



**the partnership
for water sustainability in bc**

IREI - Inter-Regional Education Initiative



Creating the Future in *The Corporation of Delta*: Rain Gardens Help Restore Nature to Urban Areas

Integrating the Site with the Watershed, Stream and Groundwater Aquifer



*This publication is the 4th in the Partnership's
"Watershed Blueprint Case Profile Series"*

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Introduction

Over a two-week period in October-November 2014, the Partnership for Water Sustainability delivered the **Across Canada Workshop Series on Resilient Rainwater Management: Adapting to a Changing Climate** to audiences in Alberta, Ontario, Quebec and the Maritimes.

The series provided the Partnership with the opportunity to showcase the accomplishments of BC local governments which are leading implementation of changes in practice. Case study experience included *The Corporation of Delta's* rain garden program. The "story behind Delta's story" is compelling.

In the words of community leader Deborah Jones, a driving force behind this "top-down and bottom-up" initiative, Delta's rain garden program "came about through a fortunate confluence of personalities, interests and skills – it is not something that a community can necessarily just decide to do, and presto, it happens."



From the perspective of the Partnership, the Delta story is powerful. It illustrates what public sector and stewardship sector champions can accomplish in the local government setting when they collaborate to tackle the "Shifting Baseline Syndrome".

In 1995, Dr. Daniel Pauly of UBC coined this phrase. He created a simple image to explain why communities unwittingly accept environmental degradation, and how it is incremental and cumulative. Yet it is equally possible to recognize the nature of the problem, do business differently, turn the clock back and replicate a desired watershed condition. This is what Delta is doing.



It took decades of urbanization to cause the progressive decline of Delta's creeks. Tackling the "Shifting Baseline Syndrome" and restoring stream health will rely upon a sustained commitment over decades. Doing business differently starts with a rain garden program, one that is founded on a stewardship ethic and helps to restore watershed function.

In this fourth in a series of *Watershed Blueprint Case Profiles*, we tell the story of Delta's rain garden program in the words of those who are implementing it. Through the Georgia Basin Inter-Regional Education Initiative (IREI), this will inform sharing and learning among participating local governments on Vancouver Island and in Metro Vancouver.

A handwritten signature in blue ink that reads "Kim A. Stephens".

Kim A. Stephens, MEng, PEng,
Executive Director
Partnership for Water Sustainability in BC
January 2015



Incorporated in 2010 as a not-for-profit society, the Partnership embraces shared responsibility and is the hub for a "convening for action" network in the local government setting. The Partnership plays a bridging role between Province, local government and community; and is the steward for the Stormwater Guidebook.

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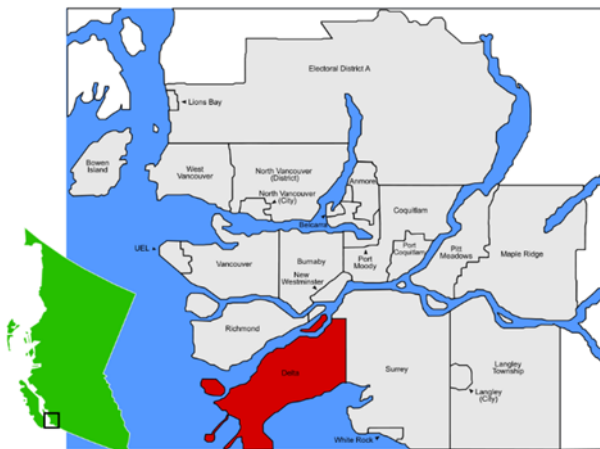
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Green Infrastructure in *The Corporation of Delta*

Delta is home to a population of approximately 100,000 people in the Metro Vancouver region of British Columbia. Delta comprises three distinct urban communities (North Delta, Ladner and Tsawwassen) within an agricultural sea.

Delta has some 500 kilometres of roadways. The corporate vision is to enhance community liveability by beautifying streets, one block at a time. In 2005, the municipality embarked upon a long-term initiative to incrementally improve the urban landscape through a streetscape program that embodies three objectives: build a greener community, adapt to a changing climate, and protect Delta's natural watercourses.

