SKOWKALE HATCHERY AND REVITALIZATION EDUCATION PROJECT (SHREP):

A CONCEPT PLAN

APRIL 2009

PREPARED FOR

THE SKOWKALE HATCHERY REVITALIZATION AND EDUCATION PROJECT,

SKOWKALE FIRST NATION

PREPARED BY

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Bryan Foster (ED Centre - Teacher)

Harold Archie (Skowkale Hatchery Manager)

Lydia Archie (Skowkale Band Manager)

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Bev Bowler (DFO Education Coordinator)

Ron Valer (Chilliwack Operations Manager)

INTRODUCTION

The Skowkale Hatchery Revitalization and Education Project (SHREP) has been delivering informal education programs and holding various events at the hatchery site. Recently, a new hatchery building was completed. SHREP has recognized the opportunity to build upon their activities at the site and have proposed three potential projects:

1). An education program;

2). Interpretive signage along the river trail; and

3). A building that will function as a learning and interpretive centre.

The purpose of this document is to explore various options for each project, present ideas and make recommendations for next steps.

BACKGROUND

SHREP is based in the Skowkale fish hatchery which is located beside the Chilliwack River at 7459 Chilliwack River Road south of Chilliwack and the Fraser River. The hatchery is located on the Skowkale Reserve which is home to approximately 228 Band Members of the Stò:lō Nation.

The hatchery has released more than a million coho fry since it was built in 1978. Currently, the hatchery produces between 20-50,000 coho fry which are released into the Little Chilliwack River. However, the hatchery has the equipment to produce over 200,000 fry and has considered releasing fry into Atchelitz, Luckakuck, and Elk Creeks in addition to Little Chilliwack River.

Education along the Little Chilliwack River started with Harold Archie, the current hatchery manager, inviting school classes to visit and hosting events at the site such as Earth Day. In 2007, the hatchery building was rebuilt after Lydia Archie, Harold's sister, secured funding through a grant. In 2006, Bryan Foster, a teacher at the Education Centre in School District 33-Chilliwack, approached Mark Johnson, the DFO Community Advisor, looking for a place to work with students and Mark put him in touch with Harold.

As more people got involved, there was a rebirth of the facility with a focus on education. More classes have been visiting the site and Earth Day celebrations have been expanding each year. Funding has even been found to provide work experience for students.

Now known as the Skowkale Hatchery Revitailization and Education Project (SHREP), the project is looking to expand again with three developments being considered: 1). An education program; 2). Interpretive signage along the river trail; and 3). A building that will function as a gathering place for education and other activities.

EDUCATION PROGRAM

One of the goals of this research was to identify educational programs that other hatcheries are delivering that may provide a model for an education program for the Skowdale Hatchery.

Most hatcheries have found funding from various sources to create their own programs and materials - as SHREP may need to do in order to create a program based on its specific needs. However, both Metro Vancouver Parks and Langley Environmental Partners have been willing to share their education materials with SHREP. As well, the Seymour Salmonid Society developed 2 teacher's guides in partnership with DFO which provide activity ideas and materials. Lastly, the author has outlined a few simple nature-based activities that can easily be implemented. These resources provide materials and ideas that SHREP can begin using immediately as they work toward growing their own program.

A number of programs from various hatcheries and other agencies are outlined below:

METRO VANCOUVER PARKS

Metro Vancouver Parks delivers both interpretive and school programs. They have generously provided their educational materials of 16 activities as reference for Skowkale Hatchery in creating their own programs.

The following activities could easily be adapted for SHREP. The full version of the 16 activities provided by Metro Vancouver Parks can be found in the Appendices:

Salmon Life Cycle Role Play
Students act out the different life stages of the salmon.

Salmon Tails
A predator-prey tag game featuring the Belted Kingfisher and salmon fry.

Shake a Bush
Students learn first-hand that streamside vegetation holds insects and is therefore a food source for young salmonids by shaking the plants and investigating the insects that fall off.

Spawner Come Home
Students smell canisters with different smelling substances to learn that salmon find their way back to their birth stream using their sense of smell. This activity could easily be adapted for SHREP and would be an activity that students would enjoy.

LANGLEY ENVIRONMENTAL PARTNERS SOCIETY (LEPS), LANGLEY

Langley Environmental Partners Society (LEPS) is a non-profit, partnership-driven organization founded in 1993, to achieve the mission of protecting and restoring the natural environment through education, cooperation and action. Partners include watershed stewardship groups, government agencies, First Nations groups, schools and specialized environmental groups. A list of some of their funders can be found on their website.

LEPS has a couple of outdoor programs for students:

Streaming Along

Duration: 2.5 hours
Ages: Grades 4 – 12

Students learn stream ecology by investigating the Salmon River and conducting water quality tests, identifying fish and sampling aquatic invertebrates.

Storm Drain Marking; Paint a Fish to Save a Fish!

Duration: ½ day
Ages: All Grades

Students paint yellow fish near storm drains in the community that flow into salmon habitat in order to raise community awareness as to how people affect our streams and the fact that everything that goes into a storm drain ends up in the nearest stream or waterway.

A Gift From LEPS

LEPS has kindly supplied SHREP with a copy of four of their activity sheets: their Streaming Along Workshop Outline, a Benthic Macroinvertebrate Search Field Form, water quality testing activities, and the LEPS Field Form. Copies of the activity sheets can be found in the Appendices.

LEPS has also created **EcoKits**, environmental education resources which pull together various activities from different resources. There are nine modules and the kits include information, activities and materials designed to make teaching and learning about environmental issues easier and more fun.

LEPs has generously offered to lend SHREP an Ecokit in order to review the materials for their own program.

The nine modules in the Ecokit include:

Agricultural Stewardship
Students learn about the different agriculture land uses in BC. By reading the book "Eat-Up: Healthy Food for a Healthy Earth", they discover where our food comes from and how it affects the earth. This EcoKit features resources provided by BC Agriculture in the Classroom.

Climate Change
Students use the Temperature Rising poster to learn about the Earth's changing climate. They create a greenhouse in a jar and learn what schools can do about global warming.

Invasive Species
Students learn about common characteristics of invasive species through activities and research projects. Colourful flash cards are provided so that students can go on an invasive species hunt in their school yard.

Species at Risk
Students learn about Canada's threatened and endangered plants and animals by playing Species at Risk Jeopardy. An interactive activity allows students to discover what happens to food webs and ecosystems when one species is removed.

Streams, Fish & Aquatic Habitats
An easy to play board game teaches students about the Pacific Salmon lifecycle. Other activities include a tag game about stressors to aquatic bug populations and water t activities.

Trees & Plants
Flash cards and identification books enable students to identify native plants. Students can also make recycled paper and plant a tree in their schoolyard or classroom with instructions.

Waste Reduction & Composting
Includes the video "Worm Bin Creatures: Alive Through a Microscope" to teach students how worms turn waste into useable compost and encourages classes to participate in a waste reduction challenge.

Water, Groundwater & Watersheds
A model teaches about the water cycle and how humans contribute to water pollution. Students also learn how to test water quality and discover the importance of wetlands.

Wildlife Habitats & Ecosystems
Students learn about local wildlife and ecosystems though a variety of activities including a food chain card, dissecting owl pellets, identifying local birds and wild flowers, building a bird nest, and making bat ears.

SEYMOUR SALMONID SOCIETY, NORTH VANCOUVER

The Seymour Salmonid Society runs the Seymour River Fish Hatchery and Education Centre. In collaboration with Fisheries and Oceans Canada, the Seymour Salmonid Society developed Gently Down the Seymour, a program for both primary and intermediate teachers.

Under the program, two manuals have been developed: one for primary teachers and one for intermediate. Both manuals can be found online at: www.seymoursalmon.com (on the bottom left hand side of the webpage). Some materials in the manuals could easily be adapted for use in the SHREP education program. The primary manual will likely be most useful if the delivery model is for high school students to deliver the program; however, the intermediate manual has more detail and may be useful both for teachers and as the program grows.

Specific activities that could easily be adapted are outlined below. Full activity descriptions and worksheets can be found online:

Forest Ecology (Primary Manual, p. 16)
A similar activity could be developed for SHREP called Riparian or River Ecology in which students could walk along the river and explore relationships among the river, salmon, other wildlife and plants. Various stops could be identified.

Aquatic Insects (Primary Manual, p. 19-21)
This information could easily be adapted for use at the Skowkale Hatchery.

Stream Survey (Primary Manual, p. 25-26)
This information could also easily be adapted to the Little Chilliwack River.

ALOUETTE RIVER MANAGEMENT SOCIETY, MAPLE RIDGE

The Alouette River Management Society (ARMS) was formed as a society in 1993. The original goal was to negotiate with BC Hydro in order to increase in the river's base flow from the Alouette Dam. After successfully completing their goal in 1996, ARMS has become increasingly involved in many aspects of watershed stewardship, including education, inventory and monitoring, habitat restoration and lobbying for the protection of aquatic habitat.

In March 1999, ARMS completed the construction of the Rivers Heritage Centre. This building contains three offices, a kitchen and a washroom facility. Speaking to ARMS in greater detail about how they accomplished fundraising and planning for the Rivers Heritage Centre may provide some lessons for SHREP in developing their centre.

In 2,000, many of ARMS' funding sources dried up and they now rely on their own fundraising efforts. They also receive an annual grant of $10,000 from the District of Maple Ridge which allows them to offset some of the costs for the Rivers Heritage Centre and educational programs.

ARMS' education programs are designed in accordance to the Ministry of Education Integrated Resource Package (IRP) and are updated regularly. ARMS continually develops programs around current environmental issues to share with the community. Their current program offerings include:

Salmon Scales and Tales

Grade: K – 7
Duration: 1.5 - 2 hours

The types of Pacific Salmon and their life cycle are introduced in this program. Students participate in interactive demonstrations and activities to learn about the trials and tribulations that salmon face. The program includes a discussion of actions that the students and their families can do to protect salmon and their habitat.

Creepy Crawlies in the Classroom

Grades: K -7
Duration: 1.5 - 2 hours

ARMS brings live aquatic macroinvertebrates into the classroom where students have the opportunity to identify and view the bugs with microscopes and magnifying glasses and learn how they are indicators of water quality.

Water Wise

Grade: 2 – 7
Duration: 1.5 hours

This program examines the water cycle and the finite water resources which exist on earth. Students are introduced to the concept of watersheds and participate in an interactive watershed demonstration where they learn types of pollution and their effects on the environment. Actions to protect and conserve water are also discussed.

Trees of Life

Grade: 2 – 7
Duration: 1.5 - 2 hours

Students learn about wildlife trees and their importance to BC's wildlife. The program starts with a short "Who Am I" game to learn some of the different species of wildlife tree users. Specific wildlife species are introduced including black bears, owls, bats, and woodpeckers. The concepts of habitat and ecosystems are discussed as well as how humans can have a positive or negative impact on the environment.

Here Today, Gone Tomorrow

Grade: 2 – 7
Duration: Approx. 1.5 hours

This program examines British Columbia's Species at Risk. Students learn about some of British Columbia's endangered wildlife species and the elements that are necessary for wildlife to survive. Also covered are reasons that wildlife and plants become endangered or extinct and the importance of protecting these species.

Wacky Weather

Grade: 3-7
Duration: 1.5-2 hours

Students learn the difference between weather and climate, how climate influences ecosystems, and how plants and animals adapt to climate. The concepts of the greenhouse effect and global warming are discussed with ideas on reducing individual impacts on the Earth. Specific activities include participation in a greenhouse gas experiment and an ecological footprint survey.

