



# Pacific Salmon Commission Southern Fund

## FINAL REPORT

**Project Number** **SP- 19**

### PROPONENT INFORMATION

**Organization:** Whitevalley Community Resource Centre Society (WCRC)

**Project Title:** Creighton Creek Stream Flow Recovery

**Contact:** Gay Jewitt

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**PSF Grant Amount:** \$18,025

**Final Project Cost:** \$101,510

### PROJECT DESCRIPTION

#### PROJECT SUMMARY

*Stated Project Summary from your Funding Application*

Water use demands are surpassing supply in many areas of the Southern Interior of British Columbia. Several dry years have lowered the water table while increased the need for irrigation causing poor water quality, increased predation and stranding / mortality of the juvenile life stage of endangered Fraser coho. This project aimed at reducing or eliminating the threat of dewatering, fish kills and loss of species abundance at various trophic levels in Creighton Creek by working with the agricultural community to develop better water use strategies.

The project helped develop alternate water use strategies by:

- evaluating the water supply and demand, withdrawals, current irrigation systems and schedule efficiencies, soil types and crop demands,
- providing information and
- developing co-operative working relationships with the agricultural community that holds water licenses.

A major focus was to identify water conservation shortfalls and develop a regime to optimize the water available. This project also looked at the possibility of storage in the upper watershed. The emphasis of this project was on applied recovery action that will result in the re-establishment of prime coho spawning and rearing habitat.



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Water demands will continue to increase with the growing population. The climatic trend in the Southern Interior for drier weather with extended shoulder seasons both increases the demand for irrigation while decreasing the snow pack and supply of surface water during the summer months. The potential for conflicts between the agricultural community and fisheries is real and growing. This project endeavored to reconcile this problem before it reached the confrontational stage by promoting stewardship among the principal users. It is

It is felt that the results of this project could be a model for other watersheds with fish survival / water use conflicts in the BC interior and elsewhere. (See project summary for details)

**Please state concisely what you did, and identify what you did not do as stated in your application for funds.**

WCRC completed the following tasks:

1. Collected the available information on:
  - the status of the Bessette system (historical flows, water quality, water rights)
  - best conservation practices
  - farm programs/assistance available
2. Researched and developed supporting arguments and materials for agricultural water conservation. Began a series of articles in the local newspaper describing the current situation and the need for water conservation and habitat preservation.
3. Made the gathered information available at WCRC year-round and will provide year-round referrals.
4. Developed a web site.
5. Created displays for Lumby Days and other public events.
6. Mapped water licensees, amounts licensed and withdrawal points (legal and otherwise) on Creighton Creek. Also mapped gauging stations and sites where water quality data was collected.
7. Developed a questionnaire on irrigation practices. Presented this questionnaire to land owners/lease holders at the individual meetings.
8. Met individually with the principal licensed irrigators to start to develop a water management strategy and explore opportunities to develop a formal watershed group based on water rights.
9. Evaluated irrigation systems and schedules, identifying conservation shortfalls. Match system capabilities to water licenses.
10. Worked with the licensees to optimize the water available while leaving sufficient flows to maintain fisheries values.
11. Measured and recorded Creighton Creek flows and withdrawals during from June to October 2004 and hired two recent graduates to assist for a ten-week period. Set up gauging stations at six sites on Creighton Creek, 3 sites on Bessette Creek and two sites on Duteau Creek. Established flow curves for these gauges. Monitored habitat loss in the lower 400 m of Creighton that is the most severely impacted as the creek flow diminishes.
12. Established at least one pilot ranch. The benefits of the conservation methods used will be monitored over the next several years.



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13. Monitor water flows, temperature and DO before and during irrigation cycling both above and below major withdrawal sites.
14. Produced and distributed pamphlets. There were no pilot results to report so the pamphlet provided information on why there is a need to conserve water, what this project is about and what the steps are being taken to ensure creek flows adequate for conservation purposes. It also provides web resources on conservation, funding and irrigation.
15. Requested BC Agriculture Council to host three Environmental Farm Plan (EFP) workshops for the Bessette system.
16. Held 2 information sessions with irrigation licensees to provide information flow and withdrawal data, the changes required ensuring adequate water flow and discussed ways of developing a water users group and stewardship agreements.
17. Documented achievements, obstacles encountered, and developed recommendations for future similar projects. Recorded why irrigators are unable or unwilling to practice water conservation.
18. Will publish final report on Whitevalley web site and distribute to the funding partners, the Village of Lumby and as requested.