In 2007, Delta hosted the first of three events comprising **Showcasing Green Infrastructure Innovation in Metro Vancouver: The 2007 Series**. This was a 'defining moment' for Delta. The key message was: *"sustainability on-the-ground is achieved incrementally through small steps"*. This way-of-thinking recognizes that changes in standard municipal practices implemented today will ripple through time and result in cumulative benefits.

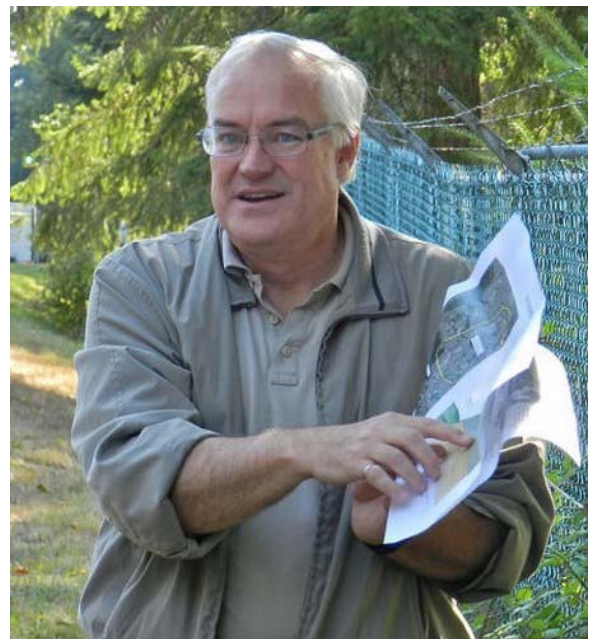


Beyond Pilot Projects

"Delta is making 'green infrastructure' a standard practice in our community. These are no longer just 'pilot projects,'" states Hugh Fraser, Deputy Director of Engineering. He is a rain garden champion; and his commitment has been critical to the success of the initiative.

"Since 2005, Delta's Engineering Department has installed porous parking lots, swales, infiltration galleries, a day-lighted ditch, rain gardens, and thousands of trees. Delta incorporates rainwater and stormwater best management practices in every capital roads and/or utility project, where feasible."

"As part of a comprehensive program to enhance streetscapes, Delta has constructed a total of 50-plus rain gardens. 10 of these are located at elementary schools; and a substantial number of project locations include multiple rain gardens along roadways or at parking lots."



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Rain Gardens Connect a Generation of Students to their Watersheds

Delta's first rain garden was constructed at Cougar Canyon Elementary School in 2006. This established the template for municipal collaboration with the Delta School District, local school populations, neighbourhoods and streamkeepers to build community rain gardens that protect the health of downstream creeks.

Early Precedents

"One of our early decisions was to add a landscape designer (Sarah Howie) to the engineering design team. Her role was to find ways to incorporate rainwater capture technologies into landscaped amenities that beautify roadways," states Hugh Fraser.

"At the time, within local government, this was viewed as a novel idea and approach – an engineer and landscape architect working as a design team. Looking back, so many good things have resulted from that one decision."

"A notable outcome is the school rain garden program in North Delta. Deborah Jones approached me with the idea [of creating rainwater infiltration projects in the Cougar Creek Watershed]. She was passionate and persistent. We identified the opportunity to build the first rain garden at Cougar Canyon Elementary School."



'Rain Gardeners' Program

"Delta has developed a rain garden program with local elementary schools, whereby city employees design and construct rain gardens at schools and then coordinate a community



planting day with local streamkeepers, school children, and neighbourhood volunteers," explains Dr. Sarah Howie, urban environmental designer for streetscapes and natural areas.

"The purpose of constructing rain gardens at elementary schools is to improve fish habitat in Delta's waterways by promoting infiltration of rainwater runoff into rain gardens instead of discharging directly into storm sewers."

