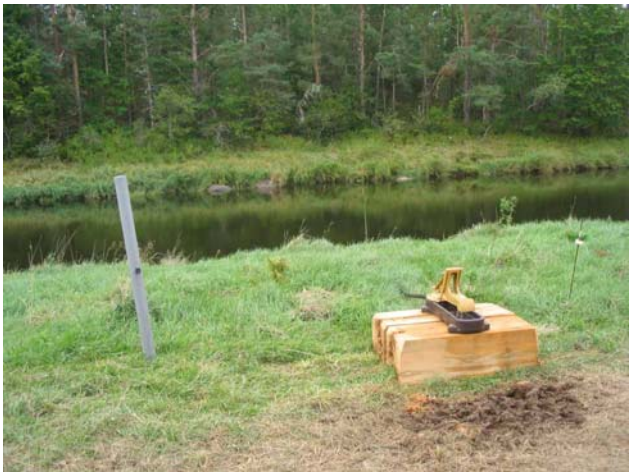

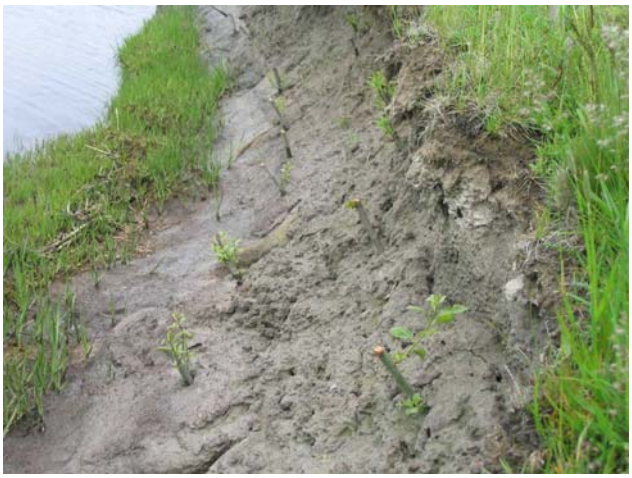

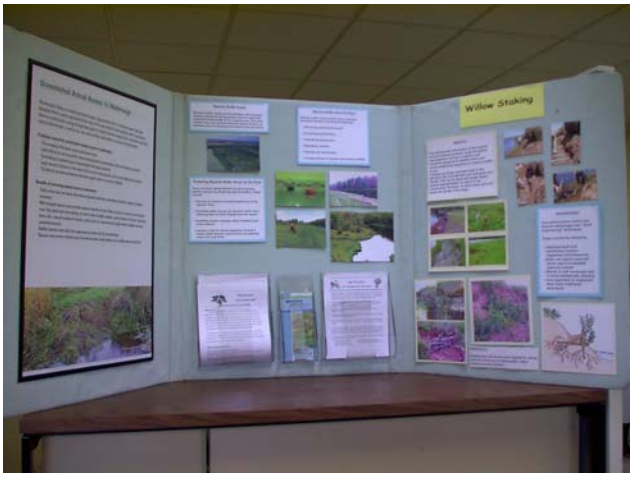

Habitat Friendly Farming

Final Project Report

Prepared for Clean Annapolis River Project
By Levi Cliche, Environmental Technologist
November 2005

Clean Annapolis River Project

Environment Canada | Environnement Canada

NOVA SCOTIA Natural Resources
HABITAT CONSERVATION FUND
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Acknowledgements

Clean Annapolis River Project would like to thank all individuals and organizations that contributed to the success of this project. These include: participating landowners for their effort and contributions to the project, Environment Canada for the funding received through the Environmental Damages Fund, Nova Scotia Department of Natural Resources for funding received through the Habitat Conservation Fund, Nova Scotia Salmon Association for the funding received through the Adopt-A-Stream Community Funding Program, Shell Canada for funding received through the Shell Environmental Fund, J.D. Irving Limited for the donation of trees, Mike Parker of East Coast Aquatics for technical support, Dr. Dave MacHattie for project support, and Reg Newell of the Department of Natural Resources for project support.

Executive Summary

The Habitat Friendly Farming project was created by Clean Annapolis River Project (CARP) as a means of improving riparian habitat health throughout the Annapolis River watershed. This was done through partnerships with local agricultural landowners aimed at identifying and implementing riparian buffer zone enhancement and protection measures, establishing ongoing stewardship of riparian zones, and generating public awareness on the importance of such measures. Sites selected for participation in the project were livestock grazing lands with a variety of issues causing degradation of riparian habitat. These issues included unrestricted livestock access to waterways, lack of vegetation in the riparian zone, and erosion of streambanks. Site-specific measures were identified in order to protect affected riparian areas from further degradation, and to restore these areas to properly functioning riparian buffers.