### **PROJECT OBJECTIVES**

Please state how you met or did not meet your objectives as stated in your application for funding.

**#1:** Increase awareness among the community and particularly the larger irrigators that there is a need for water conservation.

Public awareness was increased by the newspaper articles, presentation displays, individual and public meetings, volunteer activity, streamkeepers course, EFP workshops, the irrigation workshop and by posting information on the WCRC website.

**#2:** Demonstrate to land owners how water conservation can reduce irrigation demands, be cost effective and positively affect the fish habitat and stream ecology.

It is difficult to convince irrigators of the need to conserve water from an economic point of view when it costs 1/5000 of a cent per gallon. While most licensees are concerned about environmental issues, they are also trying to run a business that is under stress. It doesn't make economic sense to spend several hundred dollars to fix a leaky pipe connection when the water being saved is worth a few pennies over the course of a summer. However, WCRC was able to demonstrate that there isn't enough water to go around and what is available needs to be used as efficiently as possible.

**#3:** Reduce water withdrawals to increase water available for fish flows and to insure the trend towards increased production of chinook, coho and rainbow trout.

Creek data showed that there is only enough summer flow in Creighton Creek to meet approximately 6 of the 22 irrigation water licenses. However, the irrigators on Creighton Creek voluntarily reduced their water use to prevent the stranding and dewatering of fish. A water bailiff will be hired for the 2005 season to insure equitable use among the users according to the priority of their licenses. Monitoring by residents and WCRC will help to maintain fish flows on a voluntary basis.



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**#4:** Lay the groundwork for forming a stewardship group that has the knowledge and tools to manage the water resources, balancing agricultural and fisheries needs.

Two public meetings were held for the water licensees of Creighton Creek. At the first meeting, held on August 18, twenty people attended. The major water users were present. They were informed of the data collected to date i.e. that there was only enough water available to meet less than half of the water licenses. Alternative water sources, possibility of storage, conservation, irrigating on alternate days, etc., was discussed. The landowners were briefed on how priority system worked and about the possibility of hiring a bailiff. The general consensus was that they could work cooperatively amongst themselves and that they would rather not have to pay for a bailiff. As there were many questions of priority rights, association types and water bailiffs, it was agreed upon to have another meeting as soon as a representative from Water Management would be available.

Handouts of the irrigation questionnaire were given to those who hadn't yet received one. The benefits of irrigation scheduling based on available soil moisture were discussed and WCRC offered to place tensiometers in the fields of the landowners that were interested.

The second meeting was not held until October 13, the first date that Brian Nuttal of Water Management was available. Brian discussed water rights and responsibilities, bailiffs, organization types and the possibility and implications of creating and licensing water storage in the upper water shed. Brian suggested that the landowners should explore the option of hiring a bailiff as a group as soon as possible. He explained that the landowners could agree on someone to be the bailiff, in the eventuality that one is required. In the event that there is enough flow or that everyone is cooperating, they would not have to call upon the bailiff. WCRC could assist the landowners in establishing a protocol for calling in the bailiff, and then the landowners could hire the bailiff when needed.

### **PROJECT EVALUATION**

Please provide an evaluation of your project, including:

- Methods used
- Problems, how they were solved
- Unexpected outcomes, i.e. new relationships, new volunteers etc
- Budget, over, under
- Timing- did it take longer or less time
- Recommendations for future work

### Methods

#### Public Awareness

WCRC used a variety of methods to increase awareness of the need to conserve water, particularly the agricultural community. In order of effectiveness, these methods were:

1. Individual meetings
2. Public meetings
3. Newspaper Articles
4. Displays at Public Events
5. Pamphlets

Individual and to a lesser extent, public meetings, are direct, personal and address individual concerns and questions. While time consuming, they are the only way to be sure that every irrigator is aware of the problems on the creek and the best way to solicit cooperation. The newspaper articles reached a broader audience and generated more feedback than either the displays or pamphlets. The displays did catch the attention of many passer-bys at the various public events where they were displayed and water shortage is a



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topic readily discussed by most people. The pamphlets were the least effective of all the methods used. The number of pamphlets made was reduced from 1000 to 50. The budgeted money was shifted to the website.

