterfowl sp.
0554348; 5624928	left	30	waterfowl sp.
0554625; 5624535	left	80	waterfowl sp.
0554846; 5624190	left	5	tundra/trumpeter swan sp.
0554846; 5624190	left	20	waterfowl sp.
0554999; 5623933	left	50	waterfowl sp.
0555206; 5623592	left	30	waterfowl sp.
0555943; 5622334	left	5	bald eagle
0556364; 5621449	left	10	bald eagle
0556579; 5621116	left	20	waterfowl sp.
0557189; 5620150	left	40	waterfowl sp.
0557189; 5620150	left	1	gull sp.
0557498; 5619728	left	60	waterfowl sp.
0557498; 5619728	left	1	great blue heron
0557929; 5619129	left	15	gull sp.
0558334; 5618542	left	8	canada goose
0558507; 5618290	left	10	waterfowl sp.
0558688; 5618048	left	7	waterfowl sp.
0558930; 5617734	left	5	waterfowl sp.

0559591; 5616819	left	3	waterfowl sp.
0560327; 5615908	left	2	waterfowl sp.
0560744; 5615385	left	30	waterfowl sp.
0561155; 5614785	left	40	waterfowl sp.
0562073; 5613276	left	10	waterfowl sp.
0562351; 5612771	left	25	waterfowl sp.
0562575; 5612265	left	17	canada goose
0562575; 5612265	left	2	mallard
0562929; 5611470	left	5	canada goose
0563056; 5611196	left	20	waterfowl sp.
0563187; 5610828	left	15	waterfowl sp.
0563325; 5610371	left	10	waterfowl sp.
0563364; 5610224	left	50	waterfowl sp.
0563438; 5609964	left	52	waterfowl sp.
	TOTAL	**7156**	

Appendix 12. List of training, communications and outreach activities in 2017.

CWWS Presentations, Training Module and Birding Field Trip Delivery

- March 2– Regional District of East Kootenay Planning and Development Committee meeting in Cranbrook - 35 attendees
- March 10 – Wildsight Golden AGM – Presented on the CWWS project – 30 attendees
- March 23 – Delivered the CWWS Training Module in Invermere – 10 participants.
- March 25 – CWWS Field Training Module for Bird ID and protocol training at Wilmer National Wildlife Area – 13 participants
- March 27 – CWWS Training Module in Golden – 10 participants
- April 1 – CWWS Field Training for Bird ID and protocol training at Reflection Lake and Edelweiss Slough – 12 participants
- May 13 – CWWS Birding Fieldtrip at Edelweiss Slough (Golden) followed by Birding Breakfast at Reflection Lake in Golden – 14 participants
- May 13 – CWWS Event Booth at Wings Over the Rockies Gala event in Inveremere– dozens of visitors
- May 15 – 'Wild Voices for Kids' birding fieldtrip at Wilmer National Wildlife Area – 17 students from Kimberly grades 3-4
- May 25 – 'Wild Voices for Kids' birding fieldtrip at Dorothy Lake, Invermere – 19 Kindergarten students from Windermere
- May 25 – 'Wild Voices for Kids' birding fieldtrip at Dorothy Lake, Invermere – 21 Kindergarten students from Invermere
- June 21 – CWWS booth at the Golden Farmer's Market
- June 23 – Bird walk and ID training at Reflection Lake, Golden – 5 participants
- Ongoing - Time spent promoting and coordinating CWWS migratory bird surveys in spring/fall through social media, posters, emails – 110 volunteers total on 2017 CWWS
- September 9 – CWWS booth at the Golden Fall Faire
- September 13 – Presentation on the CWWS to the Akisqnuk First Nations Chief and Council – 8 people
- September 13 – Presentation to the Village of Radium Town Council – 7 people
- September 27 – Presentation to BC Wildlife Federation Wetlands Institute class/fieldtrip – 22 people
- September 30 – Fieldtrip to Columbia National Wildlife Area with school-aged home learning group from Golden – 24 people

CWWS Printed Press Releases

- March 16, 2017 – Columbia Valley Pioneer newspaper - Columbia Wetlands Waterbird Survey Seeking volunteers -
- March-May – Wings Over the Rockies – Columbia Wetlands Waterbird Survey
- May 25, 2017 – The Golden Star newspaper– "Late spring didn't slow down local bird survey.'

- June 1, 2017 – Columbia Valley Pioneer Newspaper - "800 More Birds counted in Spring survey. Wildsight's Columbia Wetlands Waterbird Survey came off with great success and with lots of birds."
- August 1, 2017 – KCP newsletter Project feature article about the CWWS
- September 7, 2017 – Columbia Valley Pioneer Newspaper – "Calling all birders – Join the fun and conservation effort of the Waterbird Survey"
- September 14, 2017 – Columbia Valley Pioneer Newspaper – "Local wildlife work undertaken thanks for conservation fund"

Additional communications

- Developed, printed and distributed a CWWS 4-page newsletter that speaks to the project and helps raise awareness around bird conservation issues, i.e. bird collisions with windows, hummingbird feeders and importance of regular cleaning. Printed 30 copies for distribution at events/presentations.
- Poster creation and distribution for three CWWS posters regarding: spring and fall survey dates, as well as two dates for two CWWS-led birding walks.
- Printed and distributed 500 CWWS brochures that were designed in 2016. This was a second printing.
- Ongoing updates to the CWWS webpage, ongoing social media updates and numerous emails to partners.

Appendix 13. Species-at-risk sighted during the CWWS, listed in order of occurrence from north to south.

