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FISH AND WILDLIFE
COMPENSATION PROGRAM

STAVE WATERSHED *WATERSHED PLAN* FINAL DRAFT

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Stave Watershed Plan

1 INTRODUCTION

This Stave Watershed Plan sets forth the strategic direction for the Fish and Wildlife Compensation Program: Coastal Region.

It begins by briefly outlining the vision, principles, policy context and strategic objectives that form the foundation of the FWCP. A description of the Stave setting includes an overview of the hydroelectric facilities and footprint impacts created by those facilities.

The priority setting process is described, followed by a short direction-setting synopsis of a set of priority Action Plans. Taken together, this Watershed Plan and the accompanying Action Plans present the FWCP: Coastal priorities for investments in compensation activities within the Stave Watershed.

1.1 FISH AND WILDLIFE COMPENSATION PROGRAM

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 original 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).

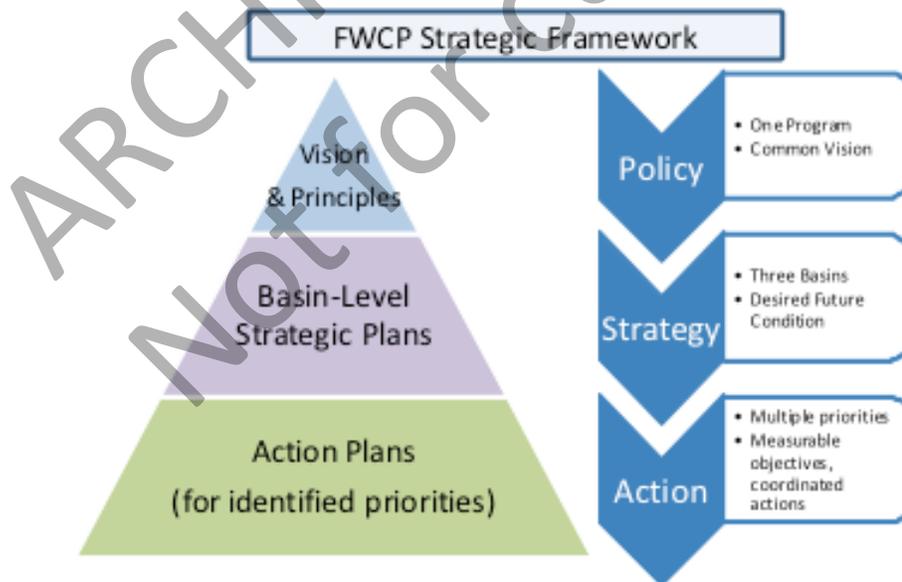


Figure 1: Relationship between the FWCP Strategic Framework, basin strategic plans and action plans.

Delivery of the program as a whole is guided by a vision, set of principles and policy priorities as developed by the program's partners.

VISION

Thriving fish and wildlife populations in watersheds that are functioning and sustainable.

An effective program will support the maintenance of healthy fish and wildlife populations in basins significantly altered by hydroelectric development. Actions taken should satisfy both the conservation and sustainable use objectives and, where possible, restore ecosystem function, making species more resistant to emerging pressures such as climate change.

PRINCIPLES

Approach - The program has a forward-looking, ecosystem-based approach that defines the desired outcomes and takes actions to restore, enhance and conserve priority species and their habitats.

Decision Making - The program efficiently uses its resources and works with its partners to make informed and consensus-built decisions that enable the delivery of effective, meaningful and measurable projects that are supported by the impacted communities.

Geographic Scope - Within the watersheds, basins and ranges of the populations of species affected by generation facilities owned and operated by BC Hydro.

Objectives - The program defines and delivers on compensation objectives that reflect the partnership's collective goals, and that align with local provincial and federal fish and wildlife conservation and management objectives in the areas where we work.

Delivery - The program strives to be a high performing organization with skilled and motivated staff and partners delivering efficient, effective and accountable projects.

PARTNERS

The program is a partnership between BC Hydro, the BC Ministry of Environment, Fisheries and Oceans Canada, First Nations and public stakeholders. Our goal is to have engagement and participation of all the partners in priority setting, approval, review and delivery of the program.

