

The Restoration Story!

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The Beginning!

In 2004, BVHD was contracted by the Town of Cochrane, Parks and Facilities Department to complete a "Long Term Master Plan for the Protection and Enhancement of Cochrane Streams". One of the recommendations in the report was that a small spring creek, later known as Millennium Creek, was a prime candidate for a major restoration program.

This small spring creek had suffered dramatically from neglect over the years and its existing channel was very wide and shallow, with no defined open water channel. The volume of flow in the stream was approximately .75 cfs yet it had a bank-full width of up to 7 metres in areas of the channel.

A trickle of water flowed thru a dense canopy of sedge and aquatic grasses with a stream bottom of silt on most of the streams length. If a new narrow deep channel could be created, the constricted flow would support a population of fish and hopefully trout.

The idea of a restoration program on the creek inspired some interest from Andy Degraw, a Parks and Facilities manager. Andy and I had a meeting and tour of the small creek in 2004 to discuss some options for a restoration project.

It was determined that cutting a new stream channel in the creek, using a high pressure water jet nozzle would produce the most cost effective result. The work would be carried out with measures employed to control and contain silt, preventing it from being moved downstream into the Bighill Creek, the project plan should get the necessary approvals from all of the government agencies!

The Town of Cochrane has a vacuum truck with a water tank and a 3000 .lb pressure water jet that Andy offered for use, when available. This piece of equipment would definitely get the job done. Andy also committed to supply some Parks staff if the schedule permitted.

A high pressure water jet nozzle can cut through the thick mat of aquatic grass and sedge roots down through the channel. Using this method would be less damaging than digging a new channel with compact heavy equipment.

The plan was to start channel cutting on the creek in 2005. Work would start directly below the Griffin Road Culvert and proceed in a downstream direction, in stages. This way the silt containment fences could be re-positioned and two silt trap pools located near the mouth of the Bighill Creek could be maintained.

Prior to work commencing, the entire channel was to be surveyed and marked with flagging to define the route of the newly cut



The New Channel Cutting!

BVHD modified the high pressure water jet nozzle so that it could be used by an individual worker without assistance. The 3000 .lb pressure coming out of the nozzle made it impossible to control without the aid of a pivot wheel and handle.

Over the summer of 2005, a new channel was slowly taking shape along the length of Millennium Creek. The new tool and equipment used for this task was working very well and workers could cut approximately between 15 to 20 metres of new channel per hour.

The most difficult areas of the stream channel to cut through were those that had a thick mat of Western Water Sedge. The sedge has a very tough root system and this slowed the process down considerably!

The use of silt fences downstream of the work area, created a damming effect upstream. This actually was beneficial towards keeping most of the disturbed materials contained and the silt settled off to areas on both sides of the newly cut channel!

There was two silt trap pools with silt fences constructed near the mouth of the creek and these were cleaned out on a regular basis, using a back hoe and tandem truck to haul away the spoil.

A flow by-pass pipe was installed on the silt trap pools, to divert the flow of clean water past the silt pools while they were being cleaned out.



Above: A length of new stream channel being cut.

The target width of the newly cut channel was a width of 50 cm and a depth of at least 30 cm. Once new riparian growth took root along the new channel in future years, the vegetation would help maintain a constricted flow.

The channel cutting program was titled the Phase One Project and in the following years, a program of enhancement work would be completed along the creek.

One of the Phase Two design components called for the installation of deflectors to help maintain the narrow constricted flow in the channel until new riparian growth developed!

The channel cutting program was completed in August of 2005 along the stream channel of the creek, from the Griffin Road culvert, downstream to the mouth of the creek.

2006–2008 Phase Two Program–Pool Habitats!

Pool habitats are an important ingredient in any stream fish habitat enhancement design! A pool provides a safe deep water refuge and holding habitat during all seasons of the year for trout of all year classes!

A total of 19 pool habitats were created along the Millennium Creek during the three year fish habitat enhancement part of the program. In order to maintain there depth and create a self scouring effect, structures were built at the top end of each pool to create a minimal but effective hydraulic jump.

On a number of the pools, an engineered undercut bank with cover was also built into the design. The structures used to maintain the pool habitats were rock and log V-weirs, opposing rock deflectors and rock V-ledges or notches.

Most of the stream is very low gradient, yet the structures are maintaining excellent pool depths!



Above: This is a 2011 photo of one of the pool habitats in the spring of the year. By late summer, much of this pools surface area will be hidden by tall grasses and new willow growth.

" Much of the work carried out on Millennium Creek has blended into the natural environment over the years since the projects completion! The pool habitats are the most noticeable enhancement component easily identified while touring the stream!"

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2006 Phase Two Enhancement Program–Deflectors!

In 2006, once the new channel had been created on the stream, it would be necessary to install timber bundle deflectors along the length of the new channel to help maintain the narrow constricted flow.

The majority of the stream had a silt laden bottom and the banks were very unstable after the cutting program. There were a few areas where this was especially evident and the placement of deflectors would produce an immediate result.

The deflectors consisted of short posts driven horizontally into the stream bank, below water level, on both sides of the stream channel. Over time these deflectors would be covered in silt and the channel would grow over with a cover of grasses and sedge.

Photos to the right: These photos show what a length of channel looked like in 2006 and then in 2007, one year after deflectors were installed!



Above: A length of channel before deflectors.



Above: The same length of channel one year later.

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Millennium Creek Willow Planting Program

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After the channel cutting work on Millennium Creek, the stream banks were left high and dry, "so to speak". Some higher than others, but still dry enough to support a good crop of new willow growth.

