

Columbia River Water Use Plan

Kinbasket & Arrow Reservoir Revegetation Management Plan

Monitoring Program and Physical Works

Annual Report: 2013

Implementation Period: February 2012 to January 2013

- **CLBMON-9 Kinbasket Reservoir Monitoring of Revegetation Efforts and Vegetation Composition Analysis**
- **CLBMON-10 Kinbasket Reservoir Inventory of Vegetation Resources**
- **CLBMON-11A Wildlife Effectiveness Monitoring of Revegetation in Kinbasket Reservoir**
- **CLBMON-11B Wildlife Effectiveness Monitoring of Revegetation and Wildlife Physical Works in the Arrow Lakes Reservoir**
- **CLBMON-12 Arrow Lakes Reservoir Monitoring of Revegetation Efforts and Vegetation Composition Analysis**
- **CLBMON-13 Inventory of Mosquito Populations in the Revelstoke Area**
- **CLBMON-33 Arrow Lakes Reservoir Inventory of Vegetation Resources**
- **CLBMON-35 Arrow Lakes Reservoir Plant Response to Inundation**
- **CLBWORKS-1 Kinbasket Reservoir Revegetation Program Physical Works**
- **CLBWORKS-2 Arrow Lakes Reservoir Revegetation Program Physical Works**

Conditional Water Licences for Kinbasket storage (27068 and 39432), Mica diversion (39431), Revelstoke diversion and storage (47215), and Arrow storage (27066)

February 28, 2013

BC Hydro Columbia River Project Water Use Plan Kinbasket & Arrow Reservoir Revegetation Management Plan Monitoring Programs and Physical Works Annual Report: 2013

1 Introduction

This document represents a summary of the status and the results of the Columbia River Kinbasket and Arrow Reservoir Revegetation Management Plan Water Use Plan (WUP) monitoring programs and physical works to January 31, 2013, as per the Columbia River Order under the *Water Act*, dated January 26, 2007. There are eight monitoring programs and two physical works.

2 Status

The following table outlines the dates that TOR for the Kinbasket and Arrow Reservoir Revegetation Management Plan WUP monitoring programs and physical works were submitted to and approved by the CWR.

Table: 2-1: Dates of Kinbasket and Arrow Reservoir Revegetation Management Plan WUP TOR Submissions and Approvals by the Comptroller of Water Rights

Monitoring Program & Physical Works TOR	Order Clause	Original ToR Submission		Most Recent ToR Resubmission	
		Date Submitted	Date Approved	Date Submitted	Date Approved
CLBMON-9 Kinbasket Reservoir Monitoring of Revegetation Efforts and Vegetation Composition Analysis	Schedule A, Clause 2(a)	Jan 25, 2008	Mar 03, 2008	Sep 17, 2010	Oct 26, 2010
CLBMON-10 Kinbasket Reservoir Inventory of Vegetation Resources	Schedule A, Clause 2(b)	Apr 04, 2007	Apr 19, 2007	Jan 12, 2009	Apr 08, 2009
CLBMON-11A Wildlife Effectiveness Monitoring of Revegetation in Kinbasket Reservoir	Schedule A, Clause 2(c)	Jan 25, 2008	Feb 26, 2008	Oct 22, 2008	Dec 10, 2008
CLBMON-11B Wildlife Effectiveness Monitoring of Revegetation and Wildlife Physical Works in the Arrow Lakes Reservoir	Schedule C, Clause 5(a); Schedule D, Clause 2(a)	Apr 03, 2009	May 11, 2009		
CLBMON-12 Arrow Lakes Reservoir Monitoring of Revegetation Efforts and Vegetation Composition Analysis	Schedule C, Clause 2(a) (b); Schedule D, Clause 2(b) (c)	Jan 25, 2008	Mar 03, 2008	Sep 17, 2010	Oct 26, 2010
CLBMON-13 Inventory of Mosquito Populations in the Revelstoke Area	Schedule C, Clause 5(b)	Jan 25, 2008	Feb 26, 2008		
CLBMON-33 Arrow Lakes Reservoir Inventory of Vegetation Resources	Schedule C, Clause 2(b) Schedule D, Clause 2(c)	Apr 04, 2007	Apr 19, 2007	Jan 12, 2009	Apr 08, 2009
CLBMON-35 Arrow Lakes Reservoir Plant Response to Inundation	Schedule C, Clause 2(c); Schedule D, Clause 2(d)	Jan 25, 2008	Apr 08, 2008	Feb 02, 2009	Mar 26, 2009
CLBWORKS-1 Kinbasket Reservoir Revegetation Program Physical Works	Schedule A, Clause 1(a)	Apr 27, 2007	May 03, 2007	Jun 26, 2012	Jul 13, 2012
CLBWORKS-2 Arrow Lakes Reservoir Revegetation Program Physical Works (Phase 1)	Schedule C, Clause 1(a); Schedule D, Clause 1(a)	Apr 27, 2007	May 03, 2007		
CLBWORKS-2 Arrow Lakes Reservoir Revegetation Program Physical Works (Phase 2)	Schedule C, Clause 1(a); Schedule D, Clause 1(a)	Feb 26, 2008	Apr 23, 2008		
CLBWORKS-2 Arrow Lakes Reservoir Revegetation Program Physical Works (Phase 3)	Schedule C, Clause 1(a); Schedule D, Clause 1(a)	Jul 06, 2010	Aug 10, 2010		
CLBWORKS-2 Arrow Lakes Reservoir Revegetation Program Physical Works (Phase 4)	Schedule C, Clause 1(a); Schedule D, Clause 1(a)	Feb 18, 2013			