Date	Easting	Northing	Species	English Species Name	Count	Survey Site
May 4/2015	496580	5695183	TUSW	Tundra Swan	2	Moberly Marsh/Gadsden Prov. Park
Oct 5/2015	496580	5695183	GBHE	Great Blue Heron	2	Moberly Marsh/Gadsden Prov. Park
Oct 15/2015	496580	5695183	GBHE	Great Blue Heron	2	Moberly Marsh/Gadsden Prov. Park
Apr 10/2017	496580	5695183	TUSW	Tundra Swan	1	Moberly Marsh/Gadsden Prov. Park
Oct 5/2017	496580	5695183	RLHA	Rough-legged Hawk	1	Moberly Marsh/Gadsden Prov. Park
Oct 15/2017	496580	5695183	RLHA	Rough-legged Hawk	2	Moberly Marsh/Gadsden Prov. Park
Oct 15/2017	496580	5695183	CAGU	California Gull	1	Moberly Marsh/Gadsden Prov. Park
Sept 29/2017	500832	5686525	LBCU	Long-billed Curlew	1	Private Lands - Hwy 1 - 1.5 km N of Golden
Oct 5/2015	501185	5685410	GBHE	Great Blue Heron	1	Golden--West Edelweiss
Apr 3/2016	501185	5685410	GBHE	Great Blue Heron	1	Golden--West Edelweiss
Apr 3/2017	501185	5685410	GBHE	Great Blue Heron	1	Golden--West Edelweiss
Apr 16/2017	501185	5685410	GBHE	Great Blue Heron	1	Golden--West Edelweiss
Oct 15/2017	501185	5685410	GBHE	Great Blue Heron	1	Golden--West Edelweiss
Apr 24/2015	501574	5685405	AMBI	American Bittern	1	Golden--Edelweiss
Oct 5/2015	501574	5685405	GBHE	Great Blue Heron	2	Golden--Edelweiss
Oct 15/2015	501574	5685405	GBHE	Great Blue Heron	2	Golden--Edelweiss
Oct 25/2015	501574	5685405	GBHE	Great Blue Heron	1	Golden--Edelweiss
Apr 16/2016	501574	5685405	GBHE	Great Blue Heron	3	Golden--Edelweiss
Apr 16/2016	501574	5685405	BARS	Barn Swallow	1	Golden--Edelweiss
Oct 5/2016	501574	5685405	GBHE	Great Blue Heron	7	Golden--Edelweiss
Apr 3/2017	501574	5685405	GBHE	Great Blue Heron	2	Golden--Edelweiss
Apr 16/2017	501574	5685405	GBHE	Great Blue Heron	1	Golden--Edelweiss
Sept 29/2017	501574	5685405	GBHE	Great Blue Heron	4	Golden--Edelweiss
Oct 5/2017	501574	5685405	GBHE	Great Blue Heron	1	Golden--Edelweiss
Oct 15/2017	501574	5685405	GBHE	Great Blue Heron	7	Golden--Edelweiss
Oct 25/2015	500804	5683907	GBHE	Great Blue Heron	1	Golden--lower Kicking Horse River
Oct 25/2015	500804	5683907	CAGU	California Gull	7	Golden--lower Kicking Horse River
Sept 29/2015	503730	5681520	GBHE	Great Blue Heron	4	Golden--Reflection Lake
Sept 29/2016	504423	5680523	GBHE	Great Blue Heron	7	Golden--Railway Pond
Oct 5/2016	504423	5680523	GBHE	Great Blue Heron	11	Golden--Railway Pond
Oct 15/2016	504423	5680523	GBHE	Great Blue Heron	3	Golden--Railway Pond
Sept 29/2016	505266	5678671	GBHE	Great Blue Heron	1	Golden--Habart's Subdivision
Oct 5/2016	505266	5678671	GBHE	Great Blue Heron	1	Golden--Habart's Subdivision
Apr 10/2017	505266	5678671	GBHE	Great Blue Heron	1	Golden--Habart's Subdivision
Sept 29/2016	503837	5677652	GBHE	Great Blue Heron	1	Nicholson-Bottom of Sander Road
Sept 29/2017	503837	5677652	GBHE	Great Blue Heron	1	Nicholson-Bottom of Sander Road
Apr 24/2015	506977	5673100	GBHE	Great Blue Heron	1	Columbia River--Horse Creek Confluence
Sept 29/2016	506977	5673100	GBHE	Great Blue Heron	1	Columbia River--Horse Creek Confluence
Oct 5/2016	506977	5673100	GBHE	Great Blue Heron	1	Columbia River--Horse Creek Confluence
May 4/2015	508664	5671813	GBHE	Great Blue Heron	1	Golden--9 mile Slough
Sept 29/2016	508664	5671813	EAGR	Eared Grebe	1	Golden--9 mile Slough
Sept 29/2016	508664	5671813	GBHE	Great Blue Heron	1	Golden--9 mile Slough

