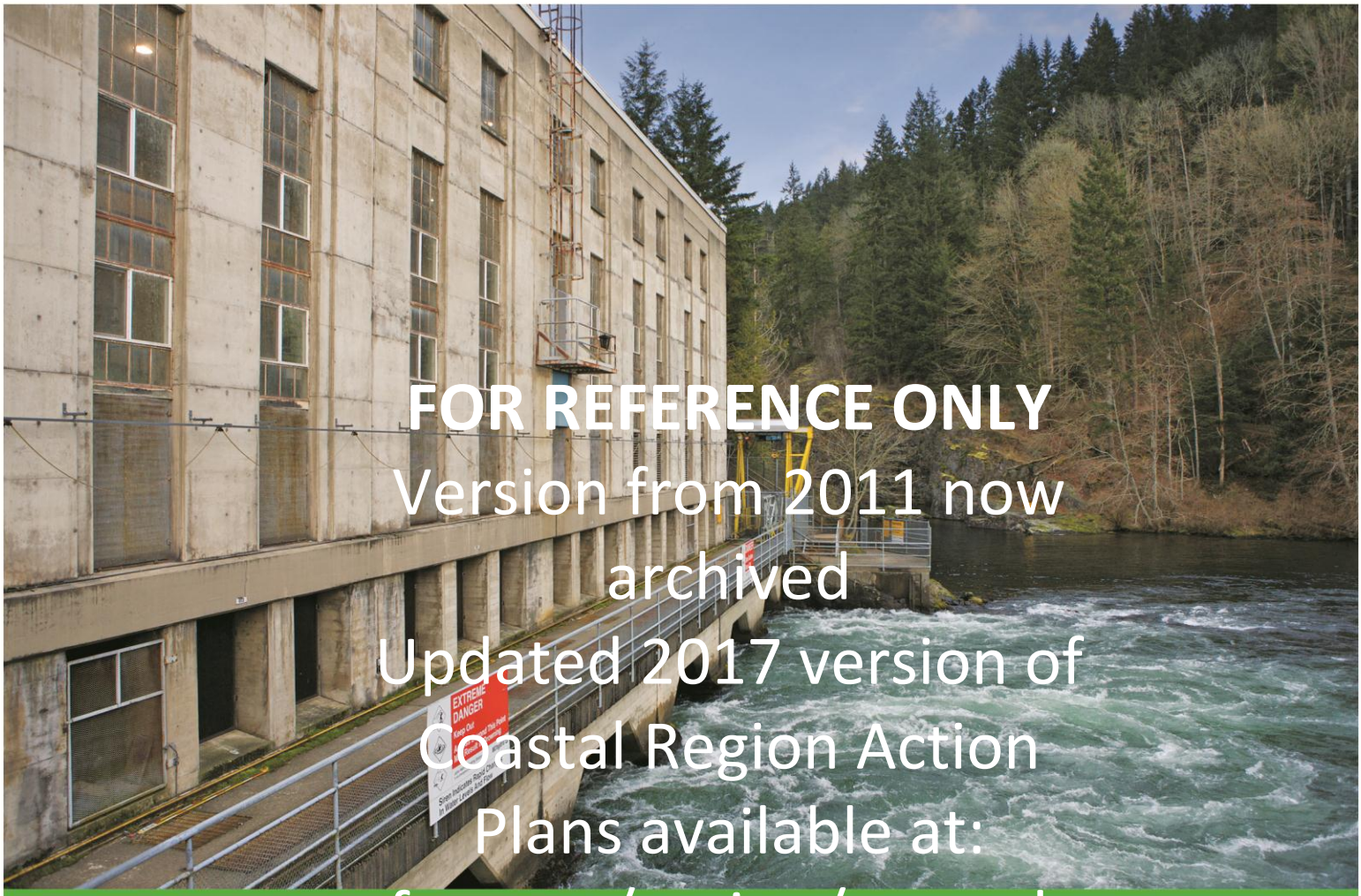

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FISH AND WILDLIFE COMPENSATION PROGRAM

CAMPBELL RIVER WATERSHED

RIPARIAN AND WETLANDS ACTION PLAN

FINAL DRAFT

The FWCP is a partnership of:

BC hydro FOR GENERATIONS

BRITISH COLUMBIA

Canada

Fisheries and Oceans Canada

Pêches et Océans Canada

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Campbell River Riparian and Wetlands Action Plan

1. INTRODUCTION

The Fish and Wildlife Compensation Program (FWCP): Coastal Region evolved from its origin as the Bridge-Coastal Restoration Program (BCRP), a program initiated voluntarily by BC Hydro in 1999 to restore fish and wildlife resources that were adversely affected by the footprint of the development of hydroelectric facilities in the Bridge-Coastal generation area. Footprint impacts include historical effects on fish and wildlife that have occurred as a result of reservoir creation, watercourse diversions and the construction of dam structures.