POLICY CONTEXT

The FWCP addresses the policy requirements and social commitments to compensate for impacts to fish and wildlife associated with the development of BCH's generating facilities. The core responsibilities of the agencies are:

Ministry of Environment

The Ministry of Environment manages and delivers a wide range of programs and services that support the Province's environmental and economic goals¹. The Ministry encourages environmental stewardship, develops innovative partnerships, engages First Nations, stakeholders and the public and actively promotes the sustainable use of British Columbia's environmental resources. Within this broader context, the Ministry has a number of responsibilities that are particularly relevant to the development and implementation of actions under the FWCP including:

- Management and conservation of the province's biodiversity;
- Protection of fish, wildlife, species-at-risk and their habitats;

¹ <http://www.bcbudget.gov.bc.ca/2010/sp/pdf/ministry/env.pdf> (MOE Service Plan)

- Protection and restoration of BC's watersheds; and,
- Provision and management of fish and wildlife-based recreation.

A number of policies and plans guide the Ministry in delivering on these goals and objectives. The **Conservation Framework**² is British Columbia's approach for maintaining the rich biodiversity of the province, providing a set of science-based tools and prioritized actions for conserving species and ecosystems in B.C. **Program Plans for Freshwater Fisheries, Wildlife and Ecosystems**³ articulate a clear set of strategies supported by actions to achieve both conservation-based outcomes and the provision of recreational opportunity. **Recovery Strategies and Management Plans** have been developed to guide the maintenance, recovery and/or use of specific species and ecosystems. These plans may include specific performance measures and targets.

Fisheries and Oceans Canada

Under the **Fisheries Act**, DFO is the primary agency responsible for conserving and managing Canada's fisheries, including Pacific salmon. It does so through management and monitoring of fisheries, protection of fish habitat, and pollution prevention. The **Policy for the Management of Fish Habitat** (1986) has an overall objective of 'net gain' of fish habitat and helps guide the implementation of fish habitat protection through collaboration with relevant provincial agencies. The **Species at Risk Act** mandates protection of geographically and genetically distinct populations. The principle goal of the **Wild Salmon Policy**⁴ is "to restore and maintain healthy and diverse salmon populations and their habitats for the benefit and enjoyment of the people of Canada in perpetuity". This is achieved through safeguarding genetic diversity, maintaining ecosystem integrity and managing for sustainable fisheries.

BC Hydro

As a Crown Corporation, BC Hydro is committed to producing, acquiring and delivering electricity in an environmentally, socially and financially responsible manner,⁵ through managing impacts from its operations, and weighing environmental values with social and economic interests. Where negative impacts cannot be avoided, it will work to mitigate or offset them, enhance affected habitat and sustain resources over the long term. As part of its water licenses to operate its facilities, BC Hydro is required to undertake compensation programs in different regions of the province. Through the compensation program, it is committed to developing positive projects, such as investments to improve fish stocks, and building relationships to encourage stakeholder and aboriginal community engagement, particularly where their input can contribute to better decisions.

PROGRAM DELIVERY

The overall vision and common principles drive the FWCP program and projects, and provide a foundation for determining strategic priorities at the watershed level (Watershed Plans) which are developed into Action Plans. The bulk of projects undertaken by the FWCP will be delivered under Action Plans that lay out a suite of key actions to achieve specific goals associated with species and ecosystems. Actions could include research, implementation activities, monitoring and evaluation activities, and communication mechanisms. Applicants are encouraged to use the Watershed Plans and Action Plans to develop projects that meet the overall objectives of the FWCP program. Technical Committees, staff and the management board will reference the plans to ensure that the highest priority projects are invested in.

A portion of the FWCP program activities will include small-scale, short-duration strategic projects that target specific issues identified by program partners or others (e.g., community members). These could include projects not yet identified in any action plans, as well as lower priority Action

² <http://www.env.gov.bc.ca/conservationframework/>

³ <http://www.env.gov.bc.ca/esd/>

⁴ Canada's Policy for Conservation of Wild Pacific Salmon, 2005.

⁵ BC Hydro Social Responsibility Policy.

Plan items that require timely response in order to take advantage of a investment or partnership opportunity.