Oct 5/2016	508664	5671813	EAGR	Eared Grebe	1	Golden--9 mile Slough
Oct 5/2016	508664	5671813	GBHE	Great Blue Heron	1	Golden--9 mile Slough
Sept 29/2017	508664	5671813	GBHE	Great Blue Heron	4	Golden--9 mile Slough
Apr 10/2016	509634	5670883	TUSW	Tundra Swan	10	Section between 9 mile & Dickson Downs
Apr 24/2015	510956	5669473	GBHE	Great Blue Heron	3	Columbia Wetlands Hwy 95 Views 10-17 km S of Golden
Apr 29/2015	510956	5669473	GBHE	Great Blue Heron	1	Columbia Wetlands Hwy 95 Views 10-17 km S of Golden
May 4/2015	510956	5669473	GBHE	Great Blue Heron	1	Columbia Wetlands Hwy 95 Views 10-17 km S of Golden
May 4/2015	510956	5669473	BANS	Bank Swallow	5	Columbia Wetlands Hwy 95 Views 10-17 km S of Golden
Apr 16/2016	510956	5669473	GBHE	Great Blue Heron	1	Columbia Wetlands Hwy 95 Views 10-17 km S of Golden
Apr 10/2017	510956	5669473	GBHE	Great Blue Heron	2	Columbia Wetlands Hwy 95 Views 10-17 km S of Golden
Sept 29/2017	510956	5669473	GBHE	Great Blue Heron	2	Columbia Wetlands Hwy 95 Views 10-17 km S of Golden
2017-10-15	510956	5669473	EAGR	Eared Grebe	1	Columbia Wetlands Hwy 95 Views 10-17 km S of Golden
Apr 3/2016	513006	5668064	GBHE	Great Blue Heron	1	19 km south of Golden-Birchlands Slough
Apr 24/2015	507643	5670294	GBHE	Great Blue Heron	1	Golden-Mulligans Slough
May 4/2015	507643	5670294	GBHE	Great Blue Heron	1	Golden-Mulligans Slough
Oct 5/2015	507643	5670294	HOGR	Horned Grebe	1	Golden-Mulligans Slough
Apr 3/2016	507643	5670294	TUSW	Tundra Swan	24	Golden-Mulligans Slough
Sept 29/2016	507643	5670294	EAGR	Eared Grebe	1	Golden-Mulligans Slough
Sept 29/2016	507643	5670294	HOGR	Horned Grebe	26	Golden-Mulligans Slough
Oct 5/2016	507643	5670294	HOGR	Horned Grebe	6	Golden-Mulligans Slough
Oct 15/2016	507643	5670294	EAGR	Eared Grebe	15	Golden-Mulligans Slough
Oct 15/2016	507643	5670294	WEGR	Western Grebe	66	Golden-Mulligans Slough
Oct 5/2017	507643	5670294	WEGR	Western Grebe	3	Golden-Mulligans Slough
Oct 15/2017	507643	5670294	WEGR	Western Grebe	2	Golden-Mulligans Slough
Apr 3/2016	515652	5666148	CAGU	California Gull	1	Columbia Wetlands -- McMurdo seasonal lake
Sept 29/2016	515652	5666148	GBHE	Great Blue Heron	4	Columbia Wetlands -- McMurdo seasonal lake
Oct 15/2016	515652	5666148	GBHE	Great Blue Heron	3	Columbia Wetlands -- McMurdo seasonal lake
Apr 3/2017	515652	5666148	CAGU	California Gull	1	Columbia Wetlands -- McMurdo seasonal lake
Oct 15/2017	515652	5666148	RLHA	Rough-legged Hawk	1	Columbia Wetlands -- McMurdo seasonal lake
Apr 24/2015	517898	5664224	GBHE	Great Blue Heron	5	Beaver Lake
Apr 29/2015	517898	5664224	GBHE	Great Blue Heron	4	Beaver Lake
May 4/2015	517898	5664224	GBHE	Great Blue Heron	4	Beaver Lake
Oct 5/2015	517898	5664224	HOGR	Horned Grebe	2	Beaver Lake
Oct 5/2015	517898	5664224	GBHE	Great Blue Heron	3	Beaver Lake
Oct 15/2015	517898	5664224	HOGR	Horned Grebe	1	Beaver Lake
Sept 29/2016	517898	5664224	GBHE	Great Blue Heron	3	Beaver Lake
Oct 15/2016	517898	5664224	GBHE	Great Blue Heron	1	Beaver Lake
Sept 29/2017	517898	5664224	GBHE	Great Blue Heron	5	Beaver Lake
Oct 15/2017	517898	5664224	N/A	Horned/Eared Grebe	3	Beaver Lake
Oct 15/2017	517898	5664224	GBHE	Great Blue Heron	2	Beaver Lake
Apr 10/2016	521587	5660644	RLHA	Rough-Legged Hawk	2	Parson North-Braisher's Slough
Apr 16/2016	521587	5660644	GBHE	Great Blue Heron	1	Parson North-Braisher's Slough
Oct 5/2016	522267	5658396	TUSW	Tundra Swan	7	Parson--Thomas Rd South 4150 area
Apr 3/2017	522267	5658396	N/A	Horned/Eared Grebe	1	Parson--Thomas Rd South 4150 area