A variety of techniques were used throughout the project in order to achieve the goals determined for individual sites. The measures taken included installation of fencing in order to eliminate livestock access to riparian buffers and waterways, installation of watering systems to eliminate the need for livestock to access waterways for drinking water, the construction of mobile crossings to eliminate livestock traffic in watercourses, planting of trees and shrubs to enhance riparian buffer zone functions, and live willow staking/live sill construction to stabilize eroding streambanks. In order to generate public awareness of the importance of riparian habitat stewardship, the farming community and the general public were engaged throughout the project in a variety of ways. These included: public displays of material pertaining to the subject of riparian habitat stewardship, media coverage of the project, a field demonstration day held at one of the project sites, representation of the project to the Federation of Agriculture by a member of CARP's board of directors, and peer education by farmers engaged in the project.

As a result of implementing the Habitat Friendly Farming Project, the following results were achieved:

- Eight farmers engaged in riparian habitat stewardship initiatives
- 2,300m fencing installed along waterways
- 20,100m^2 riparian habitat protected
- 110 cows eliminated from waterways
- 40 sheep eliminated from waterways
- 1,150 trees and shrubs planted in riparian zones
- 5,500 willow stakes used in staking/live sill construction
- 1,840m^2 streambank stabilized via willow staking/live sills
- 4,690m^2 riparian zone rehabilitated/enhanced
- 1 alternative watering system installed
- 1 mobile livestock crossing constructed
- 8 stewardship agreements signed
- 2 public displays
- 1 field demonstration day

Introduction

This report summarizes the Habitat Friendly Farming project implemented by Clean Annapolis River Project in 2005. It provides detail on the project's reasoning and development, its delivery, and the results that were achieved through its implementation.

Background

The Clean Annapolis River Project (CARP), founded in March of 1990, is a charitable organization whose goal is to *work with communities and organizations to foster the conservation, restoration and sustainable use of freshwater and marine ecosystems of the Annapolis watershed.* CARP's activities cover a wide range of environmental assessment, education and action projects. Some of the projects that CARP has initiated include volunteer air and water quality monitoring, private stewardship and conservation planning, and fish habitat restoration. CARP has been a participant in the Atlantic Coastal Action Program (ACAP) since 1991, and has been honoured with several regional, national, and international awards for its efforts.

The Annapolis Valley is a largely agricultural area through which many streams and rivers flow, making their way from the bordering North and South Mountains to the Annapolis River on the Valley floor. Where waterways and agricultural land uses meet, there is potential for serious environmental degradation. The adoption of agricultural land use practices that minimize or eliminate negative impacts on waterways is essential to the health of the Annapolis watershed. One such practice is riparian habitat stewardship. By protecting and enhancing riparian buffer zones between agricultural land and watercourses, farmers can greatly reduce the impacts of their operations on the aquatic environment, help control the flooding and erosion of their land, and provide healthy habitat for many wildlife and fish species.

The Habitat Friendly Farming project was created with the goal of fostering riparian habitat stewardship by supporting riparian buffer zone enhancement and protection measures in partnership with local farmers. This involved stabilization of eroded banks using live shrub willow cuttings, planting of trees in riparian buffers, fencing along waterways to restrict livestock from accessing riparian zones and watercourses, and provision of an alternate source of drinking water to livestock in order to eliminate the need for them to access waterways. Participating landowners committed themselves to long-term stewardship of the rehabilitated and protected riparian zones through the signing of a stewardship agreement.

This project received monetary contributions from a total of four sources. These were: Environment Canada's Environmental Damages Fund, the Department of Natural Resources Habitat Conservation Fund, Nova Scotia Salmon Association's Adopt-a-Stream program, and the Shell Environmental Fund. Though the specific goals under each funding agreement differed slightly, they were very much complimentary. This allowed for a wide range of riparian zone protection and enhancement activities, public awareness generation, and encouragement of habitat stewardship to be combined into a multifunctional, cohesive initiative. This was very well supported through the in-kind contributions of labour, equipment and materials from project participants, planting materials from J.D. Irving Limited, willow cuttings from local landowners, and the expertise and advice of the Department of Fisheries and Agriculture, the Department of Natural Resources, the Department of Environment and Labour, the Nova Scotia Salmon Association, and East Coast Aquatics.

Project Goals and Methodology

As stated In the background, the Habitat Friendly Farming project's goals covered a range that were complimentary to achieving the overall objectives of improved riparian habitat health, protection of riparian zones from degradation caused by uncontrolled livestock access, fostering of riparian habitat stewardship in the watershed, and increased public awareness of the importance of riparian zones. These objectives are divided into the following four categories:

1. Riparian Habitat Enhancement
2. Riparian Zone Protection
3. Riparian Habitat Stewardship
4. Public Awareness

Riparian Habitat Enhancement

The active enhancement of riparian habitat was achieved using various methods to establish vegetation in degraded riparian buffer zones. These methods included planting of shrub willow nursery stock, transplanting of red pines from pasture to the riparian zone, planting of live willow stakes harvested locally, and construction of live sill structures on eroding banks using local willow cuttings. The details of each method are outlined below.