PROJECT INVESTMENT CRITERIA

At the level of individual project investment and implementation decisions, the FWCP applies the following criteria to further define its role and actions within defined program areas:

- FWCP does:
 - Fund actions to create, restore, or otherwise improve the function of ecosystems that have been impacted by BC Hydro activities;
 - Fund actions to create, restore, or otherwise improve the function of alternate ecosystems that provide a better opportunity for investment;
 - Participate as a team member in species of interest planning;
 - Fund specific management actions for species of interest as identified by recovery teams and action/implementation groups;
 - Fund baseline inventory that contributes to the development of habitat or species based actions within Action Plans;
 - Fund monitoring programs designed to measure the effectiveness of FWCP funded habitat and species actions; and,
 - Contribute to all aspects of managing co-operatively managed conservation lands.
- FWCP does not:
 - Fund core activities of government or non-government agencies or programs;
 - Lead the development of species recovery goals;
 - Fund, co-ordinate or lead National Recovery Teams for species at risk;
 - Develop policy related to land or wildlife management;
 - Administer government regulations;
 - Engage in enforcement and compliance activities, except in relation to co-operatively managed conservation lands; and,
 - Fund programs designed exclusively to address government harvest objectives.

2 STAVE WATERSHED⁶

2.1 SETTING

The Stave watershed is located approximately 70 km east of Vancouver in the Fraser River Valley. It is adjacent to the easterly boundary of the Alouette watershed, both of which flow south. The Alouette River discharges into the Pitt River and then the Fraser River, while the Stave River discharges directly into the Fraser River. Two thirds of precipitation in the Stave watershed comes from south-westerly warm fronts during between October and March. The remaining third falls over the late spring and summer. The hydrology is dominated by spring runoff from melting snow and from storm events in the autumn.



Figure 2: Figure 1 Stave Watershed

The Stave River system lies within the traditional territory claimed by the Katzie and Kwantlen First Nations. The lower Stave River runs between the communities of Maple Ridge and Mission. The northern shore of the northern part of Stave reservoir borders onto Golden Ears Provincial Park.

⁶ More details of the watershed can be found at: <http://www.bchydro.com/bcrp/projects/watersheds.html>

2.2 FOOTPRINT ISSUES

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 7: Stave River (December 2000);
- Stave River Water Use Plan Consultative Committee Report (October, 1999); and
- Findings in the Community Workshop (Mission, 27 March, 2009).

Inundation: The combined reservoir area of Stave and Hayward reservoirs is 5,535 ha after flooding 2,612 hectares of land. The combined reservoir shoreline length is now 101.3 km.

Habitat loss: Stave Reservoir flooded 22.4 km of mainstem and 32 km of tributary channels, plus their associated riparian zones, while the Hayward Reservoir flooded 6 km of mainstem channel and 2.7 km of lower tributary channel, plus their associated riparian zones. Former spawning, rearing and overwintering areas are permanently lost or seasonally reduced due to dam footprint, reservoir flooding, flow diversions, or operating flows; or from non-hydro sources. Dams have reduced recruitment of large woody debris and gravel downstream.

Migration barriers: Ruskin Dam blocked passage, and anadromous and migratory resident stocks have been excluded from river habitats now occupied by Hayward Reservoir for 70 years. There is reduced fish access between reservoir and tributary habitat due to large drawdown regimes in both reservoirs.

New Habitat: Reservoirs have created new habitat for lake species, however a large proportion are non-sport fish species that compete with resident salmonids.

Altered Flow Regime. High rate of flushing through Hayward reduces littoral productivity. Periodic spills cause sedimentation of spawning habitat in the mainstream of lower Stave River. Ramping rates can contribute to fish stranding.

Diversions. 90% of the water in the Alouette river basin is diverted to the Stave. The Alouette diversion has increased annual flow volume in the lower Stave River; these altered flows have affected wetted channel area, seasonal temperatures and stream productivity.

Entrainment. Magnitude of entrainment mortality and injury is unknown. It would affect only reservoir species as there is no passage above Ruskin or Stave dams.

TGP: There are occasional TGP events that are being studied.

2.3 FWCP ACCOMPLISHMENTS TO DATE

Since 1999 the Bridge Coastal Restoration Program has invested approximately \$ 600,000 in the Stave watershed. Combined with work associated with the Water Use Plan over 118,000m² of spawning habitat has been created for fish.

Restoration work includes:

- Lower Stave River spawning channel and side-channel re-contouring.

Conservation work includes:

- Steelhead smolt imprinting
- Roosevelt Elk re-introduction.

Research work includes:

- Identification and protection of Red-Legged frog breeding habitat.

3 STRATEGIC OBJECTIVES FOR FWCP

Strategic objectives for the Fish and Wildlife Compensation Program reflect a synthesis of the core objectives and mandates of the partner agencies as they relate to mitigating impacts associated with hydro-power generation in British Columbia.