3 Schedule

The following table (Table 3-1) outlines the current schedule for the monitoring programs and physical works being delivered for the Kinbasket and Arrow Reservoir Revegetation Management Plan WUP.

Table 3-1: Table of WUP Schedule

Monitoring Programs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	WLR YR1	WLR YR2	WLR YR3	WLR YR4	WLR YR5	WLR YR6 Interim Review	WLR YR7	WLR YR8	WLR YR9	WLR YR10	WLR YR11	WLR YR12	WLR YR13 Final Review
CLBMON-9 Kinbasket Reservoir Monitoring of Revegetation Efforts and Vegetation Composition Analysis		✓	✓		✓		■		■		■		
CLBMON-10 Kinbasket Reservoir Inventory of Vegetation Resources	✓	✓		✓		✓		■		■			
CLBMON-11A Wildlife Effectiveness Monitoring of Revegetation in Kinbasket Reservoir		✓	✓	✓			■	■		■		■	
CLBMON-11B Wildlife Effectiveness Monitoring of Revegetation in the Arrow Lakes Reservoir			✓	✓	✓	■	■	■	■	■	■	■	■
CLBMON-12 Arrow Lakes Reservoir Monitoring of Revegetation Efforts and Vegetation Composition Analysis		✓	✓		✓		■		■		■		
CLBMON-13 Inventory of Mosquito Populations in the Revelstoke Area			✓										
CLBMON-33 Arrow Lakes Reservoir Inventory of Vegetation Resources	✓	✓		✓		✓		■		■			
CLBMON-35 Arrow Lakes Reservoir Plant Response to Inundation								■	■	■	■	■	
Physical Works													
CLBWORKS-1 Kinbasket Reservoir Revegetation Program Physical Works	✓	✓	✓	✓	✓	x		■	■	■			
CLBWORKS-2 Arrow Lakes Reservoir Revegetation Program Physical Works	✓	✓	✓	✓	✓		■						
Legend:	■	=	Program to be undertaken/initiated in identified year										
	u/w	=	Project is underway										
	✓	=	Program completed for the year										
	x	=	Program started, but encountered operational or hydrological delays										

4 Monitoring Programs and Physical Works Terms of Reference

The Monitoring Programs and Physical Works being implemented under the Kinbasket and Arrow Reservoir Revegetation Management Plan WUP are described in Terms of Reference. These Terms of Reference and the reports for work completed to date can be found here:

http://www.bchydro.com/about/sustainability/conservation/water_use_planning/southern_interior/columbia_river/kinbasket-revegetation.html

5 Summary of Monitoring Programs

5.1 CLBMON-9 Kinbasket Reservoir Monitoring of Revegetation Efforts and Vegetation Composition Analysis

5.1.1 Status

This monitoring program was initiated in 2008 and will be carried out every other year over 10 years. No report is attached as the project did not implement in 2012 and the previous reports have already been submitted.

5.2 CLBMON-10 Kinbasket Reservoir Inventory of Vegetation Resources

5.2.1 Status

This monitoring program was initiated in 2007 and will be carried out over every other year over 10 years. Attached is the report for Year 4 dated February 19, 2013.

5.3 CLBMON-11A Wildlife Effectiveness Monitoring of Revegetation in Kinbasket Reservoir

5.3.1 Status

This monitoring program was initiated in 2008 and will be carried out periodically over 10 years. Attached is the report for Year 4 dated October 2011.

The last two years of implementation have been limited to pellet plot surveys as this kind of data is best collected annually; however due to resource constraints full implementation of this project was deferred from 2012 to 2013.

5.4 CLBMON-11B Wildlife Effectiveness Monitoring of Revegetation and Wildlife Physical Works in the Arrow Lakes Reservoir

5.4.1 Status

This monitoring program was initiated in 2009 and will be carried out over 10 years. The program is divided into 4 modules. Attached is the 11B1 report for Year 3 dated April 17, 2012; the 11B2 report for Year 3 dated October 2011; and, the 11B4 report for Year 2 dated April 11, 2012.