Apr 3/2016	523717	5657109	GBHE	Great Blue Heron	14	Parson--Marshwood
Apr 10/2016	523717	5657109	AMBI	American Bittern	1	Parson--Marshwood
Apr 10/2016	523717	5657109	GBHE	Great Blue Heron	24	Parson--Marshwood
Apr 16/2016	523717	5657109	GBHE	Great Blue Heron	50	Parson--Marshwood
May 4/2015	525092	5657693	GBHE	Great Blue Heron	7	Parson
Oct 25/2015	525092	5657693	GBHE	Great Blue Heron	1	Parson
Apr 3/2016	525092	5657693	GBHE	Great Blue Heron	2	Parson
Apr 10/2016	525092	5657693	GBHE	Great Blue Heron	3	Parson
Sept 29/2016	525092	5657693	GBHE	Great Blue Heron	1	Parson
Oct 5/2016	525092	5657693	GBHE	Great Blue Heron	2	Parson
Sept 29/2017	525092	5657693	GBHE	Great Blue Heron	2	Parson
Oct 5/2017	525092	5657693	GBHE	Great Blue Heron	4	Parson
Oct 15/2017	525092	5657693	GBHE	Great Blue Heron	1	Parson
Oct 15/2016	526708	5654597	WEGR	Western Grebe	4	Parson - Wells Landing
Oct 15/2017	526708	5654597	WEGR	Western Grebe	1	Parson - Wells Landing
Sept 29/2016	529683	5654443	GBHE	Great Blue Heron	1	Parson - 5.6 km south
Oct 15/2016	529683	5654443	GBHE	Great Blue Heron	1	Parson - 5.6 km south
Oct 15/2017	529683	5654443	N/A	Horned/Eared Grebe	2	Parson - 5.6 km south
Oct 15/2017	529683	5654443	GBHE	Great Blue Heron	1	Parson - 5.6 km south
Oct 15/2016	530007	5654175	GBHE	Great Blue Heron	1	Parson - 6.0 km south
Sept 29/2016	529824	5654363	GBHE	Great Blue Heron	1	Parson South-Great Blue Heron Rookery
Oct 15/2016	529824	5654363	GBHE	Great Blue Heron	1	Parson South-Great Blue Heron Rookery
Oct 5/2017	529824	5654363	HOGR	Horned Grebe	1	Parson South-Great Blue Heron Rookery
Apr 24/2015	530929	5653677	WEGR	Western Grebe	1	Castledale North
Apr 10/2016	530929	5653677	N/A	Horned/Eared Grebe	1	Castledale North
Apr 16/2016	532621	5652946	N/A	Horned/Eared Grebe	1	Castledale
Sept 29/2017	532621	5652946	N/A	Horned/Eared Grebe	1	Castledale
Oct 15/2015	533662	5652149	GBHE	Great Blue Heron	2	McKeemans Slough
Oct 25/2015	533662	5652149	CAGU	California Gull	2	McKeemans Slough
Oct 5/2016	533662	5652149	GBHE	Great Blue Heron	1	McKeemans Slough
Apr 16/2017	533662	5652149	TUSW	Tundra Swan	11	McKeemans Slough
Apr 3/2016	535505	5651192	TUSW	Tundra Swan	6	Nabel/Gacek Creek
Oct 5/2016	535505	5651192	GBHE	Great Blue Heron	1	Nabel/Gacek Creek
Apr 3/2016	536052	5650624	TUSW	Tundra Swan	2	Columbia Wetlands-1.5 km south of Nabel Rd
Apr 3/2016	536895	5649835	TUSW	Tundra Swan	1	Columbia Wetlands-2 km south of Nabel Rd
Apr 16/2017	536895	5649835	GBHE	Great Blue Heron	1	Columbia Wetlands-2 km south of Nabel Rd
Oct 5/2016	537334	5649164	GBHE	Great Blue Heron	4	Columbia Wetlands-2.8 km south of Nabel Rd
Oct 15/2016	537334	5649164	GBHE	Great Blue Heron	4	Columbia Wetlands-2.8 km south of Nabel Rd
Sept 29/2017	537334	5649164	GBHE	Great Blue Heron	1	Columbia Wetlands-2.8 km south of Nabel Rd
Apr 3/2016	537673	5648629	TUSW	Tundra Swan	3	Salsbury Rd off Hwy 95
Apr 24/2015	540419	5646137	TUSW	Tundra Swan	2	Harrogate-old barns
Apr 24/2015	543588	5641273	GBHE	Great Blue Heron	3	Spillimacheen--2 km North
Oct 25/2015	544347	5639427	GBHE	Great Blue Heron	3	Spillimacheen Crossing--Westside Road
Sept 29/2016	544347	5639427	GBHE	Great Blue Heron	2	Spillimacheen Crossing--Westside Road

Oct 5/2016	544347	5639427	GBHE	Great Blue Heron	1	Spillimacheen Crossing--Westside Road
Apr 16/2017	544347	5639427	GBHE	Great Blue Heron	3	Spillimacheen Crossing--Westside Road
Oct 5/2017	544347	5639427	GBHE	Great Blue Heron	1	Spillimacheen Crossing--Westside Road
Apr 24/2015	546125	5637575	GBHE	Great Blue Heron	1	Spillimacheen--Galena Creek Ranch Slough
Oct 5/2015	546125	5637575	GBHE	Great Blue Heron	5	Spillimacheen--Galena Creek Ranch Slough
Oct 15/2015	546125	5637575	GBHE	Great Blue Heron	1	Spillimacheen--Galena Creek Ranch Slough
Sept 29/2016	546125	5637575	HOGR	Horned Grebe	100	Spillimacheen--Galena Creek Ranch Slough
Sept 29/2016	546125	5637575	GBHE	Great Blue Heron	3	Spillimacheen--Galena Creek Ranch Slough
Oct 5/2016	546125	5637575	GBHE	Great Blue Heron	3	Spillimacheen--Galena Creek Ranch Slough
Oct 15/2016	546125	5637575	GBHE	Great Blue Heron	3	Spillimacheen--Galena Creek Ranch Slough
Oct 5/2015	546084	5633382	GBHE	Great Blue Heron	4	Brisco Rd North
Oct 15/2015	546084	5633382	GBHE	Great Blue Heron	4	Brisco Rd North
Oct 15/2015	546773	5633038	GBHE	Great Blue Heron	8	Brisco Rd--Feldman's Ranch
Oct 5/2016	546773	5633038	GBHE	Great Blue Heron	1	Brisco Rd--Feldman's Ranch
Oct 15/2017	546773	5633038	GBHE	Great Blue Heron	14	Brisco Rd--Feldman's Ranch
Sept 29/2015	547512	5632483	GBHE	Great Blue Heron	1	Brisco West--Warner's Slough
Oct 5/2015	547512	5632483	GBHE	Great Blue Heron	1	Brisco West--Warner's Slough
Oct 15/2015	547512	5632483	GBHE	Great Blue Heron	1	Brisco West--Warner's Slough
Apr 3/2016	547512	5632483	TUSW	Tundra Swan	5	Brisco West--Warner's Slough
Oct 5/2016	547706	5632129	GBHE	Great Blue Heron	1	Brisco Rd - Patty's Greenhouse Slough
Oct 5/2017	549249	5633473	GBHE	Great Blue Heron	3	3.6 km north of Brisco Store
Oct 5/2017	549249	5633473	GBHE	Great Blue Heron	1	2.5 km north of Brisco Store
Sept 29/2015	549884	5630634	HOGR	Horned Grebe	2	Brisco West--Trecher's Slough
Apr 3/2016	549884	5630634	GBHE	Great Blue Heron	3	Brisco West--Trecher's Slough
Sept 29/2015	550230	5631108	HOGR	Horned Grebe	1	Brisco Road
Sept 29/2015	550230	5631108	GBHE	Great Blue Heron	1	Brisco Road
Oct 5/2017	550230	5631108	GBHE	Great Blue Heron	1	Brisco Road
Oct 15/2017	550230	5631108	GBHE	Great Blue Heron	1	Brisco Road
Sept 29/2017	552128	5629529	GBHE	Great Blue Heron	1	Brisco South - 2971 Hwy 95
Oct 15/2016	552677	5627687	GBHE	Great Blue Heron	3	Brisco South--Snider Rd
Sept 29/2017	552677	5627687	GBHE	Great Blue Heron	1	Brisco South--Snider Rd
Apr 3/2016	555688	5623632	TUSW	Tundra Swan	4	Luxor Station Road
Apr 10/2016	555688	5623632	TUSW	Tundra Swan	4	Luxor Station Road
Oct 5/2016	555688	5623632	N/A	Horned/Eared Grebe	2	Luxor Station Road
Oct 5/2016	555688	5623632	GBHE	Great Blue Heron	1	Luxor Station Road
Apr 3/2017	555688	5623632	TUSW	Tundra Swan	2	Luxor Station Road
Sept 29/2017	555688	5623632	GBHE	Great Blue Heron	1	Luxor Station Road
Apr 3/2017	556643	5621919	TUSW	Tundra Swan	5	Luxor Linkage Conservation Property
Apr 10/2017	556643	5621919	TUSW	Tundra Swan	7	Luxor Linkage Conservation Property
Apr 16/2017	556643	5621919	TUSW	Tundra Swan	4	Luxor Linkage Conservation Property
Oct 15/2015	562502	5609260	LBCU	Long-Billed Curlew	5	Radium--Red Rock Lookout
Sept 29/2016	562502	5609260	GBHE	Great Blue Heron	1	Radium--Red Rock Lookout
Oct 5/2016	564095	5608185	GBHE	Great Blue Heron	1	Radium Hot Springs--Saw Mill Pond
Oct 5/2017	564095	5608185	GBHE	Great Blue Heron	2	Radium Hot Springs--Saw Mill Pond