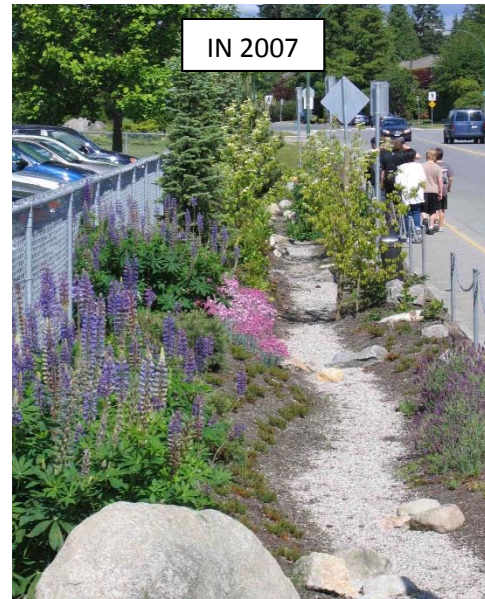
Student Involvement: "A curriculum-based '*Rain Gardeners*' education program for Grades 4 and 5 students accompanies the rain garden construction. These 'rain gardeners' connect to their local watershed and raise awareness as to how everyday actions may impact nearby watercourses."

"The rain garden allows students to experience caring for nature by maintaining the garden. The benefits of the school rain garden program are already evident, as students entering secondary school who have 'owned' rain gardens at their old elementary schools continue to be involved in other rain garden activities in their local community."

"We have constructed ten elementary school rain garden in North Delta, with only a few schools left to go. Thanks to the leadership and educational talks by the Cougar Creek Streamkeepers (and Deborah Jones in particular), a generation of students in North Delta has learned how watersheds work and why rain gardens can help improve aquatic habitat," concludes Sarah Howie.

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The school is located across the street from Cougar Creek, Delta's primary salmon-bearing creek. Creek protection was the driver that galvanized the local community. The project decommissioned two storm drains in the school parking lot. Excavated along the full length of the school parking lot, a sunken garden absorbs rainwater runoff.