Planting of Nursery Stock

Nursery propagated shrub willows donated by J.D. Irving Limited were planted at two project sites, between installed fencing and the streams running through the pastures. These were spaced between 0.5m and 1m apart.

Transplanting of Pines

At one project site, many small red pines were growing in the pasture. Some of these were transplanted into the riparian zone in order to enhance riparian buffer zone functions. These pines were planted approximately five meters apart, over a 100m section that was fenced in order to exclude livestock.

Willow Staking

Willow staking was used to establish vegetation and root systems in order to stabilize large areas of eroding riverbank. This was done using cuttings from local shrub willows between 1.5cm and 5cm in diameter, and 0.5m-1.0m in length. These were driven 3/4 of their length into the face of eroding banks in two rows spaced approximately 1m-1.5m apart. The spacing between stakes in a row was approximately 0.5m. At one location, a row of stakes was also driven into the top of the bank to help provide additional stability.

Construction of Live Sills

The construction of live sills occurred where steep, heavily eroding slopes were present. The goal of live sill construction is to stabilize the slope, and to re-establish vegetation that will aid in future stabilization and effectively create a healthy, vegetated riparian buffer zone. The technique uses freshly cut willow stakes of a diameter between 4 and 7.5 centimeters, and of an approximate length of one meter. These are used to construct 1.5 meter wide “terraces” on the slope in a pattern intended to lessen the grade of the slope. The willow stakes establish root systems and grow sprouts, effectively establishing vegetation on the bank, and providing greater stability.

Construction of Live Sills Continued

Following is a sequential description of the construction of a live sill:

1. A shallow horizontal trench three to five feet in length is dug on the bank using a spade.
2. A row of stakes is pounded into the trench, perpendicular to the bank.
3. A row of vertical stakes is pounded into the trench between the horizontal stakes.
4. Stakes are placed along the face of the sill, making the structure “box like”.
5. The soil that was removed from the bank when the trench was dug is replaced behind the face wall of stakes.
6. A row of stakes is pounded into the structure diagonally between the vertical stakes for added stability.

Riparian Zone Protection

In order to eliminate degradation of the riparian zone and contamination of watercourses present on land used for pasturing livestock, fencing was installed between 5m and 10m (in some places further) from the watercourse. The type of fencing installed varied with the site characteristics, the type of livestock present, and the needs of the farmer.

On one site, five-strand barbed wire fence was installed using a combination of steel posts and large diameter softwood anchor posts. Two sites required single strand electric wire secured on one site between plastic posts, and on the other between metal posts. One site required two strands of electric wire supported by metal posts to prevent young cattle from passing under the fence. The last site, being a sheep pasture, required a combination of page wire and a single strand of electric wire supported by steel posts to contain the livestock adequately.

At one project site, eliminating the cattle’s access to the watercourse meant they no longer had a source of drinking water. This required the installation of a mechanical "nose pump" on the pasture side of the fence that draws drinking water from the river through a small intake pipe.

Riparian Habitat Stewardship

In order to ensure long-term maintenance of the work undertaken through this project, and the stewardship of riparian habitat on the project sites by the landowner, an agreement between CARP and the landowner was drafted. The Stewardship Agreement ensures the maintenance of structures installed, the appropriate use of the materials provided, and the protection of the trees planted for a minimum of ten years so long as the land use warrants. This Stewardship Agreement was signed by the landowner and CARP's Executive Director.

Public Awareness

Increased public awareness of the importance of riparian buffer zones, their role in maintaining water quality and healthy aquatic ecosystems, and the need to preserve and/or enhance them is an important step in ensuring proper stewardship of these resources by the public. Generating awareness was an important aspect of the River Friendly Farming project, and was accomplished in several ways during its implementation. These can be divided into the following four categories:

Public Awareness Continued

- Public displays
- Media
- Project Visibility
- Networking

Public Displays

Display material concentrating on riparian zone protection and restoration activities was assembled and set up at various events throughout the project. This material covered a range of topics including: the function of riparian buffers, threats to riparian habitat, impacts from agriculture, riparian protection measures for agricultural operators, riparian zone rehabilitation techniques, and a model demonstrating the construction of live sills. There was also reference material available for the public relating to riparian zone stewardship and related issues. Displays were set up at three events. These were: CARP's Annual General Meeting, the Annapolis Valley Exhibition, and a Field Demonstration Day hosted at one of the project sites.