Oct 15/2017	567823	5602198	GBHE	Great Blue Heron	5	Dry Gulch - Old Coach Trail
Oct 15/2017	567823	5602198	RLHA	Rough-legged Hawk	1	Dry Gulch - Old Coach Trail
May 4/2015	565911	5600974	HOGR	Horned Grebe	2	Friends of Columbia Wetland (Richies Point)
Oct 5/2015	565911	5600974	GBHE	Great Blue Heron	1	Friends of Columbia Wetland (Richies Point)
Oct 15/2015	565911	5600974	GBHE	Great Blue Heron	6	Friends of Columbia Wetland (Richies Point)
Apr 10/2016	565911	5600974	GBHE	Great Blue Heron	2	Friends of Columbia Wetland (Richies Point)
Sept 29/2016	565911	5600974	GBHE	Great Blue Heron	1	Friends of Columbia Wetland (Richies Point)
Oct 15/2016	565911	5600974	WEGR	Western Grebe	1	Friends of Columbia Wetland (Richies Point)
Apr 16/2017	565911	5600974	GBHE	Great Blue Heron	14	Friends of Columbia Wetland (Richies Point)
Sept 29/2017	565911	5600974	GBHE	Great Blue Heron	5	Friends of Columbia Wetland (Richies Point)
May 4/2015	566728	5599495	GBHE	Great Blue Heron	10	Wilmer NWA (end of Smith Rd.)
Oct 15/2015	566728	5599495	HOGR	Horned Grebe	1	Wilmer NWA (end of Smith Rd.)
Apr 10/2016	566728	5599495	GBHE	Great Blue Heron	2	Wilmer NWA (end of Smith Rd.)
Apr 10/2017	566728	5599495	GBHE	Great Blue Heron	1	Wilmer NWA (end of Smith Rd.)
May 4/2015	567240	5598807	GBHE	Great Blue Heron	1	Wilmer Pontoon Road
Apr 10/2016	567240	5598807	GBHE	Great Blue Heron	2	Wilmer Pontoon Road
Apr 16/2016	567240	5598807	GBHE	Great Blue Heron	10	Wilmer Pontoon Road
Apr 3/2017	567240	5598807	GBHE	Great Blue Heron	1	Wilmer Pontoon Road
Apr 10/2017	567240	5598807	GBHE	Great Blue Heron	2	Wilmer Pontoon Road
Oct 15/2017	567240	5598807	RLHA	Rough-legged Hawk	1	Wilmer Pontoon Road
Apr 24/2015	568927	5597787	GBHE	Great Blue Heron	5	Athalmer Sloughs
Apr 29/2015	568927	5597787	GBHE	Great Blue Heron	13	Athalmer Sloughs
May 4/2015	568927	5597787	EAGR	Eared Grebe	2	Athalmer Sloughs
May 4/2015	568927	5597787	GBHE	Great Blue Heron	4	Athalmer Sloughs
Sept 29/2015	568927	5597787	GBHE	Great Blue Heron	12	Athalmer Sloughs
Oct 5/2015	568927	5597787	GBHE	Great Blue Heron	7	Athalmer Sloughs
Oct 5/2015	568927	5597787	CAGU	California Gull	1	Athalmer Sloughs
Oct 15/2015	568927	5597787	GBHE	Great Blue Heron	1	Athalmer Sloughs
Oct 25/2015	568927	5597787	TUSW	Tundra Swan	5	Athalmer Sloughs
Apr 10/2016	568927	5597787	GBHE	Great Blue Heron	1	Athalmer Sloughs
Apr 16/2016	568927	5597787	GBHE	Great Blue Heron	10	Athalmer Sloughs
Sept 29/2016	568927	5597787	GBHE	Great Blue Heron	12	Athalmer Sloughs
Sept 29/2016	568927	5597787	CAGU	California Gull	4	Athalmer Sloughs
Oct 5/2016	568927	5597787	GBHE	Great Blue Heron	3	Athalmer Sloughs
Oct 5/2016	568927	5597787	CAGU	California Gull	37	Athalmer Sloughs
Oct 15/2016	568927	5597787	GBHE	Great Blue Heron	1	Athalmer Sloughs
Oct 15/2016	568927	5597787	CAGU	California Gull	15	Athalmer Sloughs
Apr 3/2017	568927	5597787	GBHE	Great Blue Heron	12	Athalmer Sloughs
Apr 10/2017	568927	5597787	GBHE	Great Blue Heron	23	Athalmer Sloughs
Apr 16/2017	568927	5597787	GBHE	Great Blue Heron	13	Athalmer Sloughs
Sept 29/2017	568927	5597787	GBHE	Great Blue Heron	10	Athalmer Sloughs
Oct 5/2017	568927	5597787	GBHE	Great Blue Heron	8	Athalmer Sloughs
Apr 29/2015	569330	5596005	GBHE	Great Blue Heron	2	James Chabot Provincial Park
Apr 16/2017	569330	5596005	GBHE	Great Blue Heron	1	James Chabot Provincial Park