5.5 CLBMON-12 Arrow Lakes Reservoir Monitoring of Revegetation Efforts and Vegetation Composition Analysis

5.5.1 Status

This monitoring program was initiated in 2008 and will be carried out periodically over 10 years. Attached is the report for Year 3 dated January 31, 2012. The Addendum for Rev 5 report for this project for Year 1 dated May 2012 is also attached.

5.6 CLBMON-13 Inventory of Mosquito Populations in the Revelstoke Area

5.6.1 Status

This monitoring program was initiated in 2009 and is complete.

5.7 CLBMON-33 Arrow Lakes Reservoir Inventory of Vegetation Resources

5.7.1 Status

This monitoring program was initiated in 2007 and will be carried out periodically over 10 years. Attached is the report for Year 4 dated November 2012.

5.8 CLBMON-35 Arrow Lakes Reservoir Plant Response to Inundation

5.8.1 Status

Due to resource constraints, this monitoring program has been delayed. It is planned for implementation in 2014 and will be carried out over 5 years.

6 Summary of Physical Works

6.1 CLBWORKS-1 Kinbasket Reservoir Revegetation Program Physical Works

6.1.1 Status

This physical works was initiated in 2007 and will be carried out over 10 years.

Due to high water and surcharge conditions on the Kinbasket, planting for 2012 was deferred and the sedge seedlings were grown out to the next cell size for planting in a future year. These sedge seedlings will be planted either in the Kinbasket under CLBWORKS-1 or in Arrow Reservoir under CLBWORKS-2 Phase 4A (see below) in 2013 depending on which water elevation forecast presents the most favorable planting conditions.

6.2 CLBWORKS-2 Arrow Lakes Reservoir Revegetation Program Physical Works

6.2.1 Status

This physical works was initiated in 2007 and will be carried out over 10 years.

No planting occurred on Arrow Reservoir in 2012. TOR for Phase 4A has been submitted to the Water Comptroller for approval. If Arrow Reservoir has more favorable planting conditions forecasted for 2013 than the Kinbasket, the sedge seedlings from CLBWORKS-1 will be planted in the Arrow Reservoir.

7 Monitoring Programs and Physical Works Costs

The following table summarizes the Kinbasket and Arrow Reservoir Revegetation Management Plan WUP monitoring programs and physical works costs approved by the Comptroller and the Actual Costs to January 31, 2013.

Table 7-1: Kinbasket and Arrow Reservoir Revegetation Management Plan WUP Monitoring Programs and Physical Works Costs