Rain Garden at Cougar Canyon Elementary School

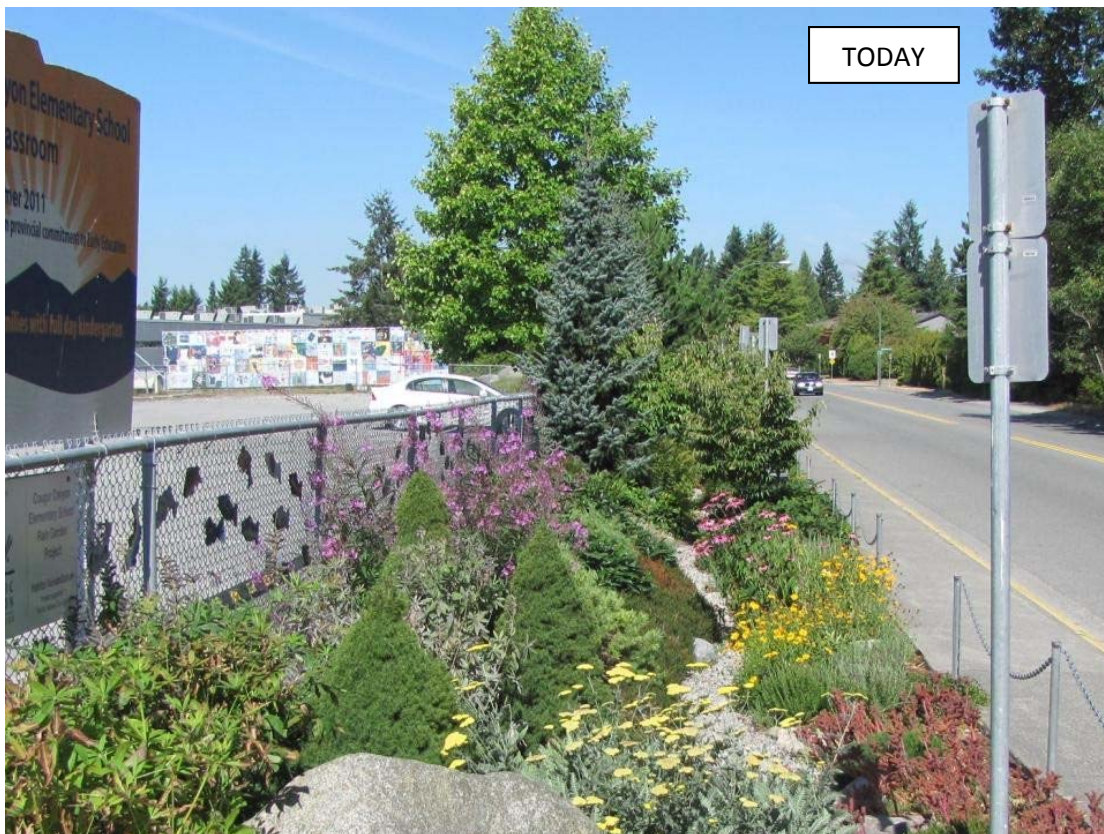


Photo Credits: *Cougar Creek Streamkeepers & Corporation of Delta*

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Rain Gardens Contribute to Restoration of Watershed Health

In 2001, Metro Vancouver and its member municipalities recognized the benefits of a watershed-based approach to integrating drainage, ecology and land use planning.

Watersheds were acknowledged as a fundamental and natural management level for the protection and use of water. Rainwater was recognized as a resource, as was the need to protect small fish-bearing streams.

The region made a commitment to the Province to have watershed-based plans in place by 2014. This commitment is a requirement in the region's *Integrated Liquid Waste & Resource Management Plan*, approved by the Hon. Terry Lake, Minister of Environment, in May 2011.

The Minister strengthened the region's plan by linking land use, watershed health and regulatory expectations. He imposed conditions that focussed attention on how the degree, type and location of land development can affect watershed health.



Streetscape Enhancement

"Delta has completed three such plans, known as *Integrated Stormwater Management Plans* or ISMPs, for areas already developed," reports Hugh Fraser. "Our urban areas are built out. This reality means there are limited opportunities for slowing, spreading and sinking rainwater. We are effectively limited to retrofitting of rain gardens within road corridors in order to provide rainwater infiltration that protects stream health."

Rain Garden Retrofits: "Most of Delta is ditched. This reflects the municipality's rural history. Yet there is a homeowner desire for ditch elimination plus implementation of urban servicing standards, even in neighbourhoods that were developed decades ago. We view grassed infiltration swales, which are rain gardens by another name, as a way to achieve a balanced solution."

"Even so, we must still deal with this concern: 'How would a rain garden affect the front of my lot?' It requires a team effort by designers and constructors to work through the range of public perception issues that revolve around implementation details," notes Hugh Fraser.

Changing the Urban Landscape for the Better

Support for streetscape enhancement starts at the top. In 2007, Delta Mayor Lois Jackson opened the *Showcasing Green Infrastructure Innovation Series* with these observations:

"The Showcasing Series is a major priority for me because this is where it happens. When you have examples of what can be done, and projects are being built, you can then wrap your mind around the green infrastructure vision and say to yourself: *what's the big deal....this is really common sense....if we can do this, then we can do more.* And before you know it, the ball is rolling and the landscape is changing for the better."



"This is all part of creating our future. And when we ask what will this community look like in 50 years, we can point to the green infrastructure examples and then we will know what it will look like in 50 years," concluded Mayor Lois Jackson.

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Streetscape Revitalization along 115th Street (btw 72 and 75A Ave)

This project comprised roadside infiltration swales throughout the 0.7 km travel corridor and rain gardens at intersections



Fit the Right Design in Right Place:
The infiltration swale is making a difference. A design challenge is how to use space more efficiently. Explore possibilities for shared use.