In 2009, the program developed a strategic framework that guides overall planning for compensation investments (MacDonald, 2009). The framework has guided the development of strategic plans for each watershed within the FWCP program area, which are in turn informing action plans that focus on specific priorities within each watershed (Figure 1).

This Riparian and Wetlands Action Plan sets out priorities for the Fish and Wildlife Compensation Program to guide projects in the Campbell River project area. It identifies actions to be undertaken in the Campbell, Heber, Salmon and Quinsam watersheds, which are collectively referred to here as the Campbell system. The plan builds on the FWCP's strategic objectives and the Campbell River Watershed Plan (FWCP, 2011). Action plans have also been developed for species of interest and salmonids; and some actions may be complementary across the different plans.

The actions and priorities outlined in this plan have been identified through a multi-stage process involving BC Hydro, Fisheries and Oceans Canada (DFO), Canadian Wildlife Service (CWS), Ministry of Environment (MOE), local First Nations, and local communities. Initial priorities were developed through consultation with agency staff. These priorities were then reviewed and discussed at a workshop[1] to allow First Nations, public stakeholders, and interested parties to comment and elaborate on the priorities.

It is important to understand, however, that planning priorities within action plans may not translate immediately into funded projects. Limited program funding requires that priority-setting has to also be developed across the program as a whole, not just within action plans. The process of selecting which actions will be implemented in any given year will occur during the annual implementation planning cycle.

[1] Campbell River, 28 May 2009.

