

Columbia River Project Water Use Plan

Kingbasket and Arrow Reservoirs Revegetation Management Plan

Effectiveness Monitoring of Wildlife Enhancement Structures in Arrow Lakes Reservoir

Implementation Year 3

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Final Annual Report

Study Period: 2017

**Kingbird Biological Consultants Ltd.
Revelstoke, BC**

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CLBWORKS-30

Monitoring of Waterfowl Nest Boxes in Revelstoke,
2017 Nesting Season



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Background

As part of the Water License Requirements (WLR) for the operation of Arrow Lakes Reservoir, Wildlife Physical Works projects were designed to enhance wildlife habitat. The CLBWORKS-30 project focuses on wetland enhancement in Revelstoke Reach area. As part of that project, nest boxes were built and installed in the study area to provide habitat for cavity-nesting ducks. Kingbird Biological Consultants Ltd. (KBC) installed 26 nest boxes in 2013 and 2014 at sites identified by BC Hydro (Appendix 1, Kellner 2013, Kellner 2014). Installation followed standard protocols (Ducks Unlimited 2008). Boxes were first monitored for use by waterfowl or other animals in February 2015, after the boxes had been available for one breeding season (spring/summer 2014). Boxes were revisited in fall 2016 for maintenance and assessment of use in the intervening two breeding seasons (2015 and 2016), and again in April 2018 for assessment of use in the 2017 breeding season.

Methods

As in 2015 and 2016, we visited all nest boxes and assessed each box for signs of use by wildlife, including presence of down, feathers, feces, eggshell fragments, membranes, other nesting material, or presence of a nest cup. When boxes had been used by wildlife, any introduced nesting material or soiled wood chips were removed, and replaced with ~10 – 15 cm of fresh wood chips to provide clean nesting material. If necessary, the nesting material in unused boxes was topped up. We also checked for and repaired any loose screws in the boxes themselves or loose nails where the boxes were attached to trees. Photos of boxes are available on request.

Results

In 2017, ten of the 26 nest boxes were used by waterfowl, based on the presence of down, shell fragments, and/or membrane pieces (Figure 1, 2, Appendix 2). One of the boxes had only a small amount of down and no other evidence of nesting; the others all had lots of down, membranes, and/or eggshell fragments. Two nests had unhatched eggs – one with one egg and one with three.

All ten of the boxes used by waterfowl were likely used by Wood Ducks (*Aix sponsa*). The shell fragments were all similar in colour and size, and unhatched eggs were beige/buff and ~50-52 mm in length.

Four of the boxes had evidence of use by Northern Flickers, including nesting or roosting material of moss, lichen, and cedar bark strips. We suspect that these boxes were being used as roosting sites by Northern Flickers, based on the lack of eggs, shells, or membranes.