It is not certain how effective the WCRC website has been but because it will be available for a longer period of time than all the other methods, it may prove to be at least as effective as the newspaper articles.

#### Flow Measurement and Withdrawals

Measuring the creek flows with the Marsh-McBirney flow meter worked well for determining what flows are available but was not a useful method of determining withdrawals. The meter itself is accurate to +/- 2% of the meter reading of the water velocity, but there is a greater source of error in the calculation of the flow. The calculations assume that the flow is laminar and perpendicular to the cross-sectional area being measured, which is not usually true. The calculated flow is also based on an estimation of area of each of the 20 segments that the cross section is divided up into. The depth of each section is measured using a rod placed in the stream. There are two sources of error inherent in these depth readings. If the substrate is large gravel or cobble, the depth can vary by several cm depending on the size of the rock the rod is set on. The surface of the water is higher on the upstream side of the rod than the downstream side and is constantly fluctuating. Because of this, two people measuring the same site will likely get slightly different results depending on where and how they set down the rod and interpret the water height. It is possible to reduce the error by preparing the metering sites and by having the same technician do all the measurements. Even so, there is some uncertainty even to one decimal place when the calculations are done in units of  $\text{ft}^3/\text{s}$ . With this amount of uncertainty, it is difficult to determine with any confidence that a small irrigation license is being exceeded unless it was being exceeded by a factor of 2 or 3. For example, a license of 80 AF would allow the licensee to withdraw water at a rate of 180 gal/min or  $0.4 \text{ ft}^3/\text{s}$  based on 100 days of irrigating. If the creek flow was being measured upstream and downstream on the withdrawal point, the results would not be accurate enough to tell if the user was exceeding the license by even 100 gal/min ( $0.2 \text{ ft}^3/\text{s}$ ) or if it was an error in the flow calculation.

Measuring withdrawals using the Doppler meter had mixed results. The Doppler meter gave erratic readings when placed within 5 m of the pump, reel, gun or an intersection in the line. This meter employs the Doppler Effect. A transducer transmits acoustic energy into the flow to a receiver. With no flow, the frequency received is identical to that transmitted; however, with a flow the frequency reflected from particles or bubbles in the fluid is altered linearly with the flow rate. The frequency shift is linearly proportional to the flow rate. The Doppler meter requires reflecting particles to be present in the water; it will not work at all on distilled water and poorly on clean water. Entrained air works to some degree as reflecting particles, but on long runs, the air bubbles may tend to float to the top of the line and give false readings. Also, air is only usually present in the system when it is first set up.

The questionnaire WCRC used was based on the tables from the *B.C. Sprinkler Irrigation Manual*. It proved to be an easiest method of estimating water usage if there were pressure gauges on the system or the owner had an accurate idea of what the pressure at various stages (pump, line, lateral or gun) were. This was usually not the case. Often there was a gauge at the pump and on the reel (if a traveling gun were being used) but not at the gun or on laterals of wheel or hand move systems. Very often the sprinkler heads on hand and wheel moves were worn and of various sizes. The pressure had to be estimated in most cases and an average sprinkler head size used. The calculated water use was compared to the reading given by the Doppler meter. If the two were within 10 gal/min it was assumed to be correct.

#### Problems Encountered

##### Water Use Reduction

While there are many ways to reduce water use for domestic applications, this proved to be more difficult for field applications for several reasons. For example, it is obvious that evaporative losses are substantially more at noon on a hot windy day than at cooler times of the day. Home users can easily avoid these high-loss periods. However, this is not possible with most irrigators. To begin with, most irrigation systems are



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designed to run 23 hours/day during peak season to replace the water loss to evapotranspiration. In an efficient system, as soon as the wheel line or gun covers the field on the first pass, it is time to start the second pass. If the irrigator were to reduce the time he was irrigating by not watering during the afternoons, he would have to increase rate at which he is applying the water to make up for the lost time. The local creeks are all fully licensed or over licensed. If even one user were to increase the rate of application, the creek could be drawn dry. Increasing the rate of application could also lead to pooling and soil erosion reducing the efficiency the irrigator is trying to improve.