HYDE CREEK EDUCATION CENTER & HATCHERY, PORT COQUITLAM

The Hyde Creek Watershed Society started as a backyard project by a family using a wooden incubator and a bathtub to raise salmon. Today, the Society has grown to 55 members dedicated to working with the local municipalities, provincial and federal governments. The Society's various activities include:

- Stream Clean Up
- Habitat Restoration
- Environmental Education including exhibits at events
- Salmonid Enhancement
- Water Quality Monitoring
- Stream Inventories
- Annual Salmon Festival
- Annual Spring Open House
- Storm Drain Marking
- Hatchery Tours
- Education Programs & Classes
- Removal of invasive plant species

The Hyde Creek Education Centre and Hatchery includes historical displays of the Hyde Creek watershed, a fish culture display with live fish from the creek and its tributaries, and a teaching classroom to educate the general public on stewardship values. The grounds are naturescaped as part of the education facility. This centre may also provide a model for the SHREP centre. Touring the site and learning what is working and not working about the building may provide important information for developing the SHREP centre. As well, the Hyde Creek Watershed Society has grown from a few individuals to a group involved in many activities and their journey may provide SHREP with guidance in developing their operational design.

The Hyde Creek Education Centre and Hatchery is comprised of four main components:

- A small-scale, fully operational fish hatchery that raises approximately 40,000 Coho and 5,000 Chum per season;
- A classroom for thirty students;
- Interpretive grounds with native plants that demonstrate the benefits of Naturescaping (planting native plants in yards); and
- An off-channel rearing and demonstration pond

The education programs are designed to complement the DFO's Salmonids in the Classroom curriculum by offering hands-on activities:

Hatchery Tour - Basic

Grade: Primary

Duration: 1 hour

Students gain a basic understanding of the role of hatcheries in helping salmon. They tour the Hyde Creek Hatchery, rearing pond and observe the creek. Emphasis is on what people can do to help salmon.

Bug Expedition

Grade: Primary

Duration: 1 hour

The program explores macroinvertebrates as a food source for salmon. Students are able to observe and identify the insects and how they indicate the overall health of a stream or watershed.

Healthy Watershed

Grade: Primary

Duration: 0.5 hour

Students learn what makes a watershed healthy. An interactive model teaches the effects of urban living on waterways.

NOONS CREEK HATCHERY, PORT MOODY

Funding for Noon Creek Hatchery comes from a variety of sources, many of which are listed on the website at www.noonscreek.org/sponsors.htm. At Noons, the school programs are taught in simple outdoor classrooms which provide cover from the rain but are open on all sides.

Salmon Cycle

Grade: 4-5

Duration: 2 hours

Students learn about the life cycle of the salmon.

Stream Science

Grade: 6-7

Duration: 2.5 hours

Students measure the health of the creek in a number of ways including measuring temperature and pH. Thus, they learn how to collect data as well as discover what makes urban streams healthy or unhealthy.

KANAKA EDUCATION AND ENVIRONMENTAL PARTNERSHIP SOCIETY

Bell-Irving Fish Hatchery, Kanaka Creek Regional Park, Maple Ridge

The Bell-Irving hatchery is operated by Metro Vancouver Parks, Department of Fisheries and Oceans, BC Environment Fisheries Branch and the Kanaka Education and Environmental Partnership Society (K.E.E.P.S.). The hatchery includes rearing ponds, indoor tanks and exhibits.

K.E.E.P.S. is a stewardship group and Park Partner with Metro Vancouver. They have their headquarters at the hatchery and offer education programs and interpretive tours. K.E.E.P.S. consists of a Board of Directors, a general membership, and a part-time Coordinator via a funding contribution from the Metro Vancouver Regional District. The District of Maple Ridge is an important partner in funding two Program Interpreter positions for school programs. K.E.E.P.S. charges $1.00 per student for classroom programs and $2.00 per student for outdoor programs.

Outside Adventures

Grade: K-3
Duration: 1.5 hours

Students are introduced to salmonid life cycles, predator / prey interactions, riparian functions and plant identification. A hatchery tour is included and additional activities such as fish releases or egg takes occur seasonally. Other activities include:

- An aquatic insect study and explanation of their role as the primary source of food for young fish;
- A tour of the hatchery and a chance to feed fish;
- A nature walk along Kanaka Creek to learn about forest ecology concepts and examine wildlife habitats.

Brook Learning

Grade: 4-5
Duration: 2 hours

Students obtain data from the stream to learn basic habitat assessment techniques and understand what is required for productive salmon habitat. Salmonid life cycles and survival challenges including predators are discussed. A hatchery tour is included and additional activities such as fish releases or egg takes occur seasonally.

- Aquatic insect study invertebrate identification and indicators of water quality;
- A tour of the hatchery and a chance to feed fish;
- Forest ecology – tree identification, riparian zones, industry, woody debris;
- Measurement of basic habitat components – habitat type (pool/riffle), vegetation, depth, substrate and interpretation of the results;
- Salmon life cycle (use props and/or live specimens depending on the season);
- Game played to demonstrate the water cycle;
- Demonstration of impervious cover and urban impacts with enviroscape model;
- Water quality – temperature and PH, pollution sources, health to fish, aquatic life, people;
- Smolt releases;
- Survival game.

Wild, Wild Wet

Grade: 6-7

Duration: 2.5 hours

Students learn two methods of assessing stream health: directly, by measuring water chemistry, and indirectly, by examining the aquatic insect indicator species that live there. Salmonid life cycles and predator/prey interactions are discussed, and a hatchery tour is included. Seasonal activities may include fish releases and egg takes. Other activities include:

- Observing spawning adults;
- Discussion of the salmon life cycle (using props);
- Aquatic insect study – invertebrate identification and class based on physical features (scraper, grazer etc), indicators of water quality;
- Measurement of basic habitat components – habitat type (pool/riffle), vegetation, depth, substrate and interpretation of the results;
- Forest Ecology – plant identification, nursery logs, rotting logs as food for the forest, planting new trees, harvesting, discussion on how forests supply food to aquatic life forms, fish as part of the food web;
- Water Quality – temp, PH, DO2, turbidity, nitrates, ammonia, pollution sources, and the affect on health;
- A tour of the hatchery and a chance to feed fish.

Watershed Road Show

K.E.E.P.S. also offers a classroom program called the Watershed Road Show for grades K-7. Students learn about watershed concepts and urban impacts using an interactive Enviroscape watershed model. Students also have the opportunity to capture and identify live aquatic invertebrates to learn about their role as stream health indicators. Students are given hands-on experience with a stream adjacent to their school or one in their area.

Fishing Reaching Youth (FRY)

In this program, instructors travel to the students and work with them on a stream near their school. Typical activities include biophysical habitat assessment, riparian restoration, or monitoring. This program is usually targeted at high school students but can be modified for other grade levels.

A **storm drain marking program** and **tour to observe spawning salmon** are also offered by K.E.E.P.S.

FRASER VALLEY TROUT HATCHERY VISITOR CENTRE, ABBOTSFORD

The centre has large exhibits featuring fish, fishing and fisheries displays, a live stream display, walk-in beaver lodge and a multi projector slide show. The centre charges for its school programs. The cost of each specific program can be found under its description.

It's A Trout's Life

Grade: K-2
Duration: 1 hours
Cost: $3.00/student

A hands-on program about the trout's journey from egg to adult using an interactive felt board, role play, observation of fish and colouring.

Trout Fast Food

Grade: 2-5
Duration: 4 hours
Cost: $6.00/student

Student study aquatic insects and learn about human impacts to freshwater ecosystems.

What's That Habitat

Grade: 2-5
Duration: 2 hours
Cost: $5.00/student

Students learn about trout habitat, freshwater ecosystems, the role of hatcheries, water consumption, pollution, stewardship and storm drains.

Scientifish

Grade: 5-7
Duration: 5 hours
Cost: $7.00/student

Students examine the water quality at several outdoor sites and investigate aquatic macroinvertebrates as bioindicators.

CHAPMAN CREEK HATCHERY, SUNSHINE COAST

The Chapman Creek Hatchery is run by the Sunshine Coast Salmonid Enhancement Society. The hatchery operates year round with a full-time hatchery manager, a part-time technician and volunteers and also has a Board of Directors.

About twenty-nine percent of the Society's funding comes from fundraising activities, while twenty-seven percent comes from membership dues. Other funding sources include DFO and other grants, on-site sales and classroom revenue.

The following programs were developed and are delivered by a contractor:

A Salmon I am (*Kindergarten*): A salmon anatomy and life cycle study, followed by a tour of the creek or hatchery.

The Necessities of Life (*Grade 1*): A felt board study and game examining what a salmon needs for survival.

Salmon Cycles, Water Cycles (*Grade 2*): A learning experience about cycles looking at the water cycle, and the salmon life cycle.

Salmon Math (*Grade 3*): A math program in the hatchery environment.

Watery Habitats (*Grade 4*): Students look at water habitats, adaptation, and simple food chains.

People and Salmon in the Watershed (*Grade 5)*: A look at impacts in the watershed using the watershed model.

Aquatic Invertebrates (*Grade 6*): Exploring aquatic insects to learn how they can tell if a stream is healthy and to learn how is diversity .

Fish in the Forest (*Grade 7*): Explores ecosystems and how salmon are an important part of the forest ecosystem.

PROJECT WILD AND PROJECT WET

Another source of activities is the Project Wild and Project WET manuals available by taking workshops through Wild BC. These resources have a number of hands-on activities that would be suitable for the hatchery.

NATURE ACTIVITIES

One issue with environmental education activities is that they often talk about nature without actually having participants immersed in nature and learning for themselves through first-hand experiences of nature. For that reason, some simple activities that involve direct experience with nature have also been included:

Touchstones & Touchcones

Touchstones and Touchcones are useful as a first step to nature interaction.

In Touchstones, students stand in a circle facing in with their hands behind them. The facilitator places a stone in every person's hands and tells them to get to know their stone as well as they can because they will need to find their stone again (they are not allowed to look at them, but must get to know them by feel). After the students have a chance to get to know their stones, the stones are collected by the facilitator. There are 2 possible ways to complete this activity:

1. The stones can be placed in the middle of the circle with each student going to identify their stone;

2. The facilitator can again place a stone in each person's hand and students can pass them to the right until they find their own stone. Once they have their own stone, they hold on to it and keep passing other stones. Once everyone has their own stone, they can look at their stone. Discussion can include questions such as 'Was the colour of your stone the same as what you imagined it would be?', etc.

Touchcones

Touchcones is a follow-up to Touchstones. Collect enough evergreen cones of the same tree species for everyone in the group to have one. Douglas fir cones work well for this activity (some of the smaller cones are too hard to tell apart). Give each student a cone and allow them to look at it again telling them to get to know it really well as they will have to identify their cone. After a few minutes, collect the cones and place them in the center of the circle allowing students to go and find their cone. This is a great activity to talk about biodiversity – about all of the diversity in nature.

Secret Smells

Prepare 6 to 15 different aromatic natural substances that are found around the hatchery (eg. evergreen needles, leaves, fruits, moss, bark, cones, etc.) into cloth sacks (cloth 'sacks' can be made from a square of cloth closed with an elastic, but make them large enough so that no visual clues are provided about the contents). Students can either try to guess the contents of each bag by smelling the bag (no touching!) or go and try to find the same item on the hatchery grounds by smelling.