Conservation and sustainable use are core objectives for both the Ministry of Environment and Fisheries and Oceans. Conservation is addressed in terms of maintaining specific species or habitats both in terms of their importance for diversity (including genetic diversity), as well as their importance for ecosystem functions, integrity and productivity. For example, a species such as White Sturgeon may be important in terms of species diversity, while Pileated Woodpeckers may be important for maintaining ecosystem functioning and integrity by creating habitat for other species. Sustainable use incorporates the human interest in utilizing species for sustenance, commercial, recreational, or cultural purposes. Consequently, species such as coho, moose or bald eagles (wildlife viewing) could be considered important from a sustainable use perspective.

Community engagement is a core objective for BC Hydro under the compensation program and is driven by its social responsibility policy. It also reflects the 'shared stewardship' goal of the Ministry of Environment and those of Fisheries and Oceans' Stewardship and Community Involvement program. It reflects the importance of incorporating local values and interests in determining and implementing projects.

The FWCP strategic objectives are therefore:

Conservation

- **Maintain or improve the status of species or ecosystems of concern.**
This focuses on the conservation goals for ecosystems, habitats or ecological communities, and specific species. Priorities may be identified through the provincial Conservation Framework, or at the Conservation Unit level under the federal Wild Salmon Policy. Conservation priorities may also be identified at the watershed level based on local conditions.
- **Maintain or improve the integrity and productivity of ecosystems and habitats.**
This addresses the concept of ecosystem integrity, resiliency and the functional elements of ecosystems, including efforts to optimize productive capacity.

Sustainable Use

- **Maintain or improve opportunities for sustainable use, including harvesting and other uses.**
This objective focuses on the program's role in restoring or enhancing the abundance of priority species and in providing information to resource management decision makers related to providing opportunities for harvesting and other uses. Harvesting includes First Nations, recreational, sport and commercial harvests. Other uses may include cultural, medicinal, or non-consumptive uses.

Community Engagement

- **Build and maintain relationships with stakeholders and aboriginal communities.**
This objective stems from BCH's social responsibility policy, MOE's shared stewardship goal and the approach of DFO's Stewardship and Community Involvement Program. This recognizes the importance of engaging aboriginal communities, local stakeholders, and other interest groups to contribute toward making good decisions and delivering effective projects.

4 PRIORITIES

4.1 INTRODUCTION

Across the FWCP as a whole, the general process of identifying priority action plans involves three steps:

Step 1 – Identification (Candidate Priority Species and Ecosystems)

The first step involves identifying and prioritizing the species and ecosystems against the core strategic objectives, and how they have been impacted by footprint issues associated with hydro-power generation.

Step 2 – Preliminary Planning

This step consists of reviewing the identified priorities with consideration to identifying candidate action plans. It may involve grouping species or ecosystems together for coordinated action. Key considerations include: addressing limiting factors, exploring the opportunity for multiple benefits, addressing any specific local threats, the practicality of implementing actions, and the plan's consistency with existing agency programs.

Step 3 - Prioritization

This step consists of a final prioritization of candidate action plans (and their priority areas) according to cost effectiveness and technical feasibility criteria:

- **Technical Feasibility.** – The program should generally seek out investments that are the most technically feasibility. Considerations generally include the use of proven methods and availability of technical resources. Innovative approaches should be considered but they must have a credible technical foundation and reasonable expectation of success. The potential interrelationship with system operations and programs being implemented by the Water License Requirements program must also be considered.
- **Cost Effectiveness.** – The program should generally seek out investments that are the most cost effective. This includes issues or actions which may benefit multiple species, areas where there is an opportunity to leverage additional funds for activities, issues where previous work has been conducted and incremental expenditure may have substantive benefits, actions that are closely related to on the ground actions with measurable impacts, amongst others.

4.2 PRIORITY SETTING IN THE COASTAL REGION

In the Coastal region of the FWCP, Step 1 involved a review of existing Watershed Restoration Plans, interviews with agency staff, a series of community workshops and a final evaluation.

In 2000, specific restoration objectives were originally articulated in the Watershed Restoration Plans.⁷ These plans contain details of the major footprint impacts, objectives and limiting factors for productivity and have guided the work of the FWCP Coastal for the past decade.

Priorities for FWCP Coastal were reviewed in 2009 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 priority setting was developed through consultation with agency staff. These were then reviewed and discussed at a

⁷ Watershed Restoration Plans may be obtained at the FWCP website:
<http://www.bchydro.com/bcrp/projects/watersheds.html>

series of open houses to allow First Nations, public stakeholders, and interested parties to comment and elaborate on the priorities.