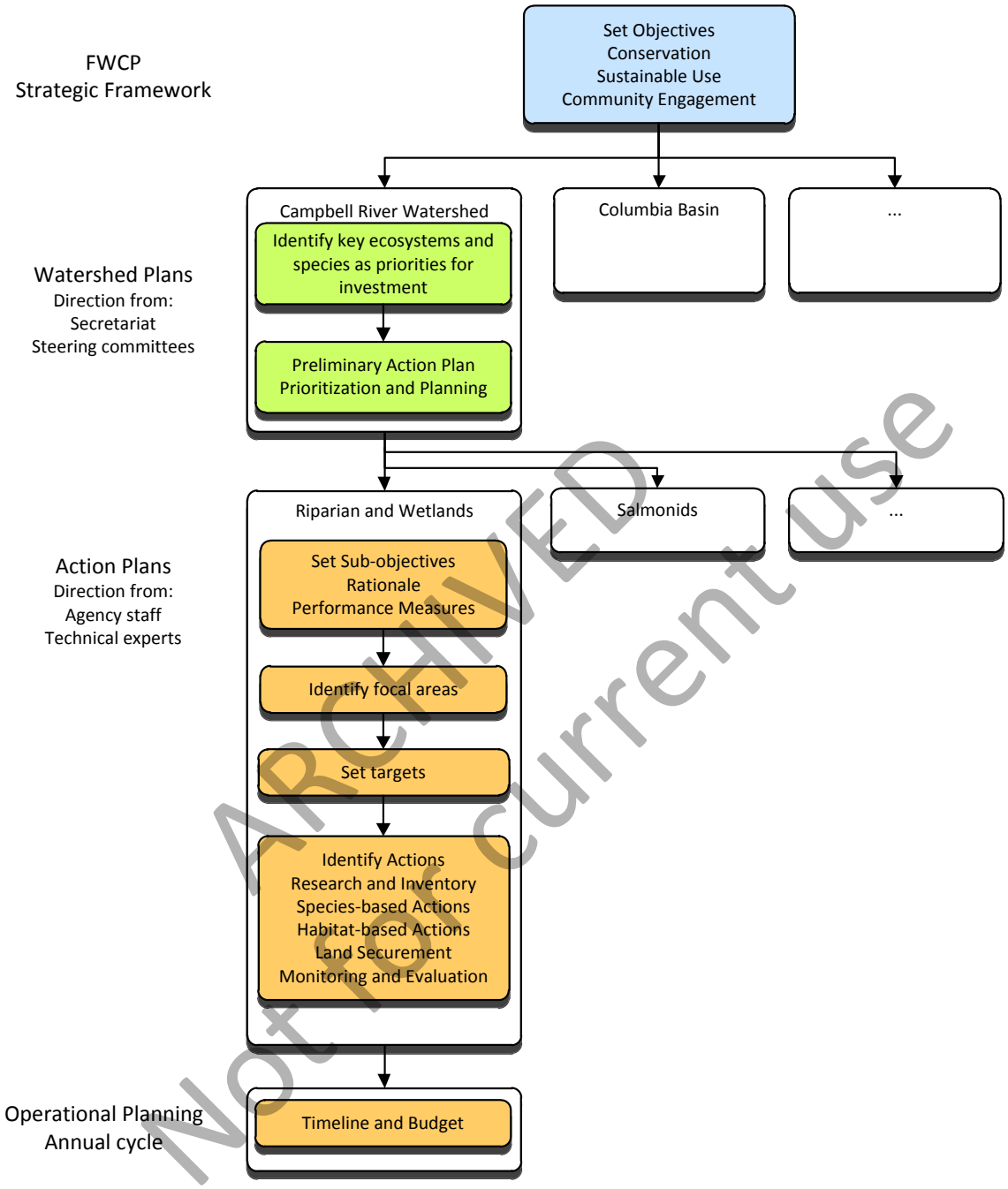

Figure 1: Relationship between the Riparian and Wetlands Action Plan and higher level planning and objectives.

2. OVERVIEW CONTEXT

The Campbell system, including the upper sub-basins of the Heber, Salmon and Quinsam, straddles the Vancouver Island mountain range near the town of Campbell River (Figure 2). Elevations range from sea level in the Campbell and Salmon river estuaries to rugged peaks with small areas of permanent snowpack over 2200 m. Inflows are typical of British Columbia coastal basins, with high inflows from snowmelt in May through July, low flows in August and September and high precipitation from October to March with mixtures of snow and heavy rain. The average precipitation in November is 420mm, but may reach 800mm. A more detailed explanation of the system and the hydro facilities can be found in BC Hydro (2000).

The Campbell River system lies within the traditional territory claimed by the Mowachaht/Muchalaht First Nation and Hamalta First Nations. The Lower Campbell River flows through the community of Campbell River before discharging into the Georgia Strait. The Upper Campbell River watershed lies within Strathcona Provincial Park and adjoins the Upper Puntledge River and Ash River watersheds.

The Campbell River hydro-electric development consists of three dams on the Campbell mainstem and one diversion on each of the Salmon, Quinsam and Heber rivers. On the mainstem, John Hart Dam (1953), is the lowermost facility, impounds John Hart Reservoir and diverts water to a powerhouse located 2km downstream of Elk Falls. John Hart has the lowest discharge capacity (124 m^3/s) and the system is usually operated to optimise production at its generating station. The local basin area behind John Hart Dam is relatively small, only 24 km^2, and inflows are dominated by upstream releases.

Ladore Dam (1958) is the middle facility, which impounds Lower Campbell Lake Reservoir, and has a powerhouse adjacent to the dam with a discharge capacity of161.5 m^3/s. The terrain consists of rolling heavily forested hills, the mean basin elevation is 250 m and the local basin area behind Ladore Dam is 243 km^2. Inflows a primarily influenced by upstream releases at Strathcona Dam, and from diversions from the Salmon and Quinsam rivers.

Strathcona Dam (1958) is the uppermost facility, impounds Upper Campbell Reservoir and Buttle Lake, and has a powerhouse located at the toe of the dam with a discharge capacity of 175.6 m^3/s. The upper most reservoir was formed by impounding Upper Campbell and Buttle lakes, and is about 50 km long and up to 5 km wide. The creeks feeding the reservoir tend to be short and steep. The Elk River sub-basin contains the longest watercourse, which is 24 km long and falls roughly 760 m. The mean basin elevation is 950 m and the basin area is 1192 km^2. Natural hydraulic inflows from the basin are augmented by diverting water from the Heber River. During periods of high inflow when it is necessary to control rising levels in Upper Campbell Lake, Strathcona discharges are often increased to 175.6 m^3/s resulting in spills at the Ladore and John Hart facilities.