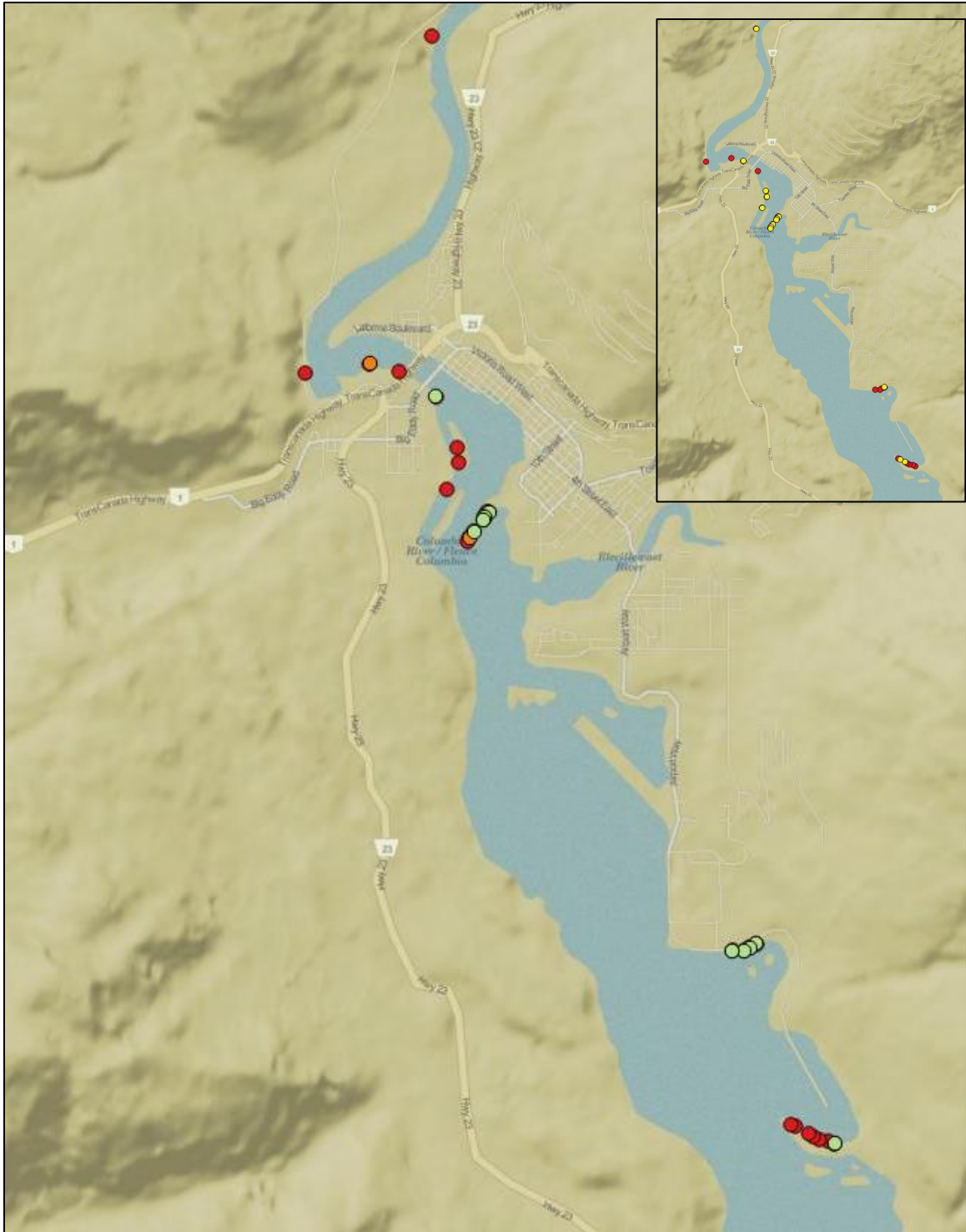


Figure 1. Location of the 26 nest boxes installed in the Revelstoke reservoir drawdown zone and assessed for use. Green markers show boxes that were used by waterfowl in 2017. Orange markers are boxes that have been used in past years but were not used in 2017. Red markers indicate boxes that have not been used for nesting. Inlay shows boxes used by other wildlife in 2017 (yellow markers).



Figure 2. The fluffy down interior of a nest box used by waterfowl (left), and the 50-mm long beige eggs found inside two of the boxes (right), suspected of being from Wood Ducks.

Five of the boxes at Downie Marsh contained dry mushrooms, likely stashed by red squirrel (*Tamiasciurus hudsonicus*). Three of these mushroom boxes also showed evidence of duck nesting. One of the boxes was almost full of mushrooms, preventing future access by waterfowl (Fig. 3).

One box at Cartier Bay contained wings assumed to be from a Vaux's Swift predated while roosting in the box (Fig. 4). Finally, a box at Downie Marsh contained three owl pellets (Figure 4); the box may have been a roost site for a Northern Saw-whet owl (*Aegolius acadicus*). These owls are occasionally found roosting around Revelstoke.