The results from the Stave Watershed workshop are summarized in Appendix A, highlighting the species, habitats, and specific activities as priorities for further work. On the aquatic side, chum and coho salmon, steelhead, and cutthroat trout were viewed as the highest priority fish species in the lower Stave River. In particular, maintaining the abundant chum run. Other species such as pink, sockeye and bull trout were considered as less of a priority of funding activities at this time. Both kokanee and cutthroat were considered as priorities for the reservoir, though there is little information on either species at present.

Species at Risk were also identified as priorities, in particular the need to improve the overall understanding of which species exist in the watershed, and to identify appropriate actions to conserve them. Specific species of high priority included the Pacific Water shrew, wolverine, elk, Western screech owl, Spotted owl, Band-tailed Pigeon, Northern Goshawk, Great Blue heron, and several frog species. It should be noted these are not the only priorities or species at risk which might occur in the watershed, but these were specifically mentioned. Improving littoral productivity, enhancing winter range for ungulates, conserving and improving wetlands and riparian areas were all considered as high priority habitats for funding consideration. Controlling invasive species, while not listed, were also noted in the workshop as being important in terms of maintaining ecosystem integrity and health.

The priorities emerging from the workshops were subsequently reviewed by BCH and Agency staff in relation to how well they addressed the strategic objectives, the extent to which species were impacted by footprint impacts, and what activities could provide multiple benefits to multiple species. The resulting direction for the Stave River Watershed is to focus the next five year period on the development and implementation of three priority *Action Plans* for priority topic areas: Salmonids, Riparian / Wetlands and Species of Interest. Other areas for future action plan development were identified as invasive species and upland areas.

4.3 PRIORITY ACTION PLAN SUMMARIES

The Salmonid and Riparian / Wetlands Action Plans focus on overall ecosystems in support of multiple fish and wildlife species. The objectives and sub-objectives within these two plans reflect the overall ecosystem focus, and the plans include primarily habitat-based actions, supported as required by research/information acquisition, assessments and monitoring/evaluation actions.

The Species of Interest Action Plan focuses on species of conservation concern (including species-at-risk) or other regionally important species for management planning process. The objectives, sub-objectives and actions within this plan reflect this focus on individual species.

All three priority action plans in the Stave watershed provide broad support to the FWCP strategic sustainable use objective.

The three priority action plans for the Stave watershed are summarized below. The full plans can be accessed on the FWCP website ([provide](#)).

SALMONID ACTION PLAN

Rationale

Salmonid species in general have been heavily impacted by the creation of dams and hydroelectric facilities in the Stave system. Chum are considered at capacity, but due to their importance as a commercial and sport fishery they need to be maintained. Limiting factors for other salmonids in the Stave watershed include useable habitat, access to habitats and tributaries (e.g., Thompson Creek). This overall action plan for salmonids includes integrated habitat restoration planning and analysis to determine actions that provide the most benefit to multiple species.

Top priorities for the Lower Stave include sustainable use and conservation, including maintaining high chum population, creating access to channels, reducing stranding and supporting the hatchery. Steelhead and cutthroat are top conservation priorities. Priorities in the reservoir include undertaking stream evaluations to determine status and capacity for cutthroat.

The bulk of money spent in the Stave system to-date has been towards enhancement activities for habitat, in particular spawning. Additional work should focus on the potential for off channel enhancement and access.

Focus

1. Assessment of the effectiveness of existing habitat enhancements in terms of adult returns and escapement, including maintaining chum productivity (periodic gravel placement etc.).
2. Implementation of habitat restoration actions for priority areas, including off channel opportunities, gravel placement etc.
3. Assess capacity and status of species in reservoirs.

Expected outcome

- Improved habitat capacity and productivity in multiple stream systems.
- Sustained abundance of anadromous and resident salmonid populations at target levels over time.
- Understanding of cutthroat status and abundance, develop targets and opportunities for enhancement.
- Determine origin of sockeye and develop targets and opportunities for enhancement if appropriate.
- Strategy for continued reservoir operation.

SPECIES OF INTEREST ACTION PLAN

Rationale

'Species of interest' are defined as species of conservation concern (including species-at-risk) or other regionally important species.

Species at Risk are a priority for all agencies and partners. Some Species of interest, such as the Pacific Water Shrew, are known to exist in the Stave Watershed such as the Blue Mountain woodlots. For other species however, there is a lack of information and knowledge regarding which may potentially exist and what opportunities are available to protect them.