Monitoring Programs	Activity	Costs approved by CWR	Life to Date Actuals (LTD)	Estimated to Complete (Forecast)	Total Forecast (LTD and Forecast)	Variance Total to Approved	Explanation	Corrective Action
Kinbasket and Arrow Revegetation Management Plan Annual Report	OR	\$18,280	\$2,941	\$10,085	\$13,026	\$5,254	Efficiencies found during implementation.	No corrective action.
CLBMON#9 KIN MONITORING OF REVEGETATION EFFORTS	OR	\$946,942	\$378,192	\$501,811	\$880,003	\$66,939	Efficiencies found during implementation.	No corrective action.
CLBMON#9 Direct Management 001	OR	\$105,958	\$48,929	\$32,803	\$81,733	\$24,225		
CLBMON#9 Implementation 002	OR	\$840,984	\$329,262	\$469,008	\$798,270	\$42,714		
CLBMON#10 KIN INVENTORY OF VEGETATION RESOURCES	OR	\$1,320,912	\$767,655	\$463,412	\$1,231,067	\$89,845	Efficiencies found during implementation.	No corrective action.
CLBMON#10 Direct Management 001	OR	\$97,315	\$44,832	\$31,011	\$75,843	\$21,472		
CLBMON#10 Implementation 002	OR	\$1,223,597	\$722,822	\$432,401	\$1,155,224	\$68,373		
CLBMON#11a KIN REVEGETATION WILDLIFE EFFECTIVENESS MONITORING OF REVEGETATION	OR	\$2,186,700	\$774,687	\$1,322,941	\$2,097,628	\$89,072	Efficiencies found during implementation.	No corrective action.
CLBMON#11a Direct Management 001	OR	\$185,103	\$58,431	\$58,608	\$117,039	\$68,064		
CLBMON#11a Implementation 002	OR	\$2,001,597	\$716,256	\$1,264,333	\$1,980,589	\$21,008		
CLBMON#11b ARROW REVEGETATION & WILDLIFE PHYSICAL WORKS	OR	\$4,129,608	\$1,330,535	\$2,798,589	\$4,129,124	\$484	Program is split among 4 modules which increases the direct management costs but is offset by contracting efficiencies	No corrective action.
CLBMON#11b Direct Management 001	OR	\$230,114	\$108,850	\$145,903	\$254,753	(\$24,639)		
CLBMON#11b Implementation 002	OR	\$3,899,494	\$1,221,685	\$2,652,686	\$3,874,371	\$25,123		
CLBMON#12 OR ARROW REVEGETATION MONITORING AND VEGETATION COMPOSITION ANALYSIS	OR	\$655,495	\$297,359	\$338,168	\$635,527	\$19,968	Efficiencies found during implementation.	No corrective action.
CLBMON#12 Direct Management OR 001	OR	\$97,818	\$52,031	\$40,202	\$92,233	\$5,585		
CLBMON#12 Implementation OR 002	OR	\$557,677	\$245,328	\$297,966	\$543,294	\$14,383		
CLBMON#12 ONR ARROW REVEGETATION MONITORING AND VEGETATION COMPOSITION ANALYSIS	ONR	\$83,822	\$24,472	\$53,989	\$78,461	\$5,361	Efficiencies found during implementation.	No corrective action.
CLBMON#12 Direct Management ONR 001	ONR	\$12,509		\$0	\$0	\$12,509		
CLBMON#12 Implementation ONR 002 - REV 5	ONR	\$71,313	\$24,472	\$53,989	\$78,461	(\$7,148)		
CLBMON#13 MID COL MONITORING: MOSQUITO POPULATIONS	OR	\$111,650	\$86,894		\$86,894	\$24,756		
CLBMON#13 Direct Management 001	OR	\$26,962	\$25,622		\$25,622	\$1,340		
CLBMON#13 Implementation 002	OR	\$84,688	\$61,273		\$61,273	\$23,415		
CLBMON#33 OR ARROW INVENTORY VEGETATION	OR	\$1,437,358	\$927,166	\$509,561	\$1,436,727	\$631		
CLBMON#33 Direct Management OR 001	OR	\$89,191	\$58,675	\$26,902	\$85,577	\$3,614		
CLBMON#33 Implementation OR 002	OR	\$1,348,167	\$868,491	\$482,659	\$1,351,150	(\$2,983)		
CLBMON#33 ONR ARROW INVENTORY VEGETATION REV 5	ONR	\$41,154	\$18,669	\$21,845	\$40,513	\$641		
CLBMON#33 Direct Management ONR 001 REV 5	ONR			\$0	\$0	\$0		
CLBMON#33 Implementation ONR 002 - REV 5	ONR	\$41,154	\$18,669	\$21,845	\$40,513	\$641		
CLBMON#35 ARROW PLANT RESPONSE TO INUNDATION	OR	\$297,322	\$7,838	\$269,642	\$277,479	\$19,843	Efficiencies found during implementation.	No corrective action.
CLBMON#35 Direct Management 001	OR	\$73,186	\$7,838	\$45,506	\$53,343	\$19,843		
CLBMON#35 Implementation 002	OR	\$224,136		\$224,136	\$224,136	\$0		
CLBWORKS#1 KINBASKET: REVEGETATION 1800/1500	OR	\$2,668,277	\$1,649,017	\$1,010,983	\$2,660,000	\$8,277	Efficiencies found during implementation.	No corrective action.
CLBWORKS#1 Direct Management 001	OR	\$198,883	\$98,826	\$96,174	\$195,000	\$3,883		
CLBWORKS#1 Implementation 002	OR	\$2,469,394	\$1,550,191	\$914,809	\$2,465,000	\$4,394		
CLBWORKS#2 ARR & MID COL: REVEGETATION - Phase 1	OR	\$142,450	\$136,476		\$136,476	\$5,974		
CLBWORKS#2 PH1 Direct Management 001	OR	\$37,732	\$35,077		\$35,077	\$2,655		
CLBWORKS#2 PH1 Implementation 002	OR	\$104,718	\$101,400		\$101,400	\$3,318		
CLBWORKS#2 ARR & MID COL: REVEGETATION - Phase 2	OR	\$1,636,415	\$1,638,480		\$1,638,480	(\$2,065)		
CLBWORKS#2 PH2 Direct Management 001	OR	\$46,846	\$40,955		\$40,955	\$5,891		
CLBWORKS#2 PH2 Implementation 002	OR	\$1,589,569	\$1,597,525		\$1,597,525	(\$7,966)		
CLBWORKS#2 ARR & MID COL: REVEGETATION - Phase 3	OR	\$440,867	\$388,492		\$388,492	\$52,375		
CLBWORKS#2 PH3 Direct Management 001	OR	\$19,078	\$21,050		\$21,050	(\$1,972)		
CLBWORKS#2 PH3 Implementation 002	OR	\$421,789	\$367,442		\$367,442	\$54,347		
OR - Ordered Remissible								
ONR - Ordered Non-Remissible								