Figure 3. Mushrooms were found in five nest boxes at Downie Marsh. These mushrooms were likely deposited by a squirrel.



Figure 4. Wings (likely from a Vaux's swift), left, and an owl pellet, likely from a Northern saw-whet owl, right.

Boxes were mostly still securely attached to trees but needed some minor maintenance. One box at Montana Bay was on the ground in pieces after its tree was chopped down by beaver (*Castor canadensis*). All pieces were located and the box was rebuilt and reattached to a nearby, larger tree, slightly farther from the water's edge. Boxes 27 (Big Eddy) and 16 (Cartier Bay) have cracked panels or rot, and it is recommended that these boxes be repaired or replaced after this breeding season.

Nest boxes were used by waterfowl at all sites – the Big Eddy (1 box), Cartier Bay (1 box), Downie Marsh (4 boxes), and the north shore of Montana Bay (4 boxes). There was an increase in the number of boxes used by waterfowl in 2017, after four nesting seasons of boxes being available. Ten boxes were used, up from nine used in 2015/2016 and four used boxes in 2014, the first season they were available. Of the boxes used in 2017, two boxes used in previous years were not re-used, while 3 boxes were newly-used in 2017.

Discussion

Unlike in 2015 and 2016, only one type of duck appeared to have used the boxes for nesting in 2017. The egg size and colour, and the down and feathers, suggest that all boxes were used by Wood Ducks. In 2015 and 2016, boxes showed evidence of use by Wood Ducks and Common Mergansers. There was also one Northern Flicker nest.

The increasing use of nest boxes by waterfowl suggests that natural cavities may be limiting or the boxes are preferable to cavity-nesting ducks. Although the species using the boxes had to be identified based only on the colour of down feathers and shell fragments, Wood Ducks and Mergansers are both cavity-nesting species that have been seen with broods in the area. Merganser eggs are noticeably larger than Wood Duck eggs, and were found after 2016 but not 2017. Buffleheads, the only other cavity-nesting duck with buff eggs (Ducks Unlimited 2008), are a possibility but have not been confirmed to reproduce around Revelstoke Reach (van Oort

and Cooper 2013, van Oort et al. 2014).

The presence of unhatched eggs in the nest boxes is not unusual for wood ducks (www.woodducksociety.com), and could be due to infertile eggs, death during development, or being laid later (perhaps by a different hen). Eggs should be removed after the brood has departed so that the box is clean for the next season (Ducks Unlimited 2008).

Finally, as stated in the initial reports, it is advisable that the effectiveness of the nest-box installation continues to be monitored. Yearly maintenance should be undertaken every fall (Ducks Unlimited 2008), including removing used nesting material, unhatched eggs, membranes and shell pieces, as well as adding fresh wood shavings and tightening any loose screws/nails. As mentioned in the results, two boxes should be repaired/replaced after the 2018 nesting season.

Literature cited

- Ducks Unlimited. 2008. Nest Box Guide for Waterfowl. Ducks Unlimited Canada. 34pp.
- Kellner, M. 2013. Installation of waterfowl nest boxes in Revelstoke Reach. Prepared for Eva-Maria Boehringer, BC Hydro Water License Requirements, Burnaby, BC.
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- van Oort, H. and J. Cooper. 2013. CLBMON 40: Arrow Lakes Reservoir Shorebird and Waterbird Monitoring Program: Years 1-5. Study Period : 5 Year Interim Review 2008-2012 Annual Report – Year 6, 2013. Unpublished report for BC Hydro Generation, Water Licence Requirements, Burnaby, BC. 18 pp.
- van Oort, H., C. Bird and J.M. Cooper. 2014. CLBMON 40: Arrow Lakes Reservoir Shorebird and Waterbird Monitoring Program. Annual Report – Year 6, 2013. Unpublished report for BC Hydro Generation, Water Licence Requirements, Burnaby, BC. 43 pp. + Apps.