ADDITIONAL RESOURCES

Victor Elderton, North Vancouver Outdoor School

Victor has provided important advice and ideas throughout this project. He has an education project that he would like to find funding to complete which may provide a good education program for SHREP. The program is called 'Ode to Oncorhynchus' (Latin name for salmon) and is a series of activities with small props that follow the cycle of the salmon.

Equipment Funding

Bryan Foster has $25,000 funding over 5 years from Mitchell Odyssey Foundation to support technology for students. This represents an opportunity to be able to purchase equipment to support the educational programs being developed. Some equipment has already been purchased such as a digital stereoscope and digital compound microscopes, electronic probeware (a digital probe to read temperature), a waterproof digital camera, digital probe to read temperature, and 2 GPS units. This equipment represents a wonderful opportunity to provide students with experiences they likely would not otherwise have. As well, the equipment is helpful in engaging the students. Today's generation of children have grown up in a technological world. Thus, technological equipment is useful to capture their interest, but then get them looking into things related to the natural world with which most of them have little experience. For example, the equipment will support many of the Steamkeepers Modules or may be used for geocaching and watershed mapping in order to learn navigation.

Streamkeepers Handbook

The Streamkeepers Handbook offers a lot of information that could be used to develop a program. The following modules are some that would be most applicable:

Module 1: *Introductory Stream Habitat Survey*

Module 2: *Advanced Stream Habitat Survey*

Module 3: *Water Quality Survey*

Module 4: *Stream Invertebrate Survey*

Module 7: *Streamside Planting*

Office of Wetlands, Oceans and Watersheds, Environmental Protection Agency

Activities, projects, information magazines and curricula on wetlands, water resources, ecosystems, watersheds, wildlife and more.
www.epa.gov/owow/wetlands/education/#activities

RECOMMENDATIONS FOR THE EDUCATION PROGRAM

A variety of programs exist in the southern British Columbia area from which the SHREP education program can draw ideas and materials. SHREP has been delivering education programs and events for a number of years including hatchery tours and storm-drain marking. As well, other programs are in development such as the Water Unit involving field trips to Cheam Lake and the Chilliwack water treatment facility. It is important that as SHREP moves forward, the important work that has been done so far is not lost. Instead, SHEP needs to look at what it has already accomplished in setting the direction for future education programs.

In addition, SHREP needs to develop greater clarity in the direction they want to go before moving forward to ensure that the best possible program/s are developed and time, energy and resources are not wasted. This is normal for a group of this type. For one thing, there are different partners contributing a variety of ideas and resources. It is important to both ensure that all stakeholders have the opportunity to have input into the development of the program so that 1). everyone's needs are met and 2). everyone is supporting the same vision. This will not only be essential for the education program, but for all activities at the hatchery site including the centre building.

The following questions will guide future conversation about the education program. The best approach would be to get all the stakeholders in one room to discuss the questions. An outside facilitator may help assist the progress of the group:

- What is/are the goal/s of delivering the educational program/s?
- Who is the program aimed at? Who will be invited to attend programs?

- After students leave the hatchery, what is the main thing you would like them to understand?
- Who would deliver the program?
- Who is visiting the hatchery now? What are they doing while there?
- Is the educational program going to be ongoing?
- Will delivery of the programs be throughout the year or concentrated over a few months or ad hoc (ie. given as needed)?
- Who will oversee the students giving the program?
- Who will oversee program bookings?

One of the ideas proposed was for older students to deliver the education program to younger students. Having older students work with younger students is an excellent strategy from which both age groups will benefit. Providing children opportunities to collaborate builds democratic skills and cooperation and can help overcome prejudice against other children with varied backgrounds (Moore & Marcus 2008). However, there will be challenges to having the older students from local alternative schools deliver educational programs. Probably the biggest challenge is that these students are transient in nature and thus by the time they are ready to deliver an educational program they may be leaving. As well, a program delivered by older students to younger would have to be very easy to understand and replicate.

While having older students deliver educational programs is a great idea, it would also be good to develop programs for the older students to take. The hatchery site can provide an outdoor education site to support the students in the surrounding alternative schools.

Other specific education program recommendations include:

- The educational program should also create a different experience for students and allow them to have an opportunity for self-discovery. The format should be experiential and based on self-discovery because students as opposed to the regular classroom format of being lectured to;

- Any education program or activities developed for SHREP should make the curriculum links to the BC Curriculum Prescribed Learning Outcomes for the grades that the program wants to target. By making these links, the program will be much more attractive to teachers.

Developing a strong program –or even adapting a program so that it properly fits the needs of a different place – requires time, effort and expertise. In the case of Skowkale Hatchery, the need for a strong and easy to implement program is even more important if the plan is for the education program to be delivered by students. Thus, it is recommended that the Hatchery look for a grant in order to bring someone in who can properly develop the education program. The delivery should also be field tested with the older students delivering it (assuming that is the delivery model chosen), so that any issues can be corrected before it is widely delivered.

In addition, some kind of coordinator may be required at least in the short-term to help get the program off the ground. This may be something that could occur with a partnership with the City of Chilliwack, the School District or the Stó:lô Nation. Funding for work experience for students may also cover this.

INTERPRETIVE THEMES

Currently, there is a gravelled trail that runs from the hatchery building along the river for about a block up to the road. There are plans to extend this trail.

The trail is often used by residents of the area and dogwalkers who want to avoid the busy road and walk along a pleasant section of the river.

The following are ideas for interpretive signs along the River:

- The story of the Skowkale;
- How the salmon use the river ie. What elements of the river are important to them (habitat needs), at what stages of their life cycle they use the river;
- The importance of the riparian area, the various plant and wildlife species that live there, and how they interact;
- The history of the river: what is was like before it was changed and how it has been changed as a result of urban development;
- A map of waterways around Chilliwack and the fish species that inhabit them;
- The history of the hatchery and how it evolved;
- The importance of the fish as a traditional food source;
- Ethnobotany – this would work particularly well in combination with a native plant nursery or garden.

One option would be to develop interpretive signs that would be part of the school programs. Alternatively, signs could be created for other users of the area such as community members and visitors including those who will use the picnic area once it is established.

More discussion is needed by the various partners who play a role in the SHREP site in order to clarify the goals for the site before an interpretive theme for the signs can be chosen. Once the theme has been narrowed down, specific sign locations can be identified.

EDUCATION CENTRE

Increasingly, children and adults are being pulled inside by technology such as television, computers, and video games as well as parental concerns over stranger danger. Urbanization has replaced natural diversity with relatively homogenous landscapes of impervious surfaces.

Losing contact with nature has obvious health concerns such as the obesity epidemic currently being seen. Being outdoors is the best predictor of physical activity in children, but unfortunately many children no longer have access to natural settings. But research is beginning to uncover other losses that have occurred as people have become increasingly disconnected from nature. Alarmingly, recent research is suggesting that lack of experiential play is resulting in children being 2-3 years behind in cognitive and conceptual development from children a couple of decades ago (Moore & Marcus 2008). One study by Wells found a statistically significant correlation between nature and cognitive functioning of a group of children from low-income families when they moved to 'greener' homes where they had natural views through their windows. Green views have also been correlated with positive psychological benefits. Studies are also beginning to demonstrate a connection between nature and improved attention functioning. Nature may also moderate the effects of stressful life events on the well-being of children.

Unfortunately, the contemporary way that we build buildings and develop areas has increasingly isolated people from the beneficial experience of nature. However, physical design can play a role in improving the quality and quantity of exposure to nature by integrating it into the built environment (Moore & Marcus 2008) and by celebrating human dependence on nature.

Recognizing the physical, emotional, mental and spiritual benefits of nature on humans, it is recommended that 3 main design philosophies be incorporated into the building design of the SHREP centre:

1. Green Design
2. Stó:lô Design
3. Biophilia Design

1). GREEN DESIGN

Green or sustainable design should be incorporated into the centre as much as possible in order to create a centre that is both healthy for people and the environment. Green design is defined as having the least possible environmental impact and creating a healthy space for people to inhabit. Green design will both help to protect the riparian corridor on which the centre will be situated and will also provide a model of sustainable development for students, the surrounding community, and visitors. If the centre functions as an interpretive and/or retail space, then the green design may attract visitors who want to understand how to implement green design in buildings.

A number of concepts are associated with green design:

Efficient Use of Energy and Resources

The efficient use of energy and resources involves the use of designs, products and materials that either use less energy and resources or renewable energy sources. Examples include:

- Overall building orientation and configuration maximizes free heating and cooling from sun and wind;
- Insulated roof, walls and floor
- Energy efficient windows and doors
- Weather-stripping
- Programmable thermostat
- High performance heating system
- Tankless hot water heater
- Heat recovery ventilator (HRV)
- Fluorescent, compact fluorescent or LED lighting
- Energy efficient appliances
- Renewable energy system such as solar, wind or geoexchange

- Maximizing natural lighting – while traditional Stó:lô buildings may have been relatively dark, it is suggested that the centre be fitted with large windows and skylights. This would serve a dual purpose: it would make the most of the little light available in the Pacific Northwest and would also allow ample views of the riparian zone connecting building inhabitants with the local environment even when they are inside. Also, additional lighting should be targeted for the uses in the specific areas of the building rather than having lighting that provides a uniform and sometimes irritating amount of light throughout the building.

Nontoxic and Planet-friendly Materials

Our indoor spaces are often extremely toxic due to the chemicals found in building products, flooring, paint, varnishes, cleaning products, and carpets. Green design emphasizes the use of materials that are non-toxic such as VOC-free (volatile organic compound) paints and varnishes.

Sustainable design also focuses on using products with the smallest environmental impact possible.

Examples include:

- The use of local materials as much as possible;
- Using non-toxic products such as zero-VOC paint;
- The use of products that sustainably sourced;
- Operable windows that allow for natural ventilation

Water

Saving water is a big part of green design and there are many ways of doing this:

- Water-saving plumbing fixtures and appliances eg. Flow restrictor on taps adds air to water reducing flow from 3.5 gallons per minute to 1.5. Rain barrels for landscape use.
- Wastewater management such as installing a grey water system;
- Planting native, drought-resistant plant species;
- Collect water for landscape irrigation eg. A low-tech method is to simply have a rain barrel

Site Considerations

The building should be sited to avoid sensitive areas and decrease any damage to the site as much as possible. The carrying capacity of the site should be factored into decisions about the use of the site and numbers of people using the site.

2).REFLECTING THE SKOWKALE & STÓ:LÔ CULTURE

Given that the site is on the Skowkale Reserve, it is essential that any developments reflect the community and people.

The Stó:lô name comes from from the word for river. The Stó:lô consider themselves the river people. Their cultural traditions are derived from the river and surrounding land. As the centre would be built along the river, it would be a perfect place to reflect the Stó:lô culture.

Further research should involve looking at various First Nation buildings that have already been built and finding out more about their development process:

Seabird Island School

Before Seabird Island School was built, a community committee was formed to decide on the needs of the new school facility. Staff and students were also involved with the decision-making. Working closely with the committee, the architect designed a building which would represent the cultural and environmental relationship of First Nation's traditional education. From certain views of the building a canoe, and eagle, a clam, an owl and a salmon can be seen in the design. The majority of the construction crew came from Seabird and the neighbouring communities.

Xa:Ytem Longhouse Interpretive Centre

The federal government officially designated Xa:ytem as a National Historic Site in July of 1992; it was one of the earliest First Nation spiritual sites in Canada to be formally recognized.

The goal of the site is to increase public knowledge of the Stó:lo culture and provide a focus for the expression of the cultural heritage of the Stó:lo people by preserving the site's spiritual character and artifacts as well as to provide opportunities for Stó:lo cultural activities that promote and strengthen Stó:lo culture. A 4,000 square foot longhouse has been built of cedar at Xa:Ytem.