Oct 5/2017	569330	5596005	HOGR	Horned Grebe	1	James Chabot Provincial Park
Oct 15/2017	569330	5596005	N/A	Horned/Eared Grebe	2	James Chabot Provincial Park
Apr 29/2015	569101	5594510	GBHE	Great Blue Heron	1	Invermere--Dorothy Lake
May 4/2015	569101	5594510	GBHE	Great Blue Heron	1	Invermere--Dorothy Lake
Apr 16/2016	569101	5594510	GBHE	Great Blue Heron	1	Invermere--Dorothy Lake
Apr 10/2017	569101	5594510	GBHE	Great Blue Heron	1	Invermere--Dorothy Lake
May 4/2015	569095	5594379	EAGR	Eared Grebe	1	Invermere-Kin Beach/Lake Windermere
May 4/2015	569095	5594379	GBHE	Great Blue Heron	1	Invermere-Kin Beach/Lake Windermere
Oct 15/2016	569095	5594379	HOGR	Horned Grebe	2	Invermere-Kin Beach/Lake Windermere
Oct 5/2017	569095	5594379	N/A	Horned/Eared Grebe	1	Invermere-Kin Beach/Lake Windermere
Oct 5/2017	570297	5594259	WEGR	Western Grebe	1	Invermere--Lakeview Meadows/Lake Windermere
Apr 24/2015	570748	5593653	HOGR	Horned Grebe	1	Invermere--Baltac Beach/Lake Windermere
Apr 10/2016	570748	5593653	HOGR	Horned Grebe	2	Invermere--Baltac Beach/Lake Windermere
Apr 16/2016	570748	5593653	HOGR	Horned Grebe	9	Invermere--Baltac Beach/Lake Windermere
May 4/2015	571272	5593421	HOGR	Horned Grebe	36	Off Baltac Road--Lake Windermere
May 4/2015	571272	5593421	EAGR	Eared Grebe	9	Off Baltac Road--Lake Windermere
May 4/2015	571272	5593421	WEGR	Western Grebe	6	Off Baltac Road--Lake Windermere
Oct 5/2015	571272	5593421	WEGR	Western Grebe	1	Off Baltac Road--Lake Windermere
Oct 15/2015	571272	5593421	SUSC	Surf Scoter	8	Off Baltac Road--Lake Windermere
Oct 15/2015	571272	5593421	WEGR	Western Grebe	8	Off Baltac Road--Lake Windermere
Oct 25/2015	571272	5593421	SUSC	Surf Scoter	1	Off Baltac Road--Lake Windermere
May 4/2015	571394	5590993	GBHE	Great Blue Heron	3	Windermere Cemetery Hill
Oct 15/2015	571394	5590993	HOGR	Horned Grebe	4	Windermere Cemetery Hill
Oct 15/2015	571394	5590993	WEGR	Western Grebe	7	Windermere Cemetery Hill
Apr 3/2016	571394	5590993	GBHE	Great Blue Heron	1	Windermere Cemetery Hill
Oct 15/2017	571394	5590993	N/A	Horned/Eared Grebe	3	Windermere Cemetery Hill
May 4/2015	571529	5590359	HOGR	Horned Grebe	1	Invermere--Cardiff Ave Beach/Lake Windermere
Oct 15/2015	571529	5590359	WEGR	Western Grebe	1	Invermere--Cardiff Ave Beach/Lake Windermere
Sept 29/2017	571529	5590359	CAGU	California Gull	1	Invermere--Cardiff Ave Beach/Lake Windermere
Oct 5/2015	571533	5590015	CAGU	California Gull	14	Invermere--Windermere Creek/Lake Windermere
Oct 25/2015	571533	5590015	CAGU	California Gull	4	Invermere--Windermere Creek/Lake Windermere
Sept 29/2016	571533	5590015	CAGU	California Gull	6	Invermere--Windermere Creek/Lake Windermere
Oct 5/2016	571533	5590015	CAGU	California Gull	4	Invermere--Windermere Creek/Lake Windermere
Oct 15/2016	571533	5590015	CAGU	California Gull	17	Invermere--Windermere Creek/Lake Windermere
Apr 3/2017	571533	5590015	TUSW	Tundra Swan	3	Invermere--Windermere Creek/Lake Windermere
Oct 5/2017	571533	5590015	CAGU	California Gull	7	Invermere--Windermere Creek/Lake Windermere
Oct 15/2017	571533	5590015	TUSW	Tundra Swan	5	Invermere--Windermere Creek/Lake Windermere
Oct 15/2017	571533	5590015	CAGU	California Gull	7	Invermere--Windermere Creek/Lake Windermere
Oct 15/2015	569121	5592081	WEGR	Western Grebe	10	Invermere--Grizzly Ridge Heights
Apr 10/2016	569121	5592081	GBHE	Great Blue Heron	1	Invermere--Grizzly Ridge Heights
Oct 15/2016	569121	5592081	CAGU	California Gull	2	Invermere--Grizzly Ridge Heights
Oct 5/2017	569121	5592081	WEGR	Western Grebe	3	Invermere--Grizzly Ridge Heights
Oct 15/2017	569121	5592081	WEGR	Western Grebe	23	Invermere--Grizzly Ridge Heights
Oct 5/2015	570100	5590763	WEGR	Western Grebe	1	Lake Windermere--End of Coy Rd