Some types of irrigation are more efficient than others. Evaporative losses from traveling or stationary guns are greater than that of wheel and hand moves or pivot irrigation where smaller sprinkler heads and lower pressures are used. These wheel and hand-move systems are very labor intensive and the pivot requires a large capital outlay.

Finally, it does not make economic sense for an irrigator to try to upgrade his system to conserve water. Water is inexpensive and as such, is often treated that way. When water costs roughly one cent for 5000 gallons (\$1.10/ AF), there is little incentive to spend a hundred dollars to fix a leaky mainline or tens of thousands of dollars to upgrade an entire system.

While it may not make economic sense to upgrade an irrigation system to save water, most the irrigators were sensitive to the effects they had on the environment and were willing to make voluntary reductions in their water use to prevent de-watering the creek. This was especially true, once the principal users were brought together as a group. Individual users were much more likely to agree to cutback their water use if everyone else on the system were willing to do the same.

While the calculation of water being use by most irrigators was a rough estimate in most cases, the results indicate that most irrigators were using both less than their licensed allocations and less the water than required to replace ET losses. While WCRC had initially planned to use the pilot ranches to demonstrate water use reduction by more efficient scheduling, the outcome may be very different. The pilots may find more efficient ways of using their licensed amounts, but may not make a net reduction in the amount used, especially on dry years.

WCRC is working with one rancher that has begun to replace some of their traveling guns with a more efficient system for their pasture areas. This rancher has taken a long-term view and is committed to reducing all the negative impacts on the environment that commonly result from poor land management practices.

#### Budget

The project was completed on budget. There were some minor shifts within the budget in response to shifts in approach.

#### Time

The start up of the project was mid-irrigation season and too late to do any work with pilots other than find willing participants. Work with the pilots will be on going.

Working with a large number of landowners is time consuming and difficult to budget for. It is difficult to predict how long each visit will take.

#### Project Effectiveness

WCRC's approach to the combined projects was effective. WCRC was initially contacted by a community member to begin a public campaign to conserve water and by DFO to monitor creek flows and withdrawals. WCRC was already working with landowners on Creighton and Bessette Creeks to resolve problems with



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accumulated bedload. These three initiatives combined successfully and would have been less effective on their own. The ranchers and farmers would probably been less receptive to suggestions about altering their irrigation methods, forming a water users group, or acting co-operatively to voluntarily reduce water use for conservation purposes, if WCRC had not already been actively assisting some of the landowners with aggradation problems and providing information on both the available flow in the creek and where it is going.

Flexibility was key to this project. Before the start of the project, there were assumptions that water withdrawals were exceeding the licenses. As information was collected, it became apparent the over-use wasn't the main issue. Over licensing, poor communication and a degraded creek all contributed to the stranding and de-watering of juvenile salmonids that had been occurring. While monitoring withdrawals is still necessary to insure that the water is being distributed according to the priority system, improving stream morphology, looking for alternative or additional sources of water, promoting efficient use of the water available are also important if Creighton Creek is to be restored to the valuable spawning and rearing habitat for coho during low-flow years.

Another effective aspect of this project was the organizing the EFP sessions. The possibility of funding for creek and other farm projects generates enough interest to draw people to the workshops. WCRC involved 30 people representing 20 farms in the first 3 workshops in Lumby. Once the workshops are attended, the landowners become more aware of all the impacts their operations might be having on the environment especially surface and ground water. They also become aware of all the federal, provincial and municipal regulations that may impact their operations. Even if they decide not to complete an EFP, they benefit from their heightened awareness and have the EFP manuals as an information resource.