Generally, habitat is a limiting factor, particularly as much of the area is urbanized and is in privately owned lands. While work has been done on Reg-legged Frog habitat identification and protection and the re-introduction of elk, more work on Species at Risk would be beneficial in this rapidly developing area.

To build on previous efforts, more information is needed regarding how effective past efforts have been. More knowledge is needed regarding which species exist, in which habitats, and the opportunities available for their protection. Also, needed is a strategy for evaluation and monitoring that will support the ongoing process of renewing species plans and priorities in the Stave River system.

Focus

1. Build upon the past efforts associated with the identified FWCP priority species of concern in the Stave River watershed.
2. Conduct mapping and prioritization of activities for additional species of concern.

Expected outcome

- Improved knowledge and status of FWCP priority species of concern.
- Improved habitat mapping for species of concern.
- Identification and prioritization of species, locations and potential future actions for conservation and protection.

RIPARIAN AND WETLANDS ACTION PLAN

Rationale

Riparian and wetland areas have been heavily impacted by the creation of dams, and continue to be severely degraded in the remaining areas due to urbanisation. Habitat is 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 extremely diverse and biologically rich and are considered as highly valuable from an ecological standpoint.

Limited work on riparian and wetland restoration or conservation has occurred in the Stave watershed under FWCP. However, these areas have a high restoration potential and would benefit from restoration activities. Several areas have been identified as priorities, such as Silvermere Lake, areas adjacent to the Fraser River, Silverdale, etc.

A cogent plan for enhancing these ecologically important areas is needed to help guide conservation and restoration activities for the short and medium term.

Focus

1. Mapping of current wetlands and riparian areas, and categorization of areas into healthy and functioning systems (Category 1), and degraded or sub-optimal areas that would benefit from restoration (Category 2). Including
 - Silvermere Lake, the area adjacent to Fraser River (on the south side of Lougheed Highway) and the area east of Stave River.
 - The tidal wetland adjacent to the Fraser (on the south side of Lougheed Highway, east of Sate River and Silvermere).
 - Silverdale area and areas to the east of footprint areas
 - Chester Creek.
2. Assessment of opportunities for securement (conservation) and protection (from potential degradation) of Category 1 areas. This includes assessment of legal status, ownership, land use, etc.
3. Assessment of opportunities to enhance and restore Category 2 areas, with a subsequent view to conserve and protect them.

Expected outcome

- Identification and prioritization of locations and potential future actions for conservation, protection, restoration and creation of wetland and riparian habitats.

5 REFERENCES

- BC Hydro. 1999. Stave River Water Use Plan – Report of the Consultative Committee October. Executive Summary available at:
http://www.bchydro.com/etc/medialib/internet/documents/environment/pdf/wup_stave_river_executive_summary_pdf.Par.0001.File.wup_stave_river_executive_summary.pdf.
- BC Hydro. 2003. Stave River Water Use Plan (Stave Falls and Ruskin Projects). Revised for acceptance by the Comptroller of Water Rights. Available at:
http://www.bchydro.com/etc/medialib/internet/documents/environment/pdf/wup_stave_river_water_use_plan_pdf.Par.0001.File.wup_stave_river_water_use_plan.pdf.
- Bridge-Coastal Restoration Program. 2000. Strategic Plan, Volume 2, Watershed Plans, Chapter 7: Stave River. Available at: http://www.bchydro.com/bcrp/about/strategic_plan.html
- Bridge Coastal Restoration Program. 2009. Stave River workshop summary, Mission BC, March 27, 2009. Available at: http://www.bchydro.com/bcrp/about/strategic_plan.html
- Fish and Wildlife Compensation Program. 2011. Stave River Watershed Plan. Available at: [weblink](#)
- MacDonald, A. 2009. Fish & Wildlife Compensation Program: Executive Summary. Report for BC Hydro, Vancouver, BC.

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APPENDIX A

List of potential opportunities for fish and wildlife

The following list of species, ecosystems and actions were identified by agencies, First Nations and communities as being the top priorities for activities under the FWCP program. Following initial input from agencies, a multi-stakeholder workshop was held in Mission (27 March, 2009) to identify priorities. Two breakout groups, for fish and wildlife, identified priorities which were reviewed in plenary to allow all participants to comment on the findings.