Oct 15/2016	570100	5590763	CAGU	California Gull	1	Lake Windermere--End of Coy Rd
Sept 29/2017	570100	5590763	WEGR	Western Grebe	1	Lake Windermere--End of Coy Rd
Apr 29/2015	572625	5587673	BANS	Bank Swallow	6	Lake Windermere--Ruault Road
May 4/2015	572625	5587673	GBHE	Great Blue Heron	2	Lake Windermere--Ruault Road
May 4/2015	575004	5586649	WEGR	Western Grebe	2	Lake Windermere--Lakeshore Resort Campground
May 4/2015	575004	5586649	GBHE	Great Blue Heron	1	Lake Windermere--Lakeshore Resort Campground
Oct 5/2016	575004	5586649	EAGR	Eared Grebe	5	Lake Windermere--Lakeshore Resort Campground
Apr 3/2017	575004	5586649	TUSW	Tundra Swan	2	Lake Windermere--Lakeshore Resort Campground
Apr 10/2017	575004	5586649	GBHE	Great Blue Heron	2	Lake Windermere--Lakeshore Resort Campground
Sept 29/2017	575004	5586649	HOGR	Horned Grebe	1	Lake Windermere--Lakeshore Resort Campground
Oct 5/2017	575004	5586649	WEGR	Western Grebe	1	Lake Windermere--Lakeshore Resort Campground
Apr 24/2015	574620	5585343	GBHE	Great Blue Heron	5	Lake Windermere--Rushmere Road
Apr 29/2015	574620	5585343	BANS	Bank Swallow	6	Lake Windermere--Rushmere Road
May 4/2015	574620	5585343	N/A	Horned/Eared Grebe	5	Lake Windermere--Rushmere Road
May 4/2015	574620	5585343	WEGR	Western Grebe	3	Lake Windermere--Rushmere Road
May 4/2015	574620	5585343	AWPE	American White Pelican	9	Lake Windermere--Rushmere Road
May 4/2015	574620	5585343	GBHE	Great Blue Heron	3	Lake Windermere--Rushmere Road
Oct 5/2016	574620	5585343	SUSC	Surf Scoter	1	Lake Windermere--Rushmere Road
Oct 5/2016	576287	5585082	HOGR	Horned Grebe	1	Southeast End of Lake Windermere
Oct 15/2016	576287	5585082	N/A	Horned/Eared Grebe	6	Southeast End of Lake Windermere
Apr 10/2017	576287	5585082	GBHE	Great Blue Heron	2	Southeast End of Lake Windermere
Apr 16/2017	576287	5585082	GBHE	Great Blue Heron	1	Southeast End of Lake Windermere
Sept 29/2017	576287	5585082	HOGR	Horned Grebe	1	Southeast End of Lake Windermere
Oct 25/2015	576054	5583970	TUSW	Tundra Swan	6	South End Lake Windermere
Apr 3/2016	576054	5583970	GBHE	Great Blue Heron	1	South End Lake Windermere
Apr 10/2016	576054	5583970	GBHE	Great Blue Heron	3	South End Lake Windermere
Apr 16/2016	576054	5583970	GBHE	Great Blue Heron	5	South End Lake Windermere
Sept 29/2016	576054	5583970	GBHE	Great Blue Heron	1	South End Lake Windermere
Oct 5/2016	576054	5583970	GBHE	Great Blue Heron	1	South End Lake Windermere
Apr 16/2017	576054	5583970	GBHE	Great Blue Heron	1	South End Lake Windermere
Oct 5/2015	577609	5580678	HOGR	Horned Grebe	1	Columbia Wetlands Viewpoint Trail
Oct 5/2015	577609	5580678	WEGR	Western Grebe	1	Columbia Wetlands Viewpoint Trail
Oct 5/2015	577609	5580678	GBHE	Great Blue Heron	3	Columbia Wetlands Viewpoint Trail
Oct 15/2015	577609	5580678	GBHE	Great Blue Heron	2	Columbia Wetlands Viewpoint Trail
Oct 5/2016	577609	5580678	GBHE	Great Blue Heron	2	Columbia Wetlands Viewpoint Trail
Oct 5/2015	579158	5578413	LBCU	Long-billed Curlew	1	Mud Lake--Fairmont
Oct 15/2015	579158	5578413	GBHE	Great Blue Heron	6	Mud Lake--Fairmont
Sept 29/2016	579158	5578413	GBHE	Great Blue Heron	2	Mud Lake--Fairmont
Oct 5/2016	579158	5578413	GBHE	Great Blue Heron	1	Mud Lake--Fairmont
Oct 5/2015	577498	5582645	TUSW	Tundra Swan	4	Fairmont Meadows to Lakeshore Resort Canoe
Oct 5/2015	577498	5582645	WEGR	Western Grebe	6	Fairmont Meadows to Lakeshore Resort Canoe
Oct 5/2015	577498	5582645	GBHE	Great Blue Heron	1	Fairmont Meadows to Lakeshore Resort Canoe
Sept 29/2016	580257	5577755	GBHE	Great Blue Heron	13	Fairmont--meadows
Oct 5/2016	580257	5577755	GBHE	Great Blue Heron	2	Fairmont--meadows