St'at'imc Heritage and Learning Centre, Lilloet

This centre in Lilloet was completed recently with funding from the Winter Olympics.

3).BIOPHILIC DESIGN

The term, biophilic design, is derived from biophilia, coined in 1984 by Edward O. Wilson. He used it to describe what he believed was the natural, innate attraction humans have for nature. Unlike green design, which focuses on sustainable building practices which conserve energy and protect natural resources, biophilic design is more concerned with the effects of nature that promote well-being. Biophilic design recognizes that buildings have emotional and mental impacts and looks to create living and working spaces that 'speak' to us in healthy ways.

Biophilic design recognizes that the natural world is a defining part of the human psyche and as humans have become increasingly separated from nature, that separation has been demonstrating in rising rates of dissatisfaction with life and depression. In biophilic design, elements and qualities of the physical environment are used to connect people to the physical, psychological, and cognitive benefits derived from direct experiences with nature. One reason that using biophilic design for the centre is important is because research has demonstrated the strong correlation between childhood experiences of nearby 'wild' nature and environmental stewardship later in life. Should SHREP want a future generation to take over care of the site, then facilitating that care is critical.

Example of biophilic design in action are outlined below:

- Takes outdoor design into account as an important learning environment (especially important for learners whose style is not adapted to an internal learning environment). The goal is to make the outdoor environment compelling so that it attracts people to be outside. Examples include edible gardens and hands-on engagement with plants;

- Dynamic natural light - Windows and skylights can be placed so that natural light enters the building spaces from different directions and heights providing changing patterns of brightness and shadow and the experience of the sun's movement, and eliminating glare;

- Frequent opportunities for spontaneous interaction with nature, including other species (integration of and free-flowing movement between interior and exterior spaces, visual

and/or physical access to wildlife) Biophilic design views the site and building as a series of exterior and interior spaces woven together in a tapestry;

- Living walls of plants that improve air quality and bring nature indoors;
- Place-based design that creates an attachment to place by incorporating the culture, history and ecology of the geographic area;
- Use of natural forms and local natural materials.

ADDITIONAL DESIGN CONSIDERATIONS

The Building Location

The building will need to be designed based on consideration of the site. The area between the Little Chilliwack River and Chilliwack River Road is relatively narrow. Official stream setbacks for the site will need to be investigated – however, in any event, the building should be well set back from the river in order to protect the river.

At one end of the site, the plants have been removed and gravel placed over the area. Since this area has already been impacted, it is suggested that this area be examined as the appropriate spot to locate the building. As well, much of the riparian vegetation has been removed and replaced by grass. Replacing the native vegetation would be a good step in rehabilitating the site.

Operational Design

SHREP is a tri-partnership among DFO, the Chilliwack School District and the Stó:lô Nation, specifically the Skowkale and Yakweakwioose Reserves.

Partnerships can be powerful because each party brings diverse contributions to the project. Partnerships are also important for access to different sources of funding. As the site continues to develop, it is important that all stakeholders have input and a common vision. As well, it will be important to come to an understanding of the role that each group wants to play.

As an advisor for this project, Victor Elderton, the principal of the North Vancouver Outdoor School, has suggested that it is critical that a Friends of organized group with Skowkale

leadership or joint leadership be formed and that one of its goals be to start getting people using the site in a general way i.e. picnics, so that people begin to take a bigger interest in and ownership of the site.

As well, since there is obvious internal leader able to take on the facilitation of the next phases of the project, Victor has suggested that funds be found to hire a consultant to continue their collaborative work.

Potential Users and Uses

A number of people were interviewed about the centre and a number of ideas were brought forth about who would use the site and for what:

- Nature education centre ie. classroom use for learning about nature and the environment;
- Kitchen space so that students would be able to eat at the centre;
- Office space for administrative use;
- Interpretive centre ie. interpreting topics such as salmon and Stó:lô culture;
- Community centre – for outdoor gatherings along the stream, as a gathering place for craft and other activities, as a classroom for teaching traditional crafts;
- Retail centre – for the sale of traditional Stó:lô crafts.

Given the many ideas of what the centre might be, the next steps in developing a centre must involve getting consensus on what is desired and keep interested parties informed throughout the process. It is important that the stakeholders associated with the project have input into what the project will look like in the end. Not only does the process of getting stakeholder input result in a better project, it also creates 'buy-in' from stakeholders (when done properly) so that they feel ownership.

Community Ownership

Creating support from the community is essential to the success of this project. Indeed, the importance of the community taking ownership of the project cannot be overemphasized. To that end, it is suggested that a community workshop be held in the community. Enough history of the project should be presented so that everyone understands the project and then feedback should be elicited. The drawings by the C.J. Mussell would provide a good starting place for discussion along with the following questions:

- What role does the community want to play?;
- What community needs could the centre satisfy?;
- What use/s would the community like to see the site used for?
- What kind of building would the community like to see on the site?

Food should be provided in order to attract people to attend.

A workshop should also be held with one or more of the schools involved to invite student input into the project.

General Design Recommendations

The centre design should:

- Reflect and fit in to the natural area;
- Emphasize the river; for example, either insulated glass walls that look out onto the river or walls that completely open up to create an indoor/outdoor classroom;
- 'Speak' the value of the natural world;
- Reflect the Stó:lô culture;
- Surround the centre with vegetation such as a garden – things that people can smell, pick and experience;
- Be a place for all kinds of outdoor and environmental education – not just hatchery related subjects;
- B multifunctional – serve the needs of all members of the partnership from SHREP to the school district to DFO to the community;

- Use cedar to both reflect the Stó:lô culture and biophilia design. Natural materials should be used and left in as natural a state as possible in order to create a rustic, cozy feeling;
- Incorporate art that reflects nature and Stó:lô culture. For example, a graphic could be created on the floor showing the salmon species and their cycles and how that is connected to seasonal and human cycles;
- Incorporate the Halq'emeylem language. For example, Halq'emeylem words could be placed on graphics like the one described above as well as other places around the centre;
- Incorporate the canoes into the design of the centre – both to protect and display them;
- Minimize impervious surfaces to reduce stormwater runoff;
- Consider increasing the vegetative buffer between the road and river to reduce the environmental impacts of the impervious asphalt road by planting more native plants. This would also reduce noise pollution from the road (issues of vandalism may need to be considered).

The following are two initial design ideas for the centre that will provide a focus for discussion moving forward:

Building on Stilts

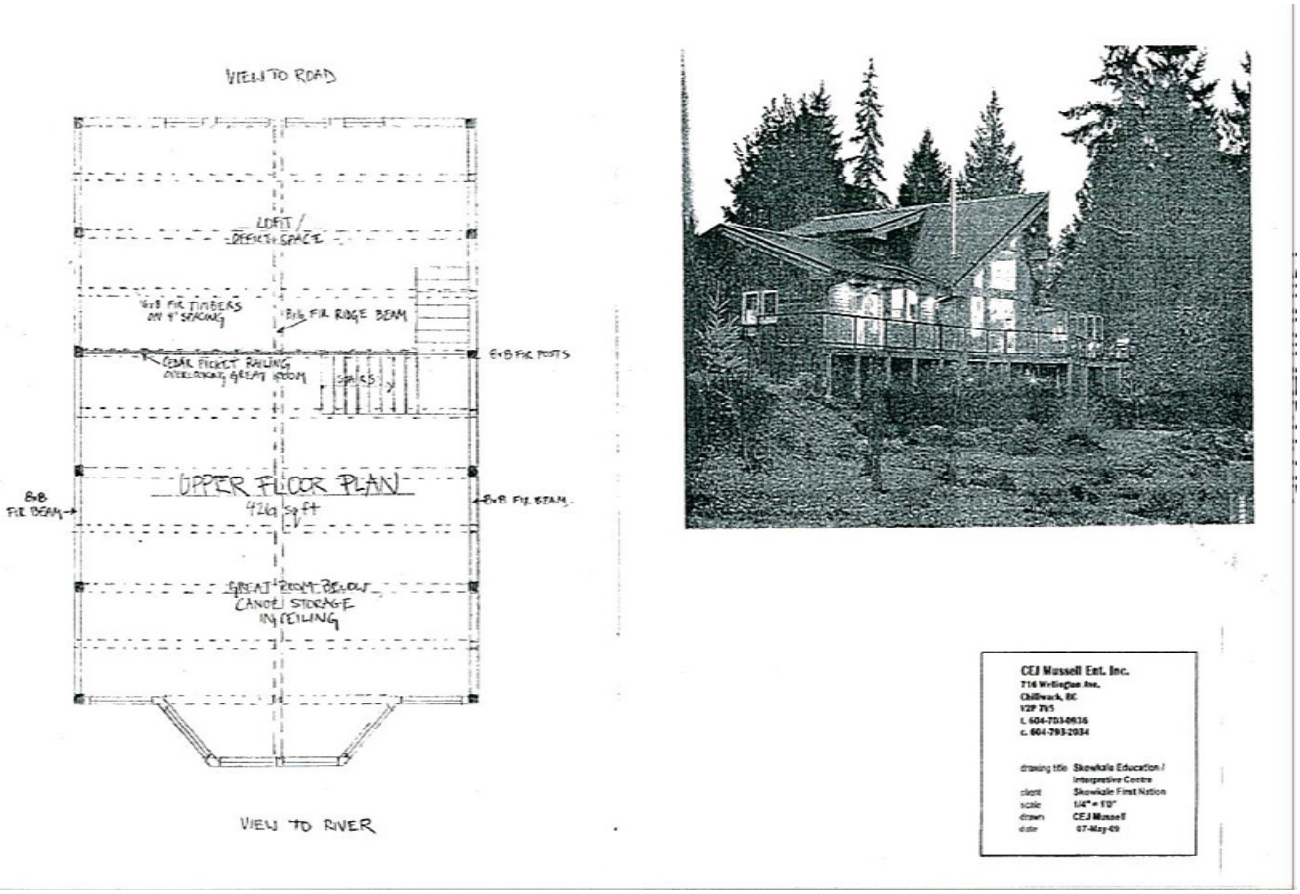
Given that the area is in a riparian zone and thus subject to flooding, a design on stilts is a possibility. This would also create an outdoor classroom underneath the building where students could work out of the rain. The drawback of a building on stilts is twofold: first of all, the building footprint would have to be larger because a second floor could not be built, and secondly, it could create an accessibility issue for people such as elders and individuals with disabilities unless an elevator was added to the design.