HABITATS

Species	FWCP Rank	Comments
Littoral Areas	high	Projects aimed at improving littoral productivity are of high priority. Projects should include the fertilization of existing plant communities and the control of ATV traffic in plant communities. To promote the long term sustainability of projects, they should be undertaken in locations that have some security from ATVs.
Ungulate Winter Range	high	Winter range enhancement and conservation for mountain goat (at NW end of Stave Lake), elk and black-tailed deer is of high priority, and can be accomplished by thinning, spacing and prescribed burns. Riparian forest conservation for elk and deer is also a high priority.
Wetlands	high	Long-term conservation and restoration of the areas to more natural conditions is needed. Areas of importance include Silvermere Lake, the area adjacent to Fraser River (on the south side of Lougheed Highway) and the area east of Stave River.
Riparian Habitat	high	Conservation covenants and the restoration of damaged sites (especially low-gradient areas) are of high priority. Enhancement of riparian areas on the east and west sides of Stave Lake would be beneficial, however the east side is more feasible, as it would be difficult to limit west side access. The tidal wetland adjacent to the Fraser (on the south side of Lougheed Highway, east of Sate River and Silvermere) is an important location for projects. Other possible locations include the Silverdale area and areas to the east of footprint areas (cheap farmland is available there, and would be a good alternative to Stave habitats that cannot be regained), and Chester Creek.

FISH

Species	FWCP Rank	Comments
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Species	FWCP Rank	Comments
Chum Salmon	high	<ul style="list-style-type: none"> Ongoing gravel replenishment in the Lower Stave River and upgrading of existing spawning areas are of high priority. These areas must be maintained on a rotating basis every 10-15 years. Precautions must be taken to prevent gravel projects from interfering with heron feeding and roosting patterns.
Steelhead Trout	high	<ul style="list-style-type: none"> Feasibility assessments are needed in order to identify projects that would improve steelhead parr habitat.
Cutthroat Trout	high	<ul style="list-style-type: none"> The species is blue-listed. Stream evaluations to determine stock status and habitat capacity are required before restoration opportunities can be assessed. Maintenance of the Thompson Creek habitat and access to the habitat are of high priority.
Coho Salmon	high/ low	<ul style="list-style-type: none"> Maintenance of the Thompson Creek habitat and access to the habitat are of high priority. Coho projects other than the above are of low priority.
Sockeye Salmon	med	<ul style="list-style-type: none"> Genetic analysis of sockeye adults is needed to determine their origin.
Pink Salmon and Chinook	low	<ul style="list-style-type: none"> The Lower Stave River is fully subscribed, the species will benefit from chum projects, so no projects have been identified.
Bull Trout	low	<ul style="list-style-type: none"> Restoration is a low priority at this time.
Other species	low/ high	<ul style="list-style-type: none"> Rainbow trout, and sturgeon are present but there is little information available about them, and they are a low restoration priority. Bass is an invasive species, and projects to control/reduce their populations are of high priority. Precautions should also be taken to ensure enhancement projects do not benefit bass, bullfrogs or sunfish.
Hayward and Stave Reservoirs		
Kokanee	high	<p>Kokanee is an important prey species.</p> <p>There is little information available on the species. Water Use Planning is currently conducting population estimates.</p> <p>While no restoration projects have been identified, the species is a high management priority.</p>
Cutthroat Trout	high	<p>Feasibility assessments are needed before potential projects can begin.</p> <p>Projects directed at improving tributary access and removing man-made obstructions would be beneficial.</p>

MAMMALS

Species	FWCP Rank	Comments
Species at Risk in General (SAR)	high	<ul style="list-style-type: none"> Species at Risk in the SFN Watershed are listed in the following section.
Pacific Water Shrew	high	<ul style="list-style-type: none"> Projects should link to Recovery Team objectives and existing Best Management Practices. Recovery habitat assessment in the watershed is necessary. Suitable habitat should be managed for the species wherever possible. Restoration and enhancement possibilities exist in the Blue Mountain and BCIT woodlots, but inventory is necessary first.
Wolverine	high	<ul style="list-style-type: none"> Disturbance of natal sites must be minimized. Would benefit from projects that increase their prey (ungulates).
Roosevelt Elk	high	<ul style="list-style-type: none"> As the species was recently transported into the Stave watershed, monitoring is required. The species was extirpated before impoundment. Grazing is an important factor in population maintenance.
Furbearers	low-med	<ul style="list-style-type: none"> Inventory and landscape-level management are necessary. There is a high beaver population in the area, which negatively affects restoration projects. Willows should not be planted near projects, as they attract beaver.