Oct 15/2016	580257	5577755	GBHE	Great Blue Heron	2	Fairmont--meadows
Oct 15/2017	580257	5577755	GBHE	Great Blue Heron	1	Fairmont--meadows
Oct 15/2017	580257	5577755	RLHA	Rough-legged Hawk	1	Fairmont--meadows
Apr 24/2015	580366	5571414	GBHE	Great Blue Heron	15	Columere Park
Apr 3/2016	580366	5571414	GBHE	Great Blue Heron	14	Columere Park
Apr 10/2016	580366	5571414	GBHE	Great Blue Heron	2	Columere Park
Sept 29/2016	580366	5571414	N/A	Horned/Eared Grebe	2	Columere Park
Sept 29/2016	580366	5571414	GBHE	Great Blue Heron	3	Columere Park
Oct 5/2016	580366	5571414	WEGR	Western Grebe	2	Columere Park
Oct 15/2016	580366	5571414	WEGR	Western Grebe	15	Columere Park
Oct 15/2017	581432	5571629	TUSW	Tundra Swan	1	Columbia Lake -- Rockbeach
Apr 24/2015	581643	5569871	GBHE	Great Blue Heron	2	Columbia Lake--Lot 48
Sept 29/2015	581643	5569871	WEGR	Western Grebe	1	Columbia Lake--Lot 48
Oct 5/2015	581643	5569871	WEGR	Western Grebe	8	Columbia Lake--Lot 48
Oct 15/2015	581643	5569871	TUSW	Tundra Swan	5	Columbia Lake--Lot 48
Oct 15/2015	581643	5569871	WEGR	Western Grebe	2	Columbia Lake--Lot 48
Oct 15/2015	581643	5569871	CAGU	California Gull	8	Columbia Lake--Lot 48
Oct 25/2015	581643	5569871	TUSW	Tundra Swan	10	Columbia Lake--Lot 48
Apr 3/2016	581643	5569871	GBHE	Great Blue Heron	1	Columbia Lake--Lot 48
Apr 10/2016	581643	5569871	GBHE	Great Blue Heron	2	Columbia Lake--Lot 48
Oct 5/2017	581643	5569871	WEGR	Western Grebe	5	Columbia Lake--Lot 48
Oct 15/2017	581643	5569871	WEGR	Western Grebe	13	Columbia Lake--Lot 48
Apr 10/2016	580589	5566702	GBHE	Great Blue Heron	2	Columbia Lake - Shoreline near Columbia Ridge
Apr 16/2016	580589	5566702	GBHE	Great Blue Heron	2	Columbia Lake - Shoreline near Columbia Ridge
Sept 29/2016	580589	5566702	WEGR	Western Grebe	25	Columbia Lake - Shoreline near Columbia Ridge
Oct 5/2016	580589	5566702	WEGR	Western Grebe	25	Columbia Lake - Shoreline near Columbia Ridge
Oct 15/2016	580589	5566702	WEGR	Western Grebe	16	Columbia Lake - Shoreline near Columbia Ridge
Oct 15/2016	580589	5566702	GBHE	Great Blue Heron	1	Columbia Lake - Shoreline near Columbia Ridge
Sept 29/2017	580589	5566702	HOGR	Horned Grebe	4	Columbia Lake - Shoreline near Columbia Ridge
Sept 29/2017	580589	5566702	WEGR	Western Grebe	4	Columbia Lake - Shoreline near Columbia Ridge
Sept 29/2017	580589	5566702	GBHE	Great Blue Heron	1	Columbia Lake - Shoreline near Columbia Ridge
Oct 5/2017	580589	5566702	GBHE	Great Blue Heron	1	Columbia Lake - Shoreline near Columbia Ridge
Oct 15/2017	580589	5566702	WEGR	Western Grebe	5	Columbia Lake - Shoreline near Columbia Ridge
Oct 15/2017	580589	5566702	GBHE	Great Blue Heron	1	Columbia Lake - Shoreline near Columbia Ridge
Apr 10/2016	582049	5567395	GBHE	Great Blue Heron	5	Columbia Lake-Armstrong Bay
Oct 5/2016	582049	5567395	WEGR	Western Grebe	4	Columbia Lake-Armstrong Bay
Apr 10/2017	582049	5567395	GBHE	Great Blue Heron	6	Columbia Lake-Armstrong Bay
Sept 29/2016	581834	5558978	N/A	Horned/Eared Grebe	5	Lewis's Woodpecker Site
May 4/2015	584276	5559074	AWPE	American White Pelican	7	Tilley Memorial Park--Canal Flats
May 4/2015	584276	5559074	GBHE	Great Blue Heron	1	Tilley Memorial Park--Canal Flats
Sept 29/2016	584276	5559074	GBHE	Great Blue Heron	2	Tilley Memorial Park--Canal Flats
Apr 10/2017	584276	5559074	CAGU	California Gull	6	Tilley Memorial Park--Canal Flats
Oct 15/2017	584276	5559074	GBHE	Great Blue Heron	1	Tilley Memorial Park--Canal Flats
Apr 24/2015	582499	5557440	GBHE	Great Blue Heron	2	Columbia Lake--South end

Apr 29/2015	582499	5557440	GBHE	Great Blue Heron	1	Columbia Lake--South end
May 4/2015	582499	5557440	TUSW	Tundra Swan	5	Columbia Lake--South end
May 4/2015	582499	5557440	GBHE	Great Blue Heron	1	Columbia Lake--South end
Oct 5/2015	582499	5557440	GBHE	Great Blue Heron	8	Columbia Lake--South end
Oct 15/2015	582499	5557440	GBHE	Great Blue Heron	2	Columbia Lake--South end
Oct 25/2015	582499	5557440	GBHE	Great Blue Heron	4	Columbia Lake--South end
Apr 10/2016	582499	5557440	GBHE	Great Blue Heron	1	Columbia Lake--South end
Sept 29/2016	582499	5557440	N/A	Horned/Eared Grebe	5	Columbia Lake--South end
Sept 29/2016	582499	5557440	GBHE	Great Blue Heron	1	Columbia Lake--South end
Oct 15/2016	582499	5557440	GBHE	Great Blue Heron	2	Columbia Lake--South end
Apr 3/2017	582499	5557440	TUSW	Tundra Swan	2	Columbia Lake--South end
Sept 29/2017	582499	5557440	GBHE	Great Blue Heron	2	Columbia Lake--South end
Oct 5/2017	582499	5557440	GBHE	Great Blue Heron	1	Columbia Lake--South end
Oct 15/2017	582499	5557440	GBHE	Great Blue Heron	5	Columbia Lake--South end