Willows are very important on any stream that has soil up to the water's edge. The plants provide shade and cover, with some helping to constrict the flow in the channel, when the branches and limbs bend down in to the water. This happens when snow fall weights the limbs enough to bend them down into the stream.

They also add stability to stream banks with their network of root systems that creep along the edge of the water, in soil that is rich in nutrient. Any woody debris that makes its way into the water, is soon water logged and this bio mass provides good forage and habitat for certain types of invertebrates.

The planting of willow cuttings along the newly created stream channel was a major objective in the design plan for the creek. There were areas of the stream where willows were already present, back from the stream channel and these would sucker roots and new chutes out to the water's edge, over time.

However, there were also areas of the stream that needed some help in establishing this beneficial riparian component. Willows were planted along the creek during the 2007 and 2008 Phase Two enhancement program. Most of the plants were placed into the stream bank by volunteers. Including the local Cochrane Scout Troop!

The planting along the stream bank involved pushing freshly collected willow cuttings into the ground, a really easy process! For the pool habitats, cuttings were collected and then pre-rooted prior to planting. This later method insured that the plants had a good start in the ground and they would grow faster than the simple push planting method.

Planting around the pool habitats was done by removing a section of grass sod along the perimeter of the pool and digging a trench down below the grass root system. The pre-rooted cuttings were then placed into the trench at an angle, with the leafy tops exposed above the ground.

The soil and sod was then replaced over the buried root systems of the willow cuttings and the sites were then watered. The plants only required one initial watering to reduce planting shock and then they were left to grow on their own.

The soil around the pool habitats stay moist throughout the summer, so the plants do very well after the first season! The three photos to the right help show how fast the willow planting around the pool habitats can produce very beneficial results, over a four year period of time!

The willow cuttings were collected from native willow plants in the immediate area. There were approximately 4 varieties of Salix willows collected!



Above: A pool habitat one year after construction.



Above: The same pool habitat one year after the willows were planted around the edge of the pool.



Above: The same pool habitat four years after the willow planting. This photo was taken in 2011.



Above: This photo shows a length of stream channel, including a pool habitat as it looked like in 2007. Willows were planted along the stream bank that year.



Right Photo: This is a 2011 photo of the same length of stream channel that was planted with willows in 2007. This photo also shows how natural looking the stream channel is after all of the fish habitat enhancement work that was completed on this section of creek!

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Millennium Creek Spawning Habitat

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As part of the four year restoration program on Millennium Creek, spawning habitat was created at key locations along the stream. The spawning habitats were built to provide a reproductive area for the resident brook trout in the creek.

It was not known whether brook trout would utilize these habitats, but based on the possibility that they might, the habitats were completed. In the fall of 2008, just weeks after the program was completed, brook trout were observed spawning in the newly placed gravel of the spawning habitats.

Over the winter months of 2009, silt that was still present in the stream, smothered most of the trout eggs in the spawning habitats. There may have been some successful incubation of eggs from trout redds (egg nests), but BVHD could not establish this for sure!

By the winter of 2010, it was determined that further measures were needed to create a more successful spawning habitat on the creek.

There was a good location on the creek, for creating a more reliable spawning habitat for brook trout. The site was located on the primary spring pond that was responsible for the majority of the streams spring water.

At the spring pond there was an area where fresh spring water came out of the ground and traveled a short distance before it entered the primary spring pond on Millennium Creek. This section of stream channel would flow free of silt throughout the year and the flows were always constant!

BVHD designed a spawning channel project for the site and secured funding from Inter Pipeline Fund to complete the project. All of the necessary permits to create the channel were obtained in the late spring of 2010 and work commenced in late August of that year.

The project involved excavating a channel down into an existing gravel fan and installing log retainer walls to maintain the channel.

Additional spawning habitat was created in the new channel, along with some large boulder structures to maintain the desired depth and velocity of flow for brook trout spawning.

Only weeks after the project was completed, in September of 2010, brook trout started to spawn in the newly created habitat!

During that fall of 2010, over 20 trout redds were excavated by brook trout in the available spawning gravel at the new spawning site! All areas of the new channel's length were utilized by the trout!



Above: This is a 2009 photo of the site chosen for the creation of a new spawning channel on Millennium Creek. Note the minimal flow!



Above: This is a 2011 photo of the new spawning channel, ten months after its construction. Willow plants were placed along the edge of the log retainer walls and they will eventually hide most of the channel!

[See the video story on this spawning channel enhancement project!](#)



A Successful Trout Egg Incubation on Millennium Creek!



Above: A 2010 photo of a spawning brook trout in the new spawning channel!

After such a good spawning result on the new channel, all hopes were directed towards a successful incubation and hatch of trout eggs, during the following late winter and early spring!

BVHD visited the site a number of times over the winter months to inspect the project and check for any frost heaving that may alter the integrity of the retainer walls. The design of the walls anticipated and hoped that enough thermal conductivity from the warmer spring water was present, to prevent frost damage.

Spring water is above the critical freezing mark, because the subterranean water comes directly out of the ground. This warmer water temperature is also beneficial to brook trout egg incubation.

I started to monitor the site for a trout egg hatch in the first week of March. In the second week of March, I spotted the first newly hatched brook trout from the new spawning channel! There were two trout that I observed that first day and in the following weeks, many more!

Fish habitat enhancement work is a very pleasurable experience for me, but the most rewarding part of creating habitats for fish, is the spawning habitats. For this work, you are inspired by the observation of new generations of trout that are present as a result of your efforts!



Above: A photo of a juvenile brook trout 3 weeks after it hatched!

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