The Salmon River Dam diverts water from the upper Salmon River and Paterson Creek into Brewster, Gray, Whymper and Fry lakes and then into Lower Campbell Lake. The Salmon diversion contributes to power generation both at the Ladore and John Hart power stations.

The Quinsam project includes the Quinsam Dam at the outlet of Wokas Lake and a diversion dam further downstream on the Quinsam River. Water is diverted through Gooseneck and Snakehead lakes, Miller Creek and into Lower Campbell Lake Reservoir. The Quinsam diversion contributes to power generation at both Ladore and John Hart power stations.

The Heber River Dam diverts water from the upper Heber River into Crest Lake then through the Drum lakes into the Elk River, which enters Upper Campbell Lake Reservoir. Crest Creek, a former tributary to Heber River, is also diverted into the Drum lakes. The Heber-Crest diversion contributes to power generation at all three power stations on the Campbell mainstem.

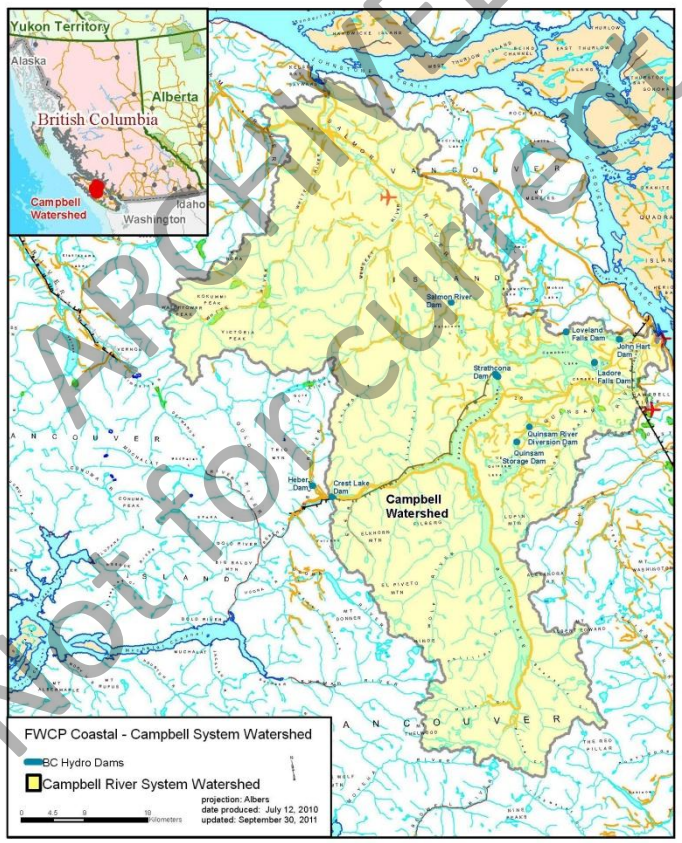

Figure 2. The Campbell River hydropower project.

2.1 IMPACTS AND THREATS

Fish and Wildlife habitat and species have been significantly altered due to the construction of the dams, the development of hydro-power, and alterations in the hydraulic regimes of the systems. The following summary of the primary footprint impacts is derived from:

- Bridge-Coastal Restoration Program: Strategic Plan, Volume 2: Watershed Plans, Chapter 2: Campbell River (December 2000);
- Campbell River Water Use Plan Consultative Committee Report (August, 2004); and
- Findings in the Community Workshop (Campbell River, May 28, 2009).

Hydro-related Impacts — All dams in the Campbell system were constructed upstream of anadromous fish barriers, but construction affected habitats for resident stocks and operations affect both upstream and downstream habitats. The impacts that occurred are based on location in the watershed as follows:

Upstream of Strathcona Dam (Upper Campbell Reservoir and Buttle Lake).

1. The impoundment flooded:
    - 3583 ha of lake,
    - 3186 ha of land,
    - 252 ha of mainstem channel and 143 ha of adjacent riparian area,
    - 21 km of tributary habitat and 65 ha of adjacent riparian area, and
    - 695 ha of wetland.
2. Annual drawdowns reduce littoral productivity and affects vegetation and riparian development, as well as posing threats to nesting birds.
3. Increased lake size has created a barrier to the movement of animals, potential for increased mortality/predation along the margins.

Upstream of Ladore Dam to Strathcona Dam (Lower Campbell Reservoir).