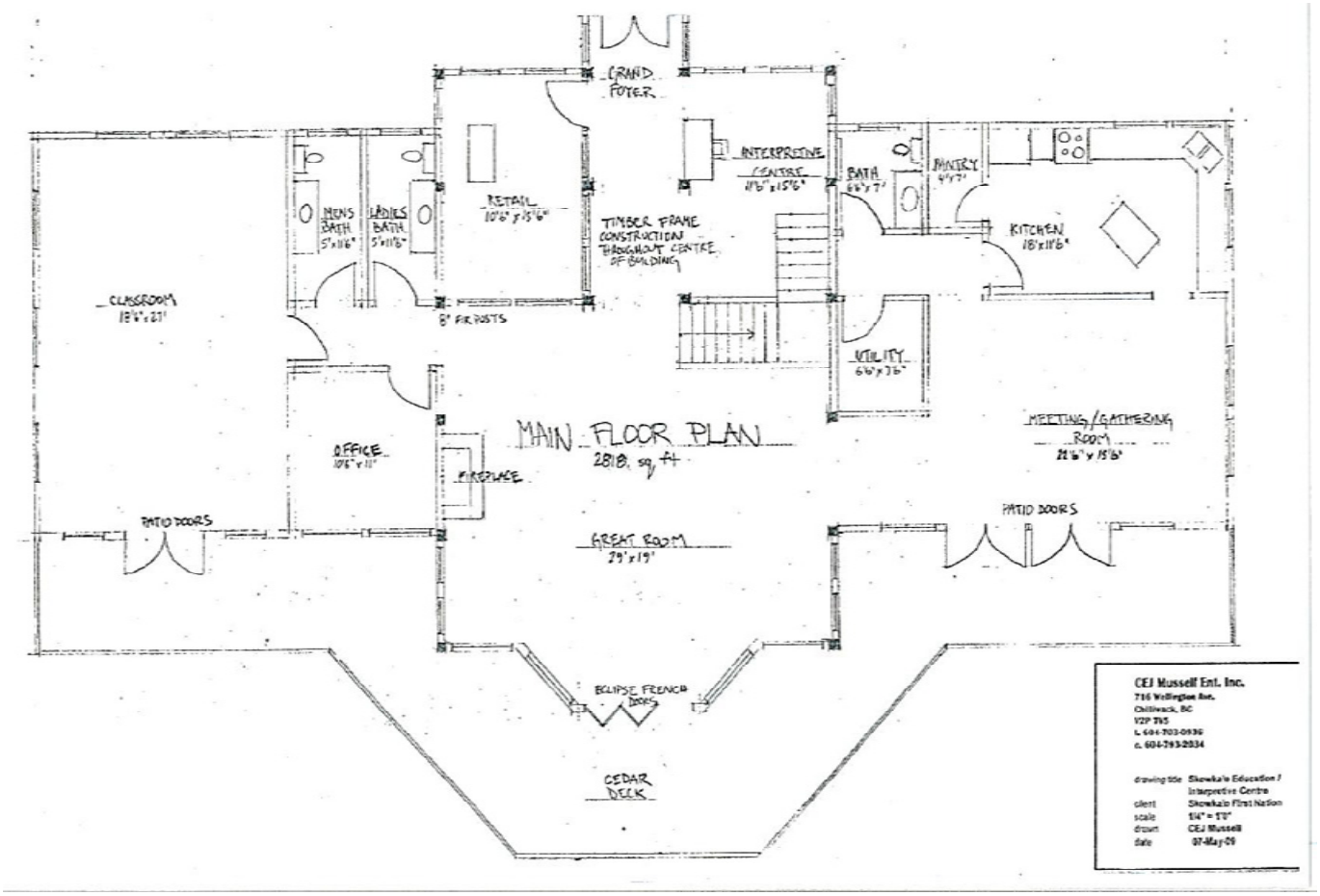
The architect, CEJ Mussell, felt that the stilt design may limit the building because it may not be possible to add a second floor. Thus, he concentrated on the second design idea below.

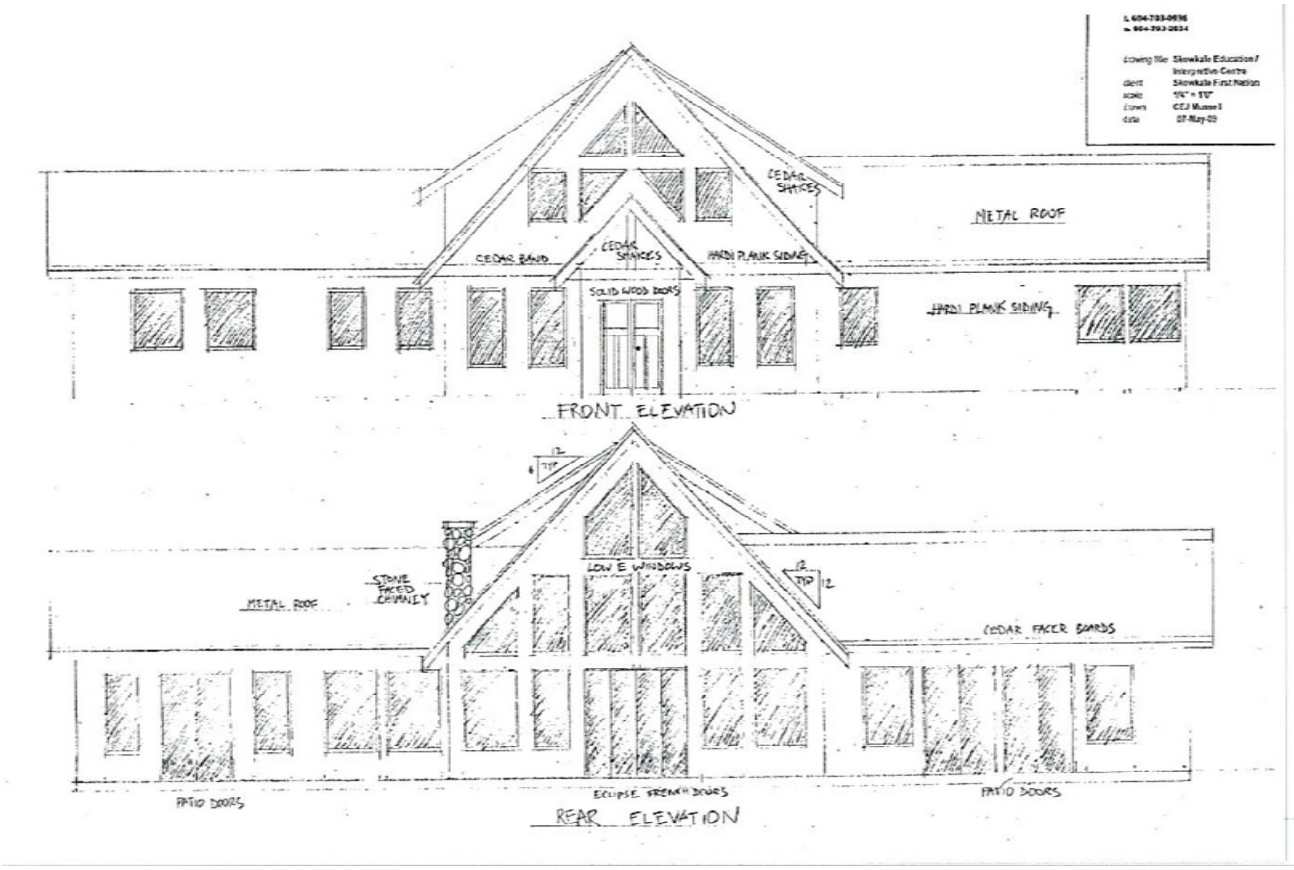
Great Room Design

A second option is a great room design with a partial second floor. A central fireplace would invite people as they stepped into the great room. The walls would be made of cedar left in its natural state. On the side near the river, large doors would open completely creating an indoor/outdoor space. Light would stream into the building from many windows, insulated glass walls and from skylights that replace the smokeholes found in traditional Stó:lô buildings. In some parts, the ceiling would rise to the second story and the war canoes could be suspended above. Activity and retail spaces would be located round the edges of the great room. A staircase at the side of the great room would lead up to the second floor where there would be office and storage space.

CEJ Mussell's conceptualization of the space can be found below:




GRAND FOYER
INTERPRETIVE CENTRE 11'6" x 15'6"
BATH 6'6" x 7'
PANTRY 4'x7'
KITCHEN 18'x11'6"
MENS BATH 5'x11'6"
LADIES BATH 5'x11'6"
RETAIL 10'6" x 15'6"
TIMBER FRAME CONSTRUCTION THROUGHOUT CENTRE OF BUILDING
CLASSROOM 18'6" x 21'
8" FIR POSTS
UTILITY 6'6" x 7'6"
MAIN FLOOR PLAN
2818 sq ft
OFFICE 10'6" x 11'
MEETING/GATHERING ROOM 21'6" x 15'6"
FIREPLACE
PATIO DOORS
GREAT ROOM 29' x 19'
PATIO DOORS
ECLIPSE FRENCH DOORS
CEDAR DECK
CEJ Mussell Ent. Inc.
716 Wellington Ave.
Chilliwack, BC
V2P 3N5
t. 604-703-0936
c. 604-793-2034
drawing title Skowkale Education / Interpretive Centre
client Skowkale First Nation
scale 1/4" = 1'0"
drawn CEJ Mussell
date 07-May-09


CEDAR SHAKES
METAL ROOF
CEDAR BAND
CEDAR SHAKES
HARDI PLANK SIDING
SOLID WOOD DOORS
HARDI PLANK SIDING
FRONT ELEVATION
LOW E WINDOWS
STONE FACED CHIMNEY
METAL ROOF
CEDAR FACER BOARDS
PATIO DOORS
ECLIPSE FRENCH DOORS
PATIO DOORS
REAR ELEVATION

PHASING THE PROJECT

This is a large undertaking and at least one individual expressed concern over the group's ability to complete the various projects considering the number of things that are already on the go. For that reason, it is suggested that the various undertakings be considered in phases. No timeline has been applied here since that should be decided in consultation with the stakeholders.

Phase I

- Finish the hatchery. The internal space of the hatchery has to be organized to be functional for hatchery and educational purposes. Also, the storage concerns need to be addressed;
- Examine the long-term sustainability of the hatchery. Many other hatchery groups have become societies as stewardship groups – would this be a right direction to take for SHREP?;
- Address the issue of the canoe house – either restoring the building or making provisions to store the canoes elsewhere. The canoes are wonderful cultural and historic artefacts that should be preserved for future generations. One suggestion is to incorporate them into the design of the new centre, but they need to be protected until the centre is developed;
- Continue to build upon hatchery operations including conducting water quality studies and making decisions about the amount of fish stock and where it comes from;
- Continue with the development of education programs that are already underway or consider how they will be integrated into new programs;
- Identify groups who want to be actively involved and get people to take ownership.

Phase II

Prioritize the various projects and develop timelines for their implementation:

- Develop a picnic site. This may be placed near the centre site to provide outdoor working space;
- Develop a native plant nursery;
- Undertake riparian planting activities;
- Continue developing the trails along the Little Chilliwack River and develop appropriate interpretive signs/experiences;

Phase III

- Undertake the development of the centre.

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Moore, Robin C. and Marcus, Claire Cooper. 2008. Healthy Planet, Healthy Children: Designing Nature into the Daily Spaces of Childhood. In Kellert, S.R., Heerwagen J. and Mador, M. (2008). Biophilic Design: the theory, science and practice of bringing buildings to life. Hoboken, NJ: Wiley.

www.sfu.museum/time/

APPENDICES

EDUCATIONAL ACTIVITIES

1). Metro Vancouver Parks

Regional Parks Department

East Area Parks Interpretation 604-530-4983

Build the Life Cycle

It is important to recognize that the different stages of a salmon's life cycle are found in different habitats, making them more vulnerable to human disturbances.

Time: *10 – 15 minutes*
Ages: *7 and up*
Materials provided: *pictures of each salmon life stage and their appropriate habitat*

Discuss with your group the different habitats where each salmon life stage is found. Eggs and alevin are in a redd, which is a gravel nest at the bottom of the stream. Fry live in freshwater creeks. Smolts are found in the brine of an estuary. You may need to clarify with your participants what an estuary is (the area of a river mouth where salt and fresh water mix). Adult salmon live in the ocean. Look for spawners over the gravel beds of their freshwater spawning grounds.