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Rain Garden Program Tackles the “Shifting Baseline Syndrome”

Dr. Daniel Pauly developed the concept of the Shifting Baseline Syndrome to describe why each new generation lacks direct knowledge of the historical condition of the environment, and how the resulting lack of understanding and appreciation plays out over time.

The image created by Dr. Pauly to illustrate the concept is presented on the next page. Over time, and without a ‘teachable moment’ to raise awareness of a change, the net effect is an incremental and typically imperceptible eroding of standards and expectations.

Delta’s comprehensive program to enhance streetscapes reflects a conscientious effort to tackle the Shifting Baseline Syndrome.

In the late 1990s, the ‘salmon crisis’ resulted in a ‘teachable moment’ in BC and galvanized awareness that the ‘stream health baseline’ was shifting, suddenly and dramatically. In response, governments recognized the need to restore and protect watershed health.

Across Canada Workshop Series

During the period October-November 2014, the story of Delta’s rain garden program was featured in the *Across Canada Workshop Series on Resilient Rainwater Management: Adapting to a Changing Climate*.

Delivered by a team from the Partnership for Water Sustainability, the 2014 series introduced audiences in Alberta, Ontario, Quebec and Maritimes to the case study experience of those who are leading changes in practice in BC.

Learning by Doing: Delta’s Hugh Fraser has almost two decades of career experience in each of BC and Ontario. Hence, he speaks from knowledge and with authority on the contrasting regulatory approaches. His insights provided the Partnership with a frame-of-reference for telling the story of what Delta is able to do because the BC regulatory environment is ‘enabling’ and encourages ‘learning by doing’.

BC’s Community Charter Act recognizes that communities are in the best position to develop solutions which meet their own unique needs and local conditions.

“In Ontario, the approach is top-down and the Ministry of Environment approves all watershed plans and drainage works,” explained Hugh Fraser. “Whereas in BC, the advantage of being enabled at the local level is the flexibility it gives to develop and adapt solutions that work.”

“Storm Water Management innovation in BC is the result of not being overly regulated.

Establish sound principles. Apply them. Adapt to the specific site conditions.

Do not be too prescriptive, it may take away the opportunity for innovation.”

Hugh Fraser, Sept 2014

Why a Rain Garden Program?

“A rain garden is something that everyone seems to intuitively understand,” notes Sarah Howie. “People like rain gardens because they are viewed as innately good. After a decade of implementation experience in Delta, we are now at a point where rain gardens are seen by both the public and municipal staff to be the desired solution for greening streetscapes.”

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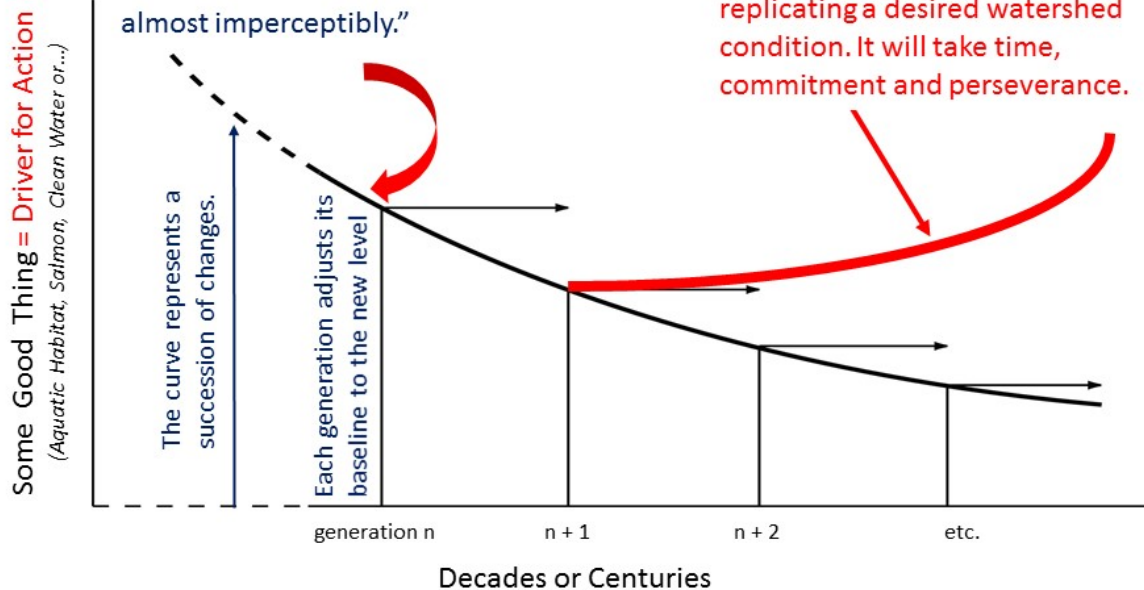
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In 1995, Dr. Daniel Pauly coined the phrase
“Shifting Baseline Syndrome”