4. The impoundment flooded:
    - 934 ha of lake,
    - 1676 ha of land,
    - 81 ha of mainstem channel and 77 ha of adjacent riparian area,
    - 20 km of tributary habitat and 61 ha of adjacent riparian area, and
    - 241 ha of wetland.
5. Annual drawdowns reduce littoral productivity and affects vegetation and riparian development, as well as posing threats to nesting birds. Annual fluctuations are considerably less than in Upper Campbell Reservoir.
6. Structures and operations may pose a hazard to wildlife.
7. The flooding of the mainstem poses barriers to migration.

8. High flushing rate through Lower Campbell Reservoir reduces littoral and wetland productivity.

Upstream of John Hart dam to Ladore dam (John Hart Reservoir).

9. The impoundment flooded:
    - 346 ha of land,
    - 62 ha of mainstem channel and 60 ha of adjacent riparian area, and
    - 4 km of tributary habitat and 11 ha of adjacent riparian area.
10. High flushing rate through John Hart Reservoir reduces littoral productivity.

Lower Campbell River.

11. Water diversions and occasional spills alter habitat characteristics in this reach.
12. The structures (including the 2.8 km flume) have inhibited movement of animals and has even resulted in drowning. Alteration of habitat along flume has also affected wildlife.
13. Spills induce adult steelhead to move upstream into the canyon past the tail race and become stranded when spills cease. Flows now being released as part of the Water Use Plan may mitigate this effect.
14. The modified flow has an unknown effect on riparian vegetation and estuary habitat.

Heber Diversion

15. The Heber Dam footprint led to losses of instream and riparian habitat.
16. Increased flows in the receiving channels changed channel hydraulics, with possible negative and positive effects.
17. The Crest diversion dewatered a tributary of the Heber River, with unknown effects.

Quinsam Diversion

18. The Quinsam Diversion Dam footprint led to losses of instream and riparian habitat, and some loss of spawning habitat.
19. The Diversion Dam reduced gravel and LWD recruitment to downstream habitats.
20. Reduced flows have had potential affect on related wildlife such as water fowl, furbearers, and elk.

Salmon Diversion

21. The Salmon Diversion Dam footprint led to losses of instream and riparian habitat.
22. The dam reduced gravel and LWD recruitment to downstream habitats.
23. Reduced flows have had potential affect on related wildlife such as water fowl, furbearers, and elk.

Non-Hydro Impacts — Other impacts on wetlands in the Campbell system include historic effects of logging, dyking and channellling and urbanization. A significant portion of the upper watershed is protected within Strathcona Provincial Park. Historic logging in the Elk watershed has increased the rate of sediment delivery to the main channel, and has contributed to channel instability in the Elk River. Logging is also implicated in increased debris and sediment delivery to the upper Salmon River.

2.2 LIMITING FACTORS

The limiting factors for wetland and riparian areas are predominantly related to extent of the available habitat, connectivity and distribution of the habitat, and its productivity.

1. Extent

The contribution of riparian and wetland habitats to broader ecological function is predominantly limited by the extent of the habitats on the land base. Habitats are lost through inundation and conversion to other land uses, and often detrimental fluctuations in water levels.

2. Distribution

Connectivity among riparian and wetland habitats, and between these habitats and other habitats and features, are important for dispersal of plants and animals and for seasonal movements of some species. Wetland and riparian habitats that are isolated will likely have decreased diversity to those which experience a healthy connectivity between areas. Distribution is therefore related not only to the extent of healthy riparian and wetland habitats, but also to adjacent land uses.

3. Productivity

Even where riparian and wetland habitats are adequately represented and connected, there are several factors that can affect their productivity:

- Hydrologic conditions such as water level variability and flow rates are among the most important variables driving riparian and wetland habitat development, structure, functioning and persistence (National Research Council 2001). Hydrologic conditions also influence the extent and distribution of habitats. For example reduced peak flows in a river, due to

regulation, result in succession to upland habitat types. Also, Extreme fluctuations both in timing and extend, such as in a drawdown zone of reservoirs, can reduce the ability of plant communities to be established and thus the establishment of wetlands.

- Stressors such as invasive species or disruptive human access can affect community structure and function.
- Loss of specific habitat features can affect life requisites of specific species, e.g., dense nesting cover for waterfowl, suitable tree cavities for nesting owls or waterfowl, loafing sites to turtles.
- Poorly understood factors limit the productivity of created wetlands. These are generally thought to be related to unnatural hydrologic regimes, soil conditions, and/or cattle grazing (e.g., Atkinson et al. 2010).