You will be provided with three sets of Build the Life Cycle cards. Split your class into three groups, and send each to a different table or work area. Give each group a set of cards, instructing them to build the life cycle of the salmon by putting each stage in the right habitat. Suggest that they identify the habitats first and put them in a circle in order, then put the salmon stage into the right habitat. Encourage each group to keep adjusting the cards until they get everything right.

After the activity, or back in the classroom, discuss with your group why a salmon would benefit from using these different habitats. (They can exploit a wider range of resources). Why would moving to these different habitats during their life make them vulnerable? (Because damage to or destruction of just one of the many habitats affects the entire cycle).

Caddisfly Larva Game

Caddisfly larvae, which are common fresh water insects, could be called "river spiders" because they create a "web" to catch their food.

Time: *10 min*
Ages: *4 to 7 years*
Materials Provided: *none*

Caddisfly larvae, which go through metamorphosis to become adult caddisflies, live in fast running streams, and use mucus to glue a 'shell' of local materials (i.e. rocks, sticks, etc) around their fragile bodies to protect themselves. They also use this mucus to attach a web to the rocks in the stream. Any small pieces of organic material floating down the stream get caught in the mucus. The caddisfly larva then eats his or her "web," consuming the bits that have been caught in it at the same time. This game allows the children to pretend to be the mucus web of a caddisfly trying to contain its tiny prey.

The children hold hands to make a circle; this is the mucus web of the caddisfly larva. One child is a small amphipod in the mucus web that is trying to escape through the ring by getting over or under the hands of the other children, who try and stop him or her by moving their hands up and down accordingly. Play the game several times to allow different children to be the amphipod.

After you have finished playing, ask the group how they could have made their web more effective (e.g. put glue on their arms to stick to the amphipod). Take the children to the edge of the stream. Have them imagine they are caddisfly larva who want to grow up and metamorphose into caddisflies. Let them choose a spot where they would stick their web to catch lots of food. Remember to consider water flow: an area with no flow will not bring enough food to the caddisfly; an area with a lot of flow might wash the web, and even the caddisfly, away.

Erosion Tag

Erosion is an important stream ecology concept. It is a powerful force that humans spend a lot of time and money trying, usually unsuccessfully, to stop. This fun game helps your group understand the basics of erosion and the relationship between trees and the stream.

Time: *10 - 15 minutes*
Ages: *6 and up*
Materials Provided: *none*

Gather your group and ask if they have know the word "erosion" and what it means (soil being washed away by water). Spend some time developing a clear definition, what the causes are (rivers washing away banks, rainwater carrying soil, damage to riverbanks caused by people, etc.), and ask them what might prevent erosion.

This game is a variation on British Bulldog. One player is the roots of a small tree; the rest are soil particles carried through by rain water. Use your foot to make two lines in the dirt about 10 meters apart at either end of the playing area. All the "soil particles" stand behind the line at one end of the playing area and the "tree root" stands in the middle between the two lines. Because a tree's roots are longer than a person's arms, the tree root in the game is allowed to move from side to side to simulate the full area of his/her roots. Restrict the width of the playing area with packs and jackets.

To begin play, shout "RAIN!" The soil particles must run down the playing area, past the tree root, much as soil is washed away by rainwater. The tree root has to tag the soil particles as they "wash" by. Soil particles are safe once they cross the second playing line. Each tagged soil particle has been trapped by the tree's roots, helping the tree to grow bigger by giving it more soil to grow in. The two (or however many were tagged on the first pass) join hands with the first root to represent the roots of a bigger tree. This longer "tree root" must now work as a team to tag eroding soil particles. If the root breaks apart at any point during the game, it can no longer function as a root and so any soil tagged by a broken root does not join the tree. Now turn the root around and have the remaining soil particles run back past the tree again to the line where they began. This continues until all the players have been caught and are one big tree root.

Finish the activity by asking the group which tree was easier to get past – the small one or the big one? Hopefully, the big tree root was more difficult to get by, and so larger trees are more effective at preventing erosion. Discuss the fact that the new forest practices code in BC prevents logging along stream banks. Ask how children running up and down urban stream banks would affect the erosion of that bank?

You may want to follow up this activity after the field trip by having everyone do a poster on different human actions that would aggravate erosion, and ways to prevent it. You could also do a tour of your neighbourhood, looking for areas where erosion has taken place and whether or not human activity has had any influence. Older grades could discuss the impacts of urban development on water flow. (Roads, houses and driveways are all impermeable to water, increasing the direct run-off into streams and waterways during a rainfall.)

Food Web

This activity allows students to appreciate the interconnections that exist in nature. Adapted from Joseph Cornell's Sharing Nature With Children.

Time: *10 minutes*
Ages: *any*
Materials provided: *ball of string, optional — pictures of different things from forest habitat*

Have the children form a circle and ask them, "Who can name a creature that lives in a stream?" Encourage specific answers, such as chum salmon, or caddisfly. Give the end of the ball of string to the person who gave the answer. Then ask, "Now what does a chum salmon eat?…Ah, a caddisfly…Okay, caddisfly, take hold of the string here. You are connected to the chum salmon because salmon like to eat caddisflies. Now, what does a caddisfly eat?"

Continue connecting the children with string and building new relationships. Bring in elements such as streamside vegetation, birds, mammals, water, soil, etc., until the entire circle of children is strung together in a web of life. This is an ecosystem (living and non-living factors interacting). Sample questions you might use to build the web are: What sort of plant might grow beside a stream? This plant would drop invertebrates into the water. Which stream creatures would eat those invertebrates? Streamside plants hold the soil back and prevent erosion, which is critical for survival of which creatures? Name one mammal that would visit the stream to catch a salmon.

When everyone is connected to the web, show how each element in the habitat can affect the others by removing someone from the web. For example, there is a dam built and the chum salmon cannot return. Have the chum tug on the web and see who else feels a tug. Anyone else who felt the tug is affected by the loss of the chum salmon, and so they start tugging too. The whole web should be vibrating with the loss of the salmon.

This activity works better with younger children if the children already know which part of the environment they are and they just have to think of the links. This can be done with pictures or labels that children wear during the activity.

Salmon and Bugs

Bugs are integral to a salmon's diet. This activity explores why finding these scrumptious treats is not always as easy as you might think.

Time: *10 minutes*
Ages: *all*
Materials Provided: *30 coloured pipecleaners*

Begin by asking your group if they know what young salmon fry eat. If they don't already know the answer, spend a few minutes allowing the group to figure out the correct answer. Once they have the correct answer (aquatic insect larvae - bugs for short), ask them if they think that finding bugs to eat in the stream is as easy as going to your refrigerator at home. They are going to have a chance to find out.

Tell the children that they are salmon looking for bugs to eat. Scatter your bag of pipecleaners in an area of rough or varied ground cover (mowed areas are not the best choice for this activity). It is fine to have everyone watch you do this. Ask your group to form two lines about 5 meters from where you scattered the pipecleaners. Create a sense of competition between the two teams by telling them the salmon will starve if they do not find food quickly. The first child from each group must run out and grab the **first "bug" they see** and then return and tag the next child in line, who then goes to find a "bug." The leader collects the pipecleaners **in the order that they are returned**. The two teams continue to race to find the "bugs" until all thirty have been found (each child will have several turns).

It is often difficult for groups to find the last few pipecleaners, so you may want to send the whole group out to try to find the last few. When the game is over, look at the "bugs" you have lined up on the ground and see if there are any trends in how they were collected (hopefully the brightly coloured bugs were found first).

Finish the activity with a discussion as to why some bugs were easier to find than others (i.e. camouflage, good hiding spots, etc.) and why this is important to salmon looking for insect food in the stream. Ask the group if they can think why some bugs are brightly coloured (warning if poisonous).

Salmon and Trout

Big salmon eat baby trout, while big trout eat baby salmon. Which is the bigger fish in this game of true or false?

Time: *10 minutes*
Ages: *7 and up*
Materials provided: *a list of true and false statements.*

The instructions for this activity must be very explicit, or mayhem can result. Line up your group in two opposing teams--salmon and trout. Have them stand about two meters apart, facing each other. Establish 'safety' lines, using packs or parents, for both teams about five meters behind each of them. You will be provided with a list of statements that will be either true or false as indicated. Feel free to add your own statements to the list from information you covered in class or during your session.

Read out loud one of the statements from the list. If the statement read is TRUE, then the Salmon must chase the Trout. Any Trout that are caught before they cross the safety line go to the Salmon team. If the statement is FALSE, then the Trout must chase the Salmon back to their safety line, with any tagged Salmon going to the Trout team. This activity requires participants to determine very quickly if a statement is true or false, and individuals will often run the wrong way, but that is part of the fun. Make sure that the group is clear on the correct answer before you read the next statement. Occasionally, a relevant piece of information is missed during the program and the group will not know the answer. Ask them to let you know if the statement relates to information not covered during the program.

Continue the game until all of the questions have been answered and declare a winning species! Be sure to discuss with the interpreter any statements or answers that were unclear.

As a follow-up activity, you could play this game again, getting the children to use their knowledge to write new true or false statements.

Salmon Life Lottery

A salmon must face many hazards from when it is spawned to when it returns as an adult. Who will survive to spawn?

Time: *15 minutes*
Ages: *7 and up*
Materials Provided: *a set of lottery cards and a key*

Introduce the activity by asking the group how many of them expect to survive to become adults and possibly have children one day. Suggest that if they were salmon, they would be considered very optimistic.

Hand out a single lottery card to each student and have them stand up. The letters on each card represent a stage of the salmon life cycle and some hazards it may face. You can have any number of duplications of the tickets except for the surviving spawner - it is most effective if there is only one or two of those. Participants are told they are salmon eggs buried in the gravel on the bottom of a stream, trying to survive life's hazards to reproduce. The first letter on everyone's ticket is an 'E,' representing "egg. Read down the list, asking who holds a ticket with the next set of letters on it, expanding on the causes of death as shown in the key. Have people sit down as they die so everyone can watch the declining population. Dramatize the descriptions as you progress through the lottery cards.

An example of how to proceed with this activity would be: "Who has the ticket 'EH'? You were a little egg on the bottom of the stream when suddenly, a horse rode through the stream, disturbing the gravel and washing you away…Everyone's ticket should now start with the letters 'EA.' You have all survived to become alevin. Who has the ticket 'EAB'?" etc.

Finish the activity by discussing the range of risks salmon face and how many salmon survive to adult. An adult female salmon produces around 2500 eggs, of which only two are expected to survive in nature, but this increases to 250 if they are hatchery raised. Discuss why salmon and stream protection is important, and what we can do.

Salmon Life Lottery Key

E - Everyone starts out as eggs laid in a nest (redd) dug in the gravel.

EU - Your eggs weren't fertilized - no further development.

EB - Disease! Your egg was infected by bacteria.

EH - A horse has ridden through your stream - you are crushed!

EL - Landslide! A stream bank collapses and smothers you.

ES - Oh no! You are eaten by a water snail.

EA - Congratulations! You have hatched into an alevin!

EAB - Yikes! You are eaten by a water beetle.

EAP - Pollution! Someone dumps garden pesticides in your stream.

EAR - Oops! Your rock is turned over and you are swept downstream.

EAF - Well done. You're now a fry swimming in the stream!

EAFK - Look out! You are eaten by a kingfisher.

EAFH - Trees around your creek were cut down - the water is too warm.

EAFS - Good job! You're now a smolt getting ready to head for the ocean.

EAFSP - Yuck! Pollution from industry is dumped into your estuary.

EAFSH - Uh oh! You've been eaten by a heron.