“With each new generation, the expectation of various ecological conditions shifts. The result is that standards are lowered almost imperceptibly.”

We can shift the baseline by replicating a desired watershed condition. It will take time, commitment and perseverance.



To view Daniel Pauly tell the story of how he came to coin the phrase “Shifting Baseline Syndrome”, visit <http://mission-blue.org/2012/03/shifting-baselines-daniel-paulys-ted-talk/>

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A Fortunate Confluence of Personalities, Interests and Skills

Community leader Deborah Jones is a driving force behind the “top-down and bottom-up” approach that defines Delta’s rain garden program. Through her involvement with the Cougar Creek Streamkeepers, she became known as the Rain Gardens Coordinator.



“The reason I am called the Rain Gardens Coordinator is that I like everyone to know what everyone else knows or thinks,” explains Deborah Jones.

“Deborah Jones is a motivator. Over the years she would phone me, always asking us to do more. She is the person who is actually maintaining so many of the rain gardens. She is so very committed,” comments Hugh Fraser.

The Story Behind the Story

“Looking back, I see now that the rain garden program evolved gradually (in the manner of any good garden) -- from early conversations in 1999, through the first rain garden in 2006, to the 19 school and community rain gardens in 2014,” states Deborah Jones.

“The program came about through a fortunate confluence of personalities, interests and skills – it is not something that a community can necessarily just decide to do, and presto, it happens.”

“Remove any one of the individuals or organizations who played roles in the process, and North Delta’s school and community rain gardens either would not have happened at all, or would have been much less successful.”

Corporation of Delta: “Perhaps because it is relatively small, Delta’s municipal government has shown an acceptance of citizen-led volunteer projects – a notable one being the construction of the very popular Burns Bog Boardwalk,” continues Deborah Jones.

“In 2001, my husband and I obtained permission from Delta Engineering to landscape a weedy drainage ditch in front of our house and our neighbour’s. This was followed by restoration planting projects in a local park and on the banks of Cougar Creek near Scott Road. These could never have happened without Delta’s openness to volunteerism, earning us some ‘street cred’ with Delta in the early 2000s.”



Mayor Lois Jackson: “Lois Jackson, a North Delta resident, was elected mayor in 1999 at least in part for her promise to give much-needed attention to North Delta. With the success of the Cougar Canyon Rain Garden, she became an enthusiastic supporter of rain gardens as a way to ‘**Brighten Up North Delta**’, an early initiative.”

“The mayor also gets the bigger picture of protecting salmon streams, and has attended quite a few school rain garden planting days to tell students what an important job they’re doing.”



Nancy McLean (currently Delta Planning & Development): “Without Nancy McLean’s off-the-wall idea of organizing a neighbourhood ‘tea at the ditch’ that we had landscaped, I doubt that infiltration drainage would have made such a lasting impression on Mayor Jackson and two other councillors who attended,” reports Deborah.

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Mayor Lois Jackson (L) at the Richardson School Rain Garden on planting day, 2011



*Deborah Jones (L) and Dr. Sarah Howie (R) at
North Delta Secondary Rain Garden, 2014*

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"Absolutely ZERO would have happened without Hugh Fraser and his support for infiltration drainage projects."