2.3 TRENDS AND KNOWLEDGE STATUS

HABITAT TRENDS

Basin-wide trends in the abundance, distribution and productivity of riparian and wetland habitats have not been compiled (other than direct BC Hydro footprint impacts). The area of inundation has not increased since dam construction, but the productivity of adjacent habitats has continued to be affected, either directly or indirectly as a result of BC Hydro operations. No significant riparian or wetland development has been undertaken by FWCP partners or other organisations in the region.

Significant changes include:

- Unknown loss of habitat from conversion to other land uses or succession to different habitat types; and,
- Deterioration in productivity from hydrology changes and stressors such as invasive species.

Riparian and wetland habitat losses can be monitored via remote sensing, air photo interpretation or ground reconnaissance. Assessing deterioration in habitat productivity is more difficult.

KNOWLEDGE GAPS

Some habitat mapping has been completed for species specific activities, including owls and amphibians. In most cases there is limited knowledge regarding the abundance, location and productivity of either riparian areas or wetlands in the Campbell River Area.

3. ACTION PLAN OBJECTIVES, MEASURES AND TARGETS

Clear and realistic management objectives are necessary to guide information acquisition and prioritize management actions. Priority actions and information needs will change as both improvements to the system are realized and information is gained. The current plan reflects the information available and values expressed by stakeholders (FWCP partners, First Nations and local communities) through reports, interviews and regional workshops held between 2009 and 2011.

3.1 OBJECTIVE SETTING

The following terminology is used in this report.

Objectives:	Objectives are high-level statements of desired future conditions (outcomes), consistent with FWCP partner mandates and policies.
Sub-objectives and Status Indicators:	Sub-objectives are detailed statements of desired future conditions within objectives, from which status indicators can be derived and alternative management actions evaluated. Sub-objectives and indicators provide the details necessary to translate policy into actions and to evaluate their consequences. They may be arranged hierarchically within objectives, and usually indicate conditions necessary to attain the objective to which they refer.
Measures:	Measures are specific metrics whose values indicate the degree to which desired future conditions have been achieved. They can be either qualitative or quantitative. There is a preference to develop the latter where possible for ease of monitoring.
Targets:	Targets are the values of measurable items that indicate the attainment of a desired condition. In the current context these may be expressed as a single value or as a range to acknowledge the inherent variability of ecosystems.
Actions:	Management actions, plans or policies for achieving the objectives.

Objectives are the “ends” or the outcomes we ultimately care about. Actions are the “means,” or the things we do to achieve them. This report focuses on describing the actions required to achieve the objectives in relation to riparian and wetland species and habitats. Complementary actions may also be identified in the separate Species of Interest Action Plan.

There are three general categories of riparian and wetland habitats defined for setting objectives:

Category 1 Natural riparian or wetland habitat:	Largely intact ecosystems with natural disturbances sufficient to maintain subclimax communities and processes characteristics of wetlands and riparian ecosystems.
Category 2 Disclimax or degraded wetland or riparian habitat, or creation of habitat	Formerly natural wetland or riparian ecosystems that have lost most or all of their natural disturbance regime and are no longer functioning effectively as wetland or riparian habitat. These areas are candidates for restoration or creation or wetlands.
Category 3 Restored or created riparian or wetland habitat:	Ecosystems resulting from water impoundments, diversions or other artificial disturbances that require active management to maintain productivity and function.

The categories contrast different levels of ecosystem function that require different management approaches. Note that there are no category 3 wetlands in the Campbell Watershed system at this time.

3.2 OBJECTIVES, MEASURES AND TARGETS

There are two riparian and wetlands management objectives for the Campbell River system as a whole.

Objective 1. **Ensure productive and diverse wetland and riparian ecosystems.**

Rationale — This objective addresses overall ecosystem integrity and directs compensation activities to develop productive, useable habitats. Riparian and wetland areas have been heavily impacted by the creation of dams, and continue to be severely degraded in the remaining areas. They may be the limiting factor for many species, including fish, which depend upon them, either for the majority of their lifecycles or for key periods such breeding. Riparian and wetland areas are the most diverse and biologically rich terrestrial ecosystems in BC and are considered as highly valuable from an ecological standpoint. They are often critical in terms of maintaining function and structure for natural system, including helping to support trophic level functioning, genetic diversity, as well as providing key ecological services such as erosion control, flood control and assimilation of nutrients.