EAFSA - Way to go! You're an adult salmon ready to spawn.

EAFSAN - Help! You are caught in a gill net.

EAFSAM - The area around your stream has been developed. You can't lay your eggs in the culvert under the new mall!

EAFSAS - Success!!! You've survived to spawn!

Salmon Life Cycle Role Play

Acting out their life cycle provides a salmon's eye view of the world.

Time: *10 minutes*
Ages: *3 - 6 years old*
Materials provided: *bring this role play with you to the program. Do the actions in italics and encourage everyone to join in.*

(Ask the group, including the adults if they are game, to form a circle and crouch down on the ground in a small ball.) You are all little salmon eggs that have been spawned in the fall by your mother and buried in the gravel at the bottom of the stream. It is very dark and there is a gentle flow of water that provides oxygen to breath and keeps you clean. *(Take a couple of deep breaths)*

It is winter now and it is getting very cold down here in the gravel. (*Shiver)* You are going through some slow changes. You wriggle as you start to grow and change *(wriggle around).* Now you are ready to pop out of your egg, so everyone burst out of your egg. *(Move out of your ball into a crouch and open up, but don't stand yet)*

So now you are moving and wriggling under the gravel and you have a big, pink bag attached to your stomach *(hold out your arms out in front of your stomach)* This is your yolk sac and you are an alevin now *(have everyone repeat the word "alevin").* You still live deep under the gravel of the stream, and you don't need to eat anything because you get all your nutrition from your yolk sac, which is like a big lunch bag.

As you eat from you yolk sac it gets smaller and smaller *(shrink size of arms to simulate the yolk sac getting smaller).*

Oh, no! Your yolk sac is all gone and you don't have any food left in it. Your belly is zipping up, just like a jacket, and you are going to have to go out into the stream to find food for yourself. You are now a fry *(get everyone to say fry).* O.K. everyone, swim really hard to get out of the gravel. *(Wiggle as you stand up.)* First thing you have to do is go right up to the top and take a gulp of air to fill your swim bladder. *(Stand on tiptoe and mime "gulping" air at the surface of the stream.)* That is a bag in your belly that you can use to go up and down in the water.

We are all feeling pretty hungry so we have to find some food. What are we looking for? Bugs! Many different insects have larvae in the water that we like to eat, so let's go eat some *(mime gobbling food from the air around you).* Mmm, now were growing and getting bigger, and look, our skin is changing color too! We are going all silvery and getting ready to swim to the ocean. Now we are called smolts *(repeat smolts as a group).*

Let's all swim down to the mouth of our river where it meets the ocean *(swim around in your circle)*; this place is called the estuary. We will spend a bit of time here while our bodies adjust to the salt water.

Now we are adult salmon. Aren't we big and beautiful and shiny? Let's go for a long swim. *(Get the group to stay in their circle and swim around).* O.K., here we go, we are swimming all the way to the coast of British Columbia, we are swimming around the coast of Alaska, and we are eating lots of smaller fish as we go. *(Pretend to chomp at smaller fish).* Now we are swimming out towards the deep ocean and are starting to head south again. Hmm, this water feels about the same temperature as the water did when we first came into the ocean. Maybe we better head back into shore again and see where we are.

Oh, look, there is Vancouver Island, we must be getting close. There's a river flowing into the ocean, I wonder if it is ours. How can we tell? We smell it! Everyone take a big sniff and see if it is our river. *(sniff)* Hmm, yup this one smells right! (*swim some more and sniff again)* Ah, this must be the Fraser River! And *(swim some more and sniff again)* this is Kanaka Creek, this is our home! Boy, our bodies have gone through some big changes since we entered the river too, look! We aren't silvery anymore; we've gone green and splotchy. The boys have big hooked noses and the girls have big fat bellies full of eggs. We are ready to spawn!

Everyone dig a nest in the gravel with their tails (*wiggle bums).* Now lay your

eggs and bury them again *(wiggle bum)* Now, children, do you know what happens to us? We die! *(dramatic death scene)*. But our bodies in the river will encourage insects to lay eggs, ensuring lots of food in the river when our babies emerge in the spring.

And that's the life cycle of a salmon!

Salmon Tails

Experience predator/prey relationships and learn what happens when there are too many predators and not enough prey. Advanced groups can learn something about trophic levels and different kinds of predators.

Time: *10 minutes*
Ages: *5 and up*
Materials Provided: *strips of flagging tape for tails*

Begin by discussing how different living things get energy to grow and live. Plants make their own food from the sun's energy; herbivores eat plants; primary carnivores eat herbivores; secondary carnivores eat primary carnivores and herbivores; omnivores eat plants and animals; scavengers and decomposers eat dead plants and animals. Each of these is called a 'trophic' level. Try to name members of each trophic group (*e.g.,* caddisfly - herbivore; damselfly - primary carnivore; salmon - secondary carnivore; raccoon - omnivore; crayfish - scavenger).

Identify one child as a Belted Kingfisher - a skilled stream predator. The remainder are salmon fry - a kingfisher's favourite food. Give each salmon fry a tail to tuck in a back pocket or waistline where the kingfisher can easily pull it out. Ensure that no one ties their tail in place, or hides it out of reach. Set clear boundaries for the game — in nature, both predators and prey have a limited home range — so the children don't run too far away. The kingfisher must 'eat' the salmon fry by pulling out their tails. When he does this, the kingfisher converts the energy from the salmon fry into offspring, and the eaten fry become kingfishers. Have the kingfishers pass collected tails to the group leader. The game continues until all salmon fry have been caught.

At the end of the game ask the group what might happen now there are no salmon left? Some birds will die of starvation.

Experiment with the size of the playing area, playing the game several times in a different sized space. Does the size of the area affect the game? Hopefully in the larger playing area the game took longer to finish, so both predator and prey lived longer. How would this information relate to the amount of space we should reserve for wildlife? In a larger area, there is less chance that animals will clean out their available resources.

Shake a Bush

Children learn firsthand that streamside vegetation holds insects and is therefore a food source for young salmonids. The children search and share their findings.

***Time**: 15 minutes*
***Ages**: 6 and up*
***Materials Provided:** white handkerchiefs and small buckets.*

Explain that streamside vegetation is not only important for shade and soil stabilization, but it is also important for insects. Many insects that cling to the leaves and branches of shrubs and trees lay their eggs in the stream. Insect larvae that live in the stream and the adults that fall into the stream become food for young salmonids. Many of the insects fly and may fly from the handkerchief; however the children will see them and know that insects were hiding on the plants.

Suggest areas that are dense with foliage and set boundaries. Remind your group that they are disturbing nature and therefore should be respectful of the creatures that they capture. Be aware that some of the larger creatures found could eat the smaller ones so they might need to be placed in separate containers.

Ask the children to work in small groups with parent helpers to guide them. The handkerchief is placed under foliage that the children shake, and catches the falling insects. The insects can then be placed in the buckets for further examination.

After a while, have the students sit in a circle, and ask them what they found. Lead a discovery about the different creatures, so the children will look closely at the animals they found:

Is it an adult, or a larva?

How is it adapted to live here it does?

Could it be food for fish?

How was it using the plants?

Stream Pledge

A stream search can be damaging and should not be done just anywhere or at anytime. Before entering the stream, it is important that groups are aware of the impacts. This is a fun way to remind your group that they have a responsibility to maintain the stream habitat.

***Time**: 2 min.*
***Ages**: any*
***Materials Provided:** none*

In order to reinforce a conservation message in a fun way, have the children raise their right hand and repeat the following pledge after you:

I promise
To go into the stream
To catch lots of creatures
To handle those creatures very carefully
To look at those creatures very closely
And then to let them go.

Before your trip to the park, you may want to write your own words or encourage your group to create a stream pledge, either as individuals or all together that they can say on the field trip.

Stream Search

Children gain firsthand experience of creatures and plants living in the stream. This activity encourages discovery, identification, and sharing.

***Time**: 30 minutes*
***Ages**: 6 and up*
***Materials Provided:** buckets, identification sheets, reference materials*
***Preparation needed:** everyone should be dressed to get wet and dirty (including shoes) and bring a change of clothes.*

Begin by sneaking quietly up to the stream edge and observing silently. You might see kingfishers, dippers (small, black bird that flies low to the water), ducks, even coyotes or mink! After a few minutes, gather your group to share their observations. Encourage participants to list all aspects of the stream community, both living (trees, moss, birds) and non-living (rocks, water, sunlight). Was there anything they didn't expect by a stream? Now tell them you are going to look at the unfamiliar part of a stream community: You are going to explore under water.

Use obvious landmarks as upstream and downstream boundaries to exploration and ask accompanying adults to strictly enforce them. Remind everyone that this activity has an impact on the stream; we don't want to spread the effects too far. **Before** distributing buckets, demonstrate appropriate stream-searching techniques:

- ✓ stand still and watch for underwater activity
- ✓ fill a bucket with water, then quickly grab a rock and drop it in the bucket; rinse the rock around and look carefully in the water for anything unusual
- ✓ don't throw water from buckets, pour it gently back into the stream
- ✓ try to place rocks facing the same way when returning them (some algae prefer either the top or bottom of a rock)
- ✓ take your time and observe carefully

Give out one bucket per child and put large buckets along the shore to collect caught invertebrates. Be aware that some insects will eat smaller ones and may need to be placed in a separate container. Encourage students to search carefully under rocks and in gravel, as many stream invertebrates are small and spend most of their life clinging to rocks in the stream to avoid being swept away.

After 10 to 15 minutes of searching, have everyone place their finds in the large buckets and collect small buckets. Either divide the available buckets among

several groups of students, or distribute the different creatures into several buckets and pass them out for observation. Encourage close observation by asking the following questions:

- How many eyes or legs can you see?
- How does it move?
- What color is it?
- Where did you find it (where does it live)?
- What is strange or wonderful about it?
- How is it adapted to live where it does?
- Have you observed any odd behaviors?

It is more important to make discoveries based on observation than to know the correct names, as discoveries you make yourself are more likely to be remembered. This step could be formalized on a discovery sheet for older children to make a record of their creature. Once observations have been made, use the provided ID sheets to find the correct name for the animal, although it can be difficult to identify stream invertebrates as there are so many different forms.

Encourage students to share their observations with each other and allow everyone to see the different animals found. Please be aware of the water temperature in the bucket, as warmer water holds less oxygen and animals that live in fast flowing streams are accustomed to a high percentage of dissolved oxygen.

Once the observations are finished, have students carefully release creatures into the stream. Check buckets to make certain that all animals have been rinsed away – some persuasion may be required!

At this point, allow time for the students to change into dry clothes.

WHAT ARE THE ODDS
Activity Description:

For Autumn Salmon Program - Salmon Come Home
Umbrella Topic: Increasing fish survival through hatchery rearing
Target Audience: All ages
This activity is intended for 30 students.

Location and Organizational Requirements: Works well both in the classroom as well as outdoors. The children will need to be divided into 2 groups which are separated by at least 2 meters.

Rational:
This activity is a good introduction to the hatchery tour to help the children understand the basic function of a hatchery. It demonstrates the comparison of fish survival of hatchery verses wild fish. The children can see that 90% of the fish survive from egg to smolt stage in the hatchery while 10% survive in the wild. The children will also learn the early development stages of fish and which stages are raised in the hatchery. They will learn through active participation.

Sequence in program:
This activity is best used as an introduction to the hatchery tour.