Hugh Fraser: "Looking back in my files, I see that Hugh and I first talked about drainage in 1999, when I phoned to ask where our neighbourhood storm drains empty," recalls Deborah Jones.

"Between 1999 and 2004, we had intermittent contact by letter and by phone about various infiltration topics, including ditch infill in North Delta, and my 'ditchscaping' project in front of our house and our neighbour's."

"In 2004, when our streamkeeper group first proposed a rainwater infiltration project (we didn't even know the expression 'rain garden' at the time), Hugh was not only open to the idea, he even suggested a potential location at Cougar Canyon Elementary School."

"The majority of municipal engineers would probably have stonewalled us, whereas Hugh came up with a pilot project site that proved perfect in every way!"

Sarah Howie: "Who could possibly be better for designing rain gardens than a landscape architect who's a bog-&-hydrology expert and works within an engineering department?!!!" continues Deborah Jones. "And how many people does anyone know with that particular skill set? Plus of course major smarts, sense of humour, open to thinking outside the box, and receptive to input from a relatively ordinary (and female) citizen & gardener like me. Can't say enough good things about Sarah! "

Pacific Salmon Foundation: "Since 2006, PSF has provided over \$33,000 in community grants to purchase plants, other materials and interpretive signage for 9 rain gardens. Signage in particular has been hugely important in familiarizing North Deltans with rain gardens."

Delta School District: "Delta school trustees, principals and teachers have provided enthusiasm, policy support and pep talks to students about the importance of their rain gardens. And STUDENTS have provided tens of thousands of dollars of donated labour."



Delta School District Maintenance Staff, Nature Trust of BC, and BC Hydro: "All four secondary school rain gardens in North Delta have been excavated by Delta School District grounds maintenance staff and funded (plants, other materials) by the Nature Trust of BC Rain Garden Fund and BC Hydro school programs."

"It's great that these organizations are willing to go with student grant applications and very approximate drawings. All four gardens have turned out well, do their job, no problems."

Stream of Dreams Society: "Joan Carne 'showed the way' in explaining rain gardens to kids, with classroom presentations to students during the first rain garden project in 2006. Since then, I've done an assembly presentation for each school, just before kids plant their garden. I have been guided by Joan's example," concludes Deborah Jones.



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A Model for Commercial Parking Lots: *Space was very limited in the school parking lot. So Sarah Howie set to work on shoe-horning an effective garden into one tiny corner of the south parking lot. She created a spiral design that maximizes the amount of soil-water contact in the garden, despite the tight space. It's an excellent example of what can be done with small spaces.*



Richardson School Rain Garden, North Delta

Photo Credits: *Cougar Creek Streamkeepers*

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Rain Garden Program Demonstrates “Shared Responsibility”

The notion of shared responsibility underpins an approach to community sustainability that enables and encourages ‘learning by doing’. Furthermore, shared responsibility means that everyone has a role to play in accomplishing a community goal, such as tackling the *Shifting Baseline Syndrome* to restore watershed and stream health.

Shared responsibility is a foundation piece for Delta’s rain garden program. “Everyone in the process, students, designers, managers and constructors, must *understand and care about* the big-picture goal. This requires an ongoing educational process that instils an ethic,” states Hugh Fraser.

Instilling a Stewardship Ethic

“Road rights-of-way account for one-third of the land area of a typical urban watershed. From the rainwater management and stream health perspective, Delta’s rain garden program can make a material difference over time.”

“When we re-build roads in Delta, streetscape enhancement is part of the capital budget. In addition, each year we invest in two or three community rain gardens.”

At every step in this process, we are instilling an ethic. Creating a lasting change does require constant reminders to staff to think about how to integrate rain gardens,” notes Hugh Fraser.

“Road designers will have a major influence on the future condition of a watershed.”

Rain Garden Implementation: “Delta’s approach to rain garden implementation is ‘design-build’. We use our own crews, and because we do, this provides us with flexibility to adapt to unforeseen or unexpected site conditions,” continues Sarah Howie.