To date, FWCP has not significantly funded restoration of riparian areas or wetlands in the Campbell watershed. However, these areas have a high restoration potential and would benefit from restoration activities.

This objective is supported by three sub-objectives:

Sub-objective 1: Secure remaining Category 1 riparian and wetland habitat.

Rationale —Wetland and riparian areas can be heavily impacted by conversion to other lands uses, such as agriculture development or forestry, amongst others. Securing remaining habitat to prevent loss is very important. Habitat is considered secure if it is protected from conversion to other land use, for example by purchasing the land or negotiating a covenant agreement.

As opportunities in the Campbell system may be limited, consideration could also be given to secure off-site category 1wetlands that would help compensate losses in the Campbell system. In dollar terms and effort there may be more effective opportunities off-site to provide compensation for habitat losses.

Measure — Hectares (or percentage) of Category 1 riparian and wetland habitat secured or conserved over a 5 year period.

Targets — Specific targets will be developed as part of the action plan implementation as current areas are not known.

Sub-objective 2: Reduce threats to Category 1 riparian and wetland habitat.

Rationale — Wetlands and riparian areas are subject to a variety of threats both internally and externally. Many naturally functioning riparian and wetland habitats (Category 1) can benefit from management actions that reduce specific threats (e.g., treatment for invasive species, access control, forestry in adjacent areas etc.).

Measure — Hectares (or percentage) of Category 1 riparian and wetland habitat improved annually.

Targets — Specific targets will be developed as part of the action plan implementation as current areas are not known.

Sub-objective 3: Restore degraded or create new riparian and wetland habitat (Category 2).

Rationale — While conservation of existing high quality habitat is always preferable, category 1 habitat may be limited or the opportunities for conservation are difficult. Restoration opportunities may be more available in areas where changes in water regime have altered successional pathways in pre-existing riparian and wetland ecosystems. Typically the regime in managed watersheds becomes more stable. Riparian and wetland ecosystems require the disturbances caused by fluctuating water levels to maintain their productivity. When these disturbances are reduced or eliminated, riparian and wetland ecosystems transition to other ecosystem types. Projects can be designed to restore the

original ecological function of these areas, or to create new riparian or wetland habitats that differ from what was present historically, but still represent an improvement in function.

Measures — Hectares of riparian and wetland habitat that are restored of created over 5 year period.

Targets — Specific targets will be developed as part of the action plan implementation as current areas are not known.

Objective 2. Maintain or improve opportunities for sustainable use.

Rationale — Many wetland and riparian species are the focus of sustainable use activities by First Nations and non-first nations people. For example some riparian and wetland dependant species are hunted (e.g., elk) while bird and wildlife viewing is also a popular recreational use in the watershed. Consequently, any actions aimed at achieving the above objectives indirectly support this sustainable use objective. Although there are no direct actions aimed at improving sustainable use at this time, it is conceivable that projects aimed at generally improving opportunities for sustainable use activities could be identified by the program partners in the future.

Measures and Targets — There are no specific measures or targets required at this time aside from those associated with the above objectives.

As part of their overall management responsibilities, MOE periodically collects information regarding abundance trends, hunter reports, catch per unit effort (CPUE) and number of hunting licences sold in the region.

4. ACTION PLAN

4.1 OVERVIEW

The Action Plan has several individual actions which are presented in Section 4.2. Some actions support multiple sub-objectives, which in turn support multiple objectives. Figure 3 provides an overview of the link between actions and objectives.