BIRDS

Species	FWCP Rank	Comments
Western Screech-Owl	high	<ul style="list-style-type: none"> Classified as a Species at Risk, with habitat restoration and securement potential. Species is a riparian-dependent secondary cavity nester, requiring minimum diameter trees. Inventory is necessary A nest box program would be beneficial.
Spotted Owl	high	<ul style="list-style-type: none"> The species is a high conservation priority, but a low restoration priority (restoration feasibility is low due to the lack of old-growth forest left in the watershed.) Projects should link to the Recovery Strategy. Landscape-level management is necessary.

Species	FWCP Rank	Comments
Band-tailed Pigeon	high / med	<ul style="list-style-type: none"> Band-tailed pigeon is a migratory, hunted, blue-list species that relies on sodium from mineral sites (in sloughs and muddy areas) during the breeding season. Securement of these critical mineral sites is necessary. Some sites may be on private land. Consensus on priority could be reached for this species, however, support was give for both medium and high priority
Northern Goshawk	high / med	<ul style="list-style-type: none"> Consensus on priority could be reached for this species, however, support was give for both medium and high priority Breeding habitat conservation and landscape-level management are necessary. Stand treatments in young forests (i.e., thinning, fertilizing) to speed up the old-growth characteristics (i.e., larger trees with larger branches for nests and canopy closer for flightpaths) would be beneficial. While the species was previously though of as old-growth dependent, they have started to use older second-growth forests as well. The species could have been greatly affected by the inundation of Stave River.
Great Blue Heron	high	<ul style="list-style-type: none"> Classified as a Species at Risk with riparian nesting and foraging habitat restoration potential. The Lower Stave River is an important feeding site for herons A rookery exists in Silverdale, but whether it is active is unknown. The impact of declining of cottonwoods in the Lower Stave River should be investigated, as it may present a good restoration opportunity.
Bald Eagle	med / high	<ul style="list-style-type: none"> Winter roost, and nesting habitat conservation are priorities, as are riparian covenants. Monitoring is needed, as the species may become endangered again (e.g. from ingesting pollutants). Consensus on priority could be reached for this species, however, support was give for both medium and high priority Bald eagles are directly linked to chum, as chum are their main food source. Would benefit from the cottonwoods project directed at herons.
Riverine Birds (Mergansers, American dipper, Harlequin duck)	med	<ul style="list-style-type: none"> Water quality, stream productivity, fisheries relationships and riparian conservation are important. Research is needed on genetics, the dispersal of birds between river systems, and the connectivity of populations over larger scales.
Osprey	low/ med	<ul style="list-style-type: none"> Numerous nests on stilts have been raised in the Stave reservoir, as well as an active nest on the Stave River on pilings. Enhancement of nest sites could be beneficial on Stave Lake and in the Lower Stave River.

AMPHIBIANS, REPTILES AND TURTLES

Species	FWCP Rank	Comments
Tailed Frog, Red-legged Frog and Western Toad	Med / high	<ul style="list-style-type: none"> • Priorities include the conservation of streams, wetlands, riparian habitats and covenants on private land. • Consensus on priority could be reached for this species, however, support was give for both medium and high priority • Water quality initiatives, inventory and research are necessary. • Red-legged frog projects tie in with some salmon projects in the watershed. • The reduction of bull frog habitat is important, and should be incorporated into stream and riparian habitat enhancement.

Wildlife Species at Risk that Occur or Could Occur in the Stave River watershed

	COSEWIC	CF Rank
Mammals		
Pacific Water Shrew	Endangered	5,6,1
Roosevelt Elk		3,2,3
Birds		
Northern Goshawk (laingi subspecies)	Threatened	1,6,1
Western Screech Owl (kennicottii subspecies)	Special Concern	3,1,2
Band Tailed Pigeon (Patagioenas fasciata)	Special Concern	5,2,3
Great Blue Heron (fannini subspecies)	Special Concern	3,6,1
Spotted Owl (caurina subspecies)	Endangered	5,6,2
Amphibians and Reptiles		
Red-Legged Frog	Special Concern	3,1,2
Tailed Frog	Special Concern	4,1,2
Western Toad	Special Concern	3,2,4
Western Painted Turtle	Endangered	4,6,2
Rubber Boa (Charina bottae)	Special Concern	5,3,4