“Successfully field-fitting a design requires that the works crew understand and care about the goal. Now that we have a comfortable working relationship, my experience is that our crews have a knack for coming up with simple yet innovative solutions to site-specific challenges.”

“Fit the right design in the right place.”

Balance Btw Public and Private

“Yes, we are making progress on the public side, but there is much more that can be done on the private side,” reflects Hugh Fraser. “The opportunities to work with property owners to retrofit rain gardens result from redevelopment, especially in commercial areas.”

“Creating a watershed health legacy will ultimately depend on how well we are able to achieve rain water management improvements on both public and private sides of a watershed. There is a huge up-side if the private sector embraces their contribution to shared responsibility.”

Adopt-a-Rain-Garden: To address the need for ongoing maintenance, Delta has instituted the Adopt-a-Rain-Garden program. “We are inviting residents, families, local groups, clubs, and other organization to work with the municipality to ensure our community’s rain gardens are kept up and working properly,” explains Sarah Howie.

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'Design with Nature' Solution on a Steep Gradient: A Delta works crew field-designed and then fabricated a metal side-inlet that directs road drainage to the rain garden located in the school parking lot



Gibson Elementary School Rain Garden, North Delta

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Rain Garden Design: Learn by Doing, Adapt and Improve

“Our rain garden projects are not cookie-cutter designs,” emphasizes Hugh Fraser. “Each site is unique; and there will always be constraints and challenges. Fortunately, rain gardens are adaptable, and our approach is adaptive. That means we learn by doing.”

Continuous Improvement

“After almost a decade of designing and building rain gardens in North Delta, we are still experimenting,” reports Sarah Howie. “On every project, we try something different. Each time we learn something new from experience, and the next time we apply that experience. In short, the design process is one of continuous improvement.”

“It means a lot to me that the project techs for road designs will come to me and ask for advice on where to locate rain gardens when they start a road revitalization project. This new way of doing business is the result of the consistent leadership that Council and Hugh Fraser in particular have provided over these past years. In fact, Hugh’s leadership has been absolutely crucial to building commitment.”

Boulevard Management: “Moving forward, a challenge will be boulevard management,” states Hugh Fraser. “People need a property line; and in the absence of a curb, they will encroach. This is an emerging issue. While the municipality’s intention is to keep boulevards natural, we are experiencing encroachment.”

Restore Hydrologic Function

Through its rain garden program, Delta municipality is demonstrating how to implement an environmentally adaptive approach to an important element of community design – that is, the streetscape. As preceding sections of this Case Profile have illustrated, the approach is collaborative and inclusive, and is founded on the concept of ‘shared responsibility’.

Design with Nature: A foundation piece for watershed and stream health is protection and/or restoration of ‘hydrologic function’ – that is, the three pathways by which rainwater reaches streams: surface runoff, interflow in shallow soils, and deep groundwater.

The key to mimicking the hydrology of a natural watershed is to replicate the shallow soil storage and conveyance system. The strategy that Delta has for retrofitting rain gardens within road corridors will help achieve this outcome.

Designing with nature at the site scale – so that hydrologic benefits accumulate and community design eventually mimics the natural water balance at a watershed scale – ultimately means that Delta’s salmon-bearing streams will be more resilient during periods when there is either too much or too little rain.

Performance Targets: An integrated design for land development, rainwater management, groundwater recharge and adaptation to a changing climate would balance the annual volume necessary for interflow storage with the annual volumes necessary to sustain the duration of interflow and allow infiltration to groundwater.

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QUOTABLE QUOTE: *“This garden really illustrates Hugh Fraser’s comments about fitting infiltration drainage into an aesthetic streetscape/roadway. People love this touch-of-BC-landscape right on a busy street surrounding a bus stop!” – Deborah Jones, November 2014*



Heath School Rain Garden, North Delta

Photo Credits: *Cougar Creek Streamkeepers*