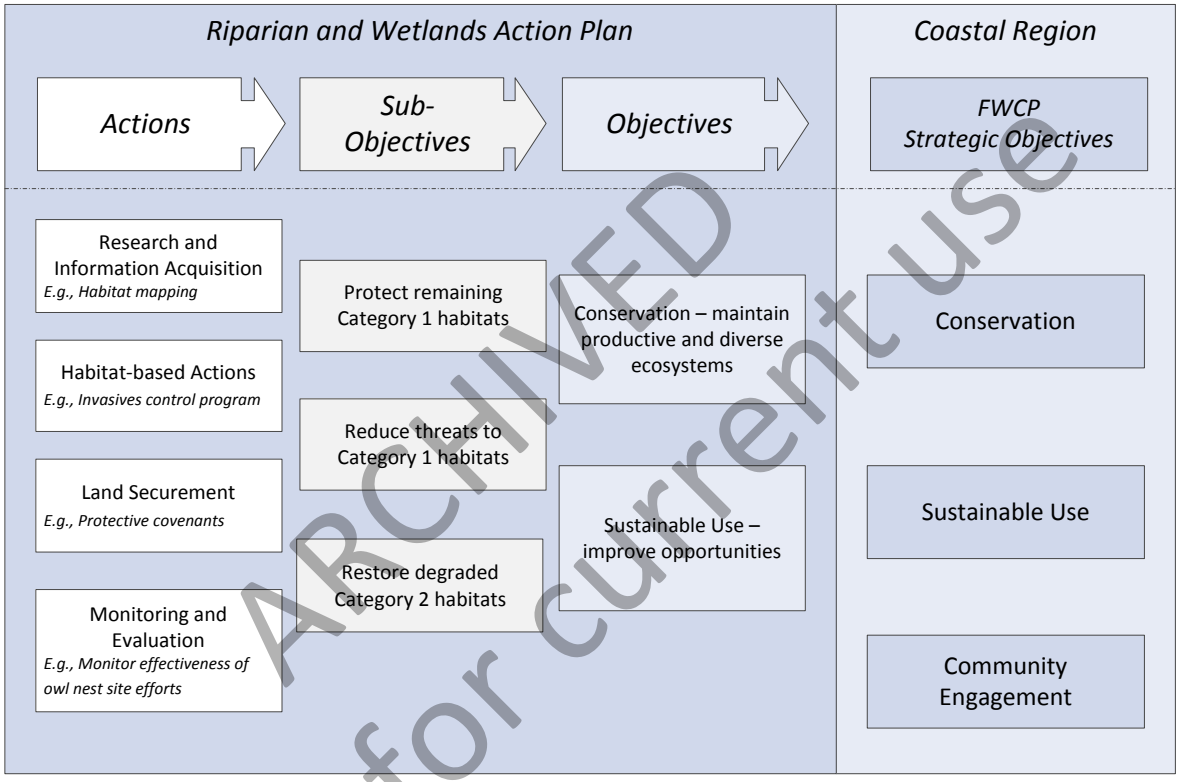

Figure 3: Relationship between actions, sub-objectives and objectives in this Riparian and Wetlands Action Plan and the FWCP strategic objectives in the Campbell River Watershed Plan.

4.2 COMPONENTS

This section presents the main actions identified for riparian and wetland areas in the Campbell River system along with the supporting rationale for why the action is required and what it will achieve (Table 1 below). Currently, there is a dearth of information regarding the extent and distribution of wetlands and riparian areas, as well as the specific species which may utilise them in the Campbell River watershed. Consequently, the initial focus of this action plan is solely on research and information acquisition. At such time as enough information is collected, the action plan should be revisited and updated with opportunities for habitat-based

actions, land securement and monitoring and evaluation. Also provided are priority ratings to guide investment planning efforts. Actions are assigned priorities from 1-3. Note that low priority actions are not included in the table.

Table 1: Actions for wetlands and riparian areas in the Campbell River Watershed

#	Action	Rationale	Priority
	Research and information acquisition		
1	Conduct mapping to determine abundance, distribution, and category of riparian and wetland habitat,	Riparian and wetland habitat is poorly mapped throughout the basin and developing a habitat map is necessary to establish targets for securement and compensation.	1
2	Identify opportunities to secure category 1 areas in the Campbell River system.	Once Category 1 areas have been identified, coherent plans need to be made to secure them. Legal status of different lands must be known to determine appropriate actions for protection.	2
3	Identify opportunities to secure off-site category 1 areas.	There may be more cost effective opportunities off-site.	3
4	Determine threats and potential mitigation strategies to improve category 1 areas	There may be potential threats reducing category 1 area productivity	2
5	Identify opportunities for restoration or creation of category 2 areas.	The Campbell system has been highly regulated and there is likely potential for restoration of degraded areas.	2
	Habitat-based actions		
6	Implement riparian and wetland restoration projects that are identified as high priorities through inventory, mapping or assessment.	Primary target is Category 2 areas.	2

#	Action	Rationale	Priority
	Land securement		
	Monitoring and adaptive management		

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