This project exceeded our expectation in several ways. The first was the high level of cooperation by the agricultural community. Water rights are a sensitive topic with farmers and ranchers. A steady supply of water is essential to their livelihood and they are protective of their rights. At the same time, most of the agricultural community appreciate the value of stream habitat and are willing to make adjustments for its preservation.

Future work would include continuing to work the irrigators on Creighton Creek to promote a water users group. Continued work with the pilots may lead to more efficient use of the available water. Monitoring flows on other creeks in the watershed will help fill information gaps uncovered in this years project and work towards a water use plan for the entire Bessette system.

### PROJECT SUMMARY STATISTICS

#### PROJECT LOCATION

Creek(s), stream(s), or river(s) where project took place Creighton, Bessette and Duteau Creeks

Receiving Waters  Columbia River  Stikine River  Fraser River  Taku River  Mackenzie River

Yukon River  Nass River  Skeena River  Other/Marine \_\_\_\_\_





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**COMMUNICATIONS**

Please indicate which communications tools used to highlight the project (check all that apply):

- Newspaper/ media releases    
  Brochure    
  Website    
  Media interview  
 Other: 5 display boards for public events, PowerPoint presentation, other WCRC Board and staff meeting presentations

**PERSONNEL**

Total number of persons trained (staff and volunteers) **3**  
 Total number of volunteers involved  Total number of volunteer hours

Agency Support: Federal, Provincial, Regional, Municipal, First Nations

Fisheries and Oceans Canada, Ministry of Agriculture, Food and Fisheries, Shuswap Nation, Okanagan Nation, Habitat Stewardship Program

**SUPPORTING DOCUMENTATION:**

Documentation attached (check all that apply):

- Maps     
 Brochure     
 Photos     
 News clippings     
 Data Report

**FUNDING PARTNERSHIPS**

**OTHER CONTRIBUTORS**

Source	Amount	Purpose
Habitat Stewardship Program	\$24,913	<ul style="list-style-type: none"> <li>Collect information on Bessette watershed socio-economic / bio-physical profile.</li> <li>Determine irrigation practices in the Bessette watershed.</li> <li>Increase local watershed resident's awareness, water conservation practices and the need for them.</li> <li>Demonstrate to land owners/leaseholders that water conservation can reduce irrigation demands and thus positively affect fish habitat and stream ecology.</li> <li>Conduct a Bessette Watershed landowner/lease holder contact program</li> <li>Explore the possibility of forming a Watershed Stewardship group.</li> </ul>
Pacific Salmon Foundation	1,671	Oxygaurd DO Meter
Water Supply Expansion Program	\$21,100	Water storage feasibility study of upper watershed
Fisheries and Oceans Canada	\$12,000	Dopler meter, Marsh-McBirney flow meter
Tolko Industries Inc	\$1,200	3 days of mapping
WCRC	\$22,707	Developing remedial design for the in-stream work; obtaining permits, arranging plant materials, organizing high school class volunteers; overseeing in-stream and riparian work and 160 hours preliminary surveys of the upper Creighton watershed at \$50/hr (\$20,000), 7 days quad rental @ \$165/day (\$1,155), 500 2-3 yr old potted mixed species trees and shrubs (\$1,350) and 20 hrs office volunteers @ \$10/hr (\$200)



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**STATEMENT OF EXPENDITURES**

INVOICE/RECEIPT/COMPANY	PSC	OTHER SOURCES	IN-KIND (in \$)
<b>Transportation/Equipment/</b>			
DFO			\$12,000
PSC	\$1,505		
PSF		\$1,671	
<b>Capital/Supplies/Incidentals</b>			
PSC	484		
<b>Payment of Services</b>			
Tolko (Mapping)			1,200
WCRC			22,707
PSC	11,902		
<b>Other/Insurance</b>			
WSEP		21,100	
HSP		24,913	
PSC	4,028		
A TOTAL PSC EXPENDITURES	\$17,919		
B TOTAL OTHER		\$47,684	
C TOTAL IN-KIND			\$35,907
D TOTAL PROJECT COST A+B+C			\$101,510
E PSC GRANT	\$18,025		
LESS TOTAL PSC EXPENDITURES A	\$17,919		
OUTSTANDING GRANT TO BE RETURNED TO PSC	\$106		