Appendix 1. Location coordinates (Zone 11 UTM and Lat/Long) for 26 duck nest boxes installed in 2013 and 2014 near Revelstoke, BC.

Site	UTM X	UTM Y	Latitude	Longitude
1	415244	5649434	50.99025032	-118.20766082
2	415225	5649433	50.99023414	-118.20792426
3	415188	5649377	50.98972988	-118.20843581
4	415174	5649343	50.98941766	-118.20862642
5	415061	5649206	50.98817588	-118.21020900
6	415000	5649131	50.98749300	-118.21105801
7	414985	5649077	50.98700006	-118.21126521
9	418376	5644202	50.94366278	-118.16186336
10	418290	5644157	50.94324997	-118.16307815
11	418233	5644129	50.94298954	-118.16388432
12	418091	5644130	50.94297202	-118.16591006
13	419277	5641797	50.92216554	-118.14850353
14	419202	5641818	50.92234072	-118.14958513
15	419096	5641852	50.92263459	-118.15109840
16	419026	5641878	50.92286417	-118.15210280
17	418968	5641919	50.92322275	-118.15293655
18	418818	5642002	50.92394988	-118.15508793
19	418751	5642036	50.92423931	-118.15603978
27	414748	5649715	50.99270110	-118.21479030
32	413053	5651144	51.00529457	-118.23927602
35	413836	5651233	51.00621658	-118.22813102
36	414197	5651138	51.00541729	-118.22297120
37	414630	5650831	51.00271588	-118.21673440
38	414864	5650217	50.99723613	-118.21325172
39	414896	5650035	50.99560216	-118.21274721
40	414650	5655144	51.04149953	-118.21745574

Appendix 2. Details on use in 2017 of nest boxes by waterfowl and other wildlife, documented in early spring 2018

Check date	Site	Box	Use by waterfowl	Use by other wildlife
April 17, 2018	Downie Marsh	1	nest - Wood Duck ¹	owl - pellets
April 17, 2018	Downie Marsh	2	No	no
April 17, 2018	Downie Marsh	3	nest - Wood Duck ¹	squirrel - mushrooms
April 17, 2018	Downie Marsh	4	nest - Wood Duck ¹	squirrel - mushrooms
April 17, 2018	Downie Marsh	5	nest - Wood Duck ¹	squirrel - mushrooms
April 17, 2018	Downie Marsh	6	No	squirrel - mushrooms
April 17, 2018	Downie Marsh	7	No	squirrel - mushrooms
April 16, 2018	Montana	9	nest - Wood Duck ¹	beaver felled the tree
April 16, 2018	Montana	10	nest - Wood Duck ¹	no
April 16, 2018	Montana	11	nest - Wood Duck ¹	no
April 16, 2018	Montana	12	nest - Wood Duck ¹	No
April 16, 2018	Cartier Bay	13	nest - Wood Duck ¹	No
April 16, 2018	Cartier Bay	14	no	No
April 16, 2018	Cartier Bay	15	no	No
April 16, 2018	Cartier Bay	16	no	No
April 16, 2018	Cartier Bay	17	no	yes – wings – suspect Vaux's swift
April 16, 2018	Cartier Bay	18	no	Flicker roost?
April 16, 2018	Cartier Bay	19	no	No
April 16, 2018	Big Eddy	27	no	Flicker roost?
April 15, 2018	Big Eddy	32	no	no
April 15, 2018	Big Eddy	35	no	no
April 16, 2018	Big Eddy	36	no	Flicker roost?
April 16, 2018	Big Eddy	37	nest - Wood Duck ¹	no
April 16, 2018	Big Eddy	38	no	Flicker roost?
April 16, 2018	Big Eddy	39	no	yes - small bird feather inside
April 15, 2018	Big Eddy	40	no	yes - Deer mice

¹Species is unconfirmed; the buff-coloured eggs and medium size suggest Wood Duck.