Teaching Approach:
Get the group of 30 children to two separate into 2 groups of 15. Make sure that they separate enough so that they can distinguish the two groups. One group will represent the hatchery raised fish and the other will represent the wild fish. The children who represent the wild fish will get one set of cards marked "wild". The other group who represent the hatchery fish will get cards, one set per child, which are marked "hatchery.

Ask the children to look at the card which shows the first stage of fish development, the egg. Tell them that the people who have a card with a yellow mark must stand away from their group. Let them know that they represent fish which succumbed to death. Explain what things effect the survival of fish in the hatchery and wild at that stage. Because the children are standing in four groups now, 1) living hatchery fish 2) dead hatchery fish, 3) living wild fish and 4) dead wild fish, they will see how many fish survive and how many die. Go through all the stages of development one at a time and ensure the groups to remain apart. Eventually the children will see that 90% of those representing Hatchery fish survive and 10% representing the wild fish survived death. If the groups are separated you can easily compare the amount of people representing living or dead fish in the hatchery group verses the wild fish group. While discussing the causes of death ask the children what they thing might be a typical cause of death at each stage of fish development. For example when you tell the children at the fry stage that those with the yellow mark on their card go over to the group representing dead wild, ask them how a wild fry may die. Explain that the wild fish are susceptible to predation while that hatchery fish are protected. Explain that eggs under the gravel sometime get crushed when people walk into the creeks. A variety of scenarios can be described.

There are 30 sets of cards for 30 children. If there is less than 30 children, get the teacher and parents to play or use less cards. If you must distribute less cards, make sure that you distribute the cards so that there is the right percentage of those representing survived fish and those representing dead fish.

Activity Objectives:
- The children will learn that the hatchery raised fish are better protected usually resulting in 9 out of 10 surviving while raised in the hatchery as compared with 1 out of 10 surviving to the smolt stage in the wild.
- The children will appreciate the role that the hatchery plays in fish survival.
- The activity is an introduction to the hatchery tour by illustrating the hatchery's basic purpose - "increasing the fishes odds for survival." It will bring more meaning to the rest of the hatchery tour.

Learning Outcomes:

- The children will identify the 4 life cycle stages of salmon which are reared in the hatchery: 1)eggs, 2) eyed egg, 3) alevin and 4) fry.
- The children will learn that the hatchery protects young fish from predation, starvation, and environment problems such as lack of oxygen, too much silt, and lack of protective cover.
- The children will know at least three problems lowering wild salmon survival (i.e. lack of oxygen, being crushed, starvation, and predation).

Connect the Life Cycle

This activity allows each child to represent part of the salmon life cycle and then cooperate with the other members of their group to complete it.

Time: *5 - 10 minutes*
Ages: *5 - 9 years*
Materials Provided: *a set of cards showing six different salmon life stages*

This activity can be used to learn the life cycle or review it with your group. You may wish to review the salmon life cycle, using the cards, before starting the activity.

Give a picture of each life stage to each child in the group. Direct them to find every other life stage they need to complete the life cycle and then stand in a circle in the right order holding their cards or placing them on the ground in front of them. For groups that do not have even numbers (6 or 12), give out extra egg cards and instruct them to have several eggs in their cycle. If they are unable to collect a complete cycle, then suggest that perhaps this salmon's life finished prematurely at the stage where there is a break in their circle.

If your group is familiar with the salmon life cycle, allow them to work it out on their own. If it a new subject for them, then work as a group to see if you can figure out the order of the stages together. Once they have completed a cycle, review each stage with the group. You may wish to extend your discussion by asking each child what habitat their particular life stage is found in.

The set of cards includes eggs, eyed eggs, alevins, fry, smolts, adults and spawners.

Life Risks

Sometimes we are unaware of how our activities can affect streams and the animals living in them. This reflective activity asks your group to consider the impacts of different human actions.

Time: *10 - 15 minutes*
Ages: *all*
Materials Provided: *a set of cards with pre-written scenarios*

This activity will have the most impact if you can do it where there is a good view of the river or stream. This will provide an essence of reality to the scenarios at you read them out and discuss them.

Gather your group in a circle and read out one of the provided scenarios. Older children could be given a card to read to the group. Ask everyone to consider the situation they have just heard and identify whether it would be good or bad for the salmon stage indicated (egg, fry, etc.) *E.g.* An alevin is buried in the gravel of the stream. It hears someone whistling to their dog and saying, "C'mon boy, fetch the stick!" The alevin then hears a splash as the stick lands in the water right over its gravel patch, then the splashing and churning of gravel as the dog runs over to fetch the stick. Do you think that this dog is going to be good or bad for the alevin? Why?

Spend a few minutes discussing the impacts of the different activities with the group and what alternatives might exist. (*e.g.* Don't let dogs in the river between September and June when there could be young salmon in the gravel. Throw the stick in a field rather than in a river, *etc.)*

A follow-up to this activity might be to have your class or group create stories of a salmon in a bad situation where something good happened to help the salmon. Or, create an art activity where children design posters that celebrate, recognize or advertise activities that encourage life in our streams and rivers.

Spawner Come Home

How does a spawning salmon find its way back home after 3 to 5 years? It smells its way back. Try this fun activity to see whether you can make it to your home creek.

Time: *10 minutes*
Ages: *all*
Materials provided*: film canisters with four different scents*

Introduce the activity by asking the group how they think salmon find their way back to their home river to spawn - road maps? Landmarks? Gyroscopes? Salmon rely on water temperature and the earth's magnetic field to find their way to the right part of the coast, but they use smell to find the right river. Designate four players to be home rivers - they do not move. The rest are spawners who must find their home creek by moving (swimming) from river to river to find their home by smell.

Give each 'river' a film canister with a different scent extract (e.g. cherry, lemon, peppermint or coconut extract). Give the rest of the players a film canister at random. This represents the smell they remember from when they were fry in the river. Have everyone use their sense of smell to determine their home river by taking the lid off their canister and sniffing and comparing it to the canisters of the different 'rivers' to find the right one. As soon as they find it, have them stay together until all the salmon find their home river.

Finish by asking the participants what might affect the salmon's ability to recognize their home stream. Discuss how environmental pollution might affect these animals.

Langley Environmental Partners

Streaming Along Workshop Outline

1. Introduce yourself and LEPS
2. Let the class know what they will be doing: 3 stations, one group per station, rotate through each: Water Quality testing, bug search and checking fish traps/salmonid ID and how it will work: 30 minutes per station, where to meet after each station, which LEPS staff will be running each station
3. Talk about the rules while in the park: not going in the water, respecting nature, hold onto garbage, stay in your groups, listen to all of the LEPS staff, teachers and parent helpers
4. Talk about the park, which stream they will be testing, some cool facts about the stream (essentially trying to get them excited about what they will be doing and to respect it as well!)
5. Get started!
6. Conclusion: Before the class leaves maybe provide a quick summary about how the water quality rated, fish seen etc. or ask the class what do they now know about the water quality of the stream

Logistics and helpful hints:

- This workshop is usually held at Williams Park.
- Each station is 15 minutes, equaling to 1.5 hours in length, but we book two hours because of intro, conclusion and switching stations time.
- Make sure to let the teacher know that there needs to be at least one adult per group and LEPS can only have one class at a time!
- Each station has its own big blue Rubbermaid with most of the necessary equipment.
- Remember to bring along the D-net and 2 buckets (1 for bug station, 1 for fish station)
- Make sure all equipment is working properly *before* heading out…especially the dissolved oxygen meter.
- Class is divided into 3 groups, then into pairs. Each pair receives a clipboard with the worksheet package (one page per station) and pencil.
- Bug station: review the macroinvertebrate section of the StreamKeepers manual to learn how to collect and the basic id of the bugs. Note: inside the kit are "keys" and posters to help with identification!
- Water Quality: review the worksheet and learn how to easily explain all sections, especially pH and how to use the testing equipment – other LEPS staff can show you how. Note: be sure to let the kids know how expensive the equipment is and **show** them how to use properly. **Hint:** Students should fill out the first portion of the sheet *before* they actually go to test the water.
- Fish station: check fish traps ahead of time, so you know whether you have to talk more or less to take up the 30 minutes. Be creative! You can talk about

riparian zones, the fisheries act etc. anything to help the kids understand why not only the fish are important, but what makes a stream healthy enough to support salmon life!

- Arrive at least 30 minutes early to have enough time to collect bugs, check fish traps and set up the water quality station.
- Decide ahead of time whether the 30 minutes includes travel time to and from the meeting spot – this can make a difference!

Benthic Macroinvertebrate Search Field Form

Macroinvertebrates (large insects or bugs) help to determine water quality. Using the tools supplied, pick out a number of bugs and place them in a small amount of water in an ice cube tray. Look at them closely using the magnifying glass. Using identification posters and charts, try to identify the types of bugs you see.

List the types of bugs you identified today

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Mayfly larva

Caddisfly larva

Aquatic worm

Leech

Stonefly larva

Midgefly larva

Very Sensitive to Pollution

Not Sensitive to Pollution

Dragonfly larva

Scud

Damselfly larva

Sowbug

Somewhat Sensitive to Pollution

Based on the types of bugs found today, is the stream: (circle one)

Healthy & has good water quality or **Unhealthy & poor quality water**

WATER QUALITY

1. TAKE A DIP: MEASURING TEMPERATURE

Measure air temperature by holding thermometer in the air for 2 minutes. Take water temperature by holding thermometer in the water for 2 minutes, then ***read the temperature while the thermometer is in the water.*** Salmon need water temperature between 7 and 15 degrees, as cool water holds more oxygen and salmon are cool water fish.

Name of Stream:	
Date	
Weather	*sunny* *rainy* *cloudy*
Time of Day	
Water Temperature	
Air Temperature	

2. MEASURING TURBIDITY

Turbidity measures the cloudiness of the water, caused by sediment, microscopic organisms and pollutants. Sediment can clog the gills of fish and aquatic critters. When sediment settles to the stream bottom, it can smother fish eggs and ruins the habitat used by fish and aquatic insects.
Measure the turbidity by placing the ruler in the water and reading the numbers- if you can see right down to the 0, the turbidity is 0, if you can only see up to the number 2, then the turbidity is 2, and so on.

Level of Turbidity in the stream:_____

3. BALANCING ACT: MEASURING PH

Acidity of a water sample is measured on a pH scale. Scale ranges from 0 to 14. Pure water is neutral, at pH 7. **Optimal pH for fish is between 7 and 8**. Under pH 4 and over pH 9, all fish die. How does the water you're testing compare?

PH OF THE STREAM_____

LEPS SALMONID FIELD FORM

Name(s):

1. A) How many species of Pacific Salmon does BC have? _____
   B) Name them:

2. Match the columns about the stages of the salmon life cycle:

Egg	I have turned silver and will be entering the ocean
Eyed Egg	I use my yolk sac as a food source
Alevin	I spend 2-4 years in the ocean maturing
Fry	I am deposited in a redd
Smolt	I emerge from gravel in the spring
Adult	I return to my natal stream to mate
Spawner	I have now developed an eye

3. Which type of salmon did you find today?

_____

_____

_____

_____

Interesting Salmon Facts:

- Salmon are ***anadromous***, meaning they spawn in fresh water but spend part of their life in salt water
- **Anadromous** is greek in origin: ***ana*** – up, ***dromos*** – running
- The Genus for Pacific Salmon is ***Oncorhynchus***, also of greek origin: **onkos** – hooked **rhynchos** - snout

- Female salmon can lay between 2,500 and 7,500 eggs
- Less than 2% of hatched salmon eggs return to spawn
- Kokanee or silver trout: subspecies of sockeye, but lives entirely in fresh water