Media

Aspects of the project were covered by two local newspapers; the Spectator, and the Monitor-Examiner. One article was written and published by the Spectator relating to CARP's receipt of Environmental Damages Fund money from Environment Canada to carry out riparian zone protection on livestock pastures. A news release was published in both the Spectator and the Monitor-Examiner advertising a field demonstration day being hosted by one project participant and CARP to highlight the initiatives taken through the project.

Project Visibility

One of the project sites is often frequented by the public while hiking, canoeing, fishing and camping. The landowner is very open to this, and is supporting awareness of the importance of riparian zone stewardship by inviting site visits, and explaining the relevance of the work that has been carried out on his property. This will be an ongoing process that should be an invaluable tool for public education.

Networking

Awareness of the importance of riparian habitat stewardship was effectively increased through communication with the individuals and organizations involved in this project. By working with landowners to encourage riparian habitat stewardship, the landowner’s knowledge of riparian zone functions, and of the importance of those functions to aquatic ecosystems is increased. This knowledge is then passed on to friends, family and peers, creating a broad reaching effect.

Through communication with the Federation of Agriculture, and submission of project details and updates for announcement at their board and general meetings, awareness of, and interest in riparian habitat stewardship has increased among members of the local agricultural community.

Project Site and Activity Descriptions

Barteaux

This farm, located in Moschelle, is mainly a fruit growing operation with some beef cattle. There has been some concern about the amount of shoreline erosion taking place on this farm's grazing lands along the Annapolis River. The banks at this location are very steep (close to vertical), and are eroding rapidly. It is common at this site to lose strips of shoreline up to one meter wide annually.

The priority identified at this site was to stabilize and vegetate a 375m stretch of 2-3m high banks. In an attempt to control erosion, single live willow stakes were driven into the bank in three rows spaced approximately one meter apart with a spacing of approximately 0.75m between stakes. Two of these rows were installed on the eroding face of the bank, with a single row installed at the top of the bank. This was done in order to establish a network of roots to provide stability to the soil, and to take up water in order to relieve pressure on bank soils from saturation and drainage. Single stakes were chosen over live sills due to the extreme slope of the banks, and the large area to be covered.

The following is a list of results achieved at this site:

- 750m^2 bank stabilization via willow staking
- Stewardship agreement signed

Bruce

This farm, located in Centrelea, is an organic livestock producing operation with pastureland along both Messenger Brook and the Annapolis River. There is erosion occurring along both watercourses, with the most severe being along the Annapolis River. The area identified for rehabilitation at this site was where Messenger Brook enters the Annapolis River. This area was chosen due to the more severe erosion, and because any work along Messenger Brook would require fencing in order to be effective. A suitable arrangement could not be made for controlling livestock access due to complicating factors at this site.

The area where work was undertaken is a stretch of the Southwest bank beginning where Messenger Brook passes through a culvert type railway crossing and enters the Annapolis River. Three 10m long stretches of heavily eroding bank were stabilized through the construction of live sills. These were constructed in order to lessen the grade of the slope, establish a root mass to bind the soils, and create vegetative cover. On another stretch, this one being too steep for live sills, two rows of live willow stakes spaced approximately 0.5m apart, with a 0.5m spacing between stakes were installed. This was done in order to establish a root system to bind the soil while creating vegetative cover, and to reduce pressure on the bank soils from saturation and drainage.

The following is a list of results achieved at this site:

- 110m^2 bank stabilization via willow staking/live sill construction
- Stewardship agreement signed

Troop

This farm is a beef producing operation located in Granville Centre. Similar to the Barteaux farm, there has been concern about the erosion occurring on hayfield/pastureland along the Annapolis River. The banks at this site are near vertical and, as with the Barteaux site, the loss of up to one meter of shoreline per year is common.

The priority at this site was to stabilize a 590m length of 3m high eroding bank on the North side of the Annapolis River. Live willow stakes were installed in two rows spaced approximately one meter apart, with a spacing of 0.5m between stakes. This was done in order to establish a root system to bind the soil while creating vegetative cover, and to reduce pressure on the bank soils from saturation and drainage. A pair of live sills was installed at two locations where erosion was beginning to take place behind relatively stable sections of bank. This was done in order to shield these areas from the erosive force of the current, establish a root mass to bind the soils, and create vegetative cover.

The following is a list of results achieved at this site:

- 980m^2 bank stabilization via willow staking/live sill construction
- Stewardship agreement signed

Longley

This farm is a small, mixed product operation with orchards and beef cattle. It is located on Highway 201 in Bridgetown . There is a large hayfield/pasture at this site, through which an unnamed (on 1:50,000 topo.) stream runs. This stream originates from springs at the base of the South Mountain, and historically supported a healthy population of Brook trout. The cows pastured on this field had nearly unrestricted access to the stream, causing some erosion of the banks, and sedimentation of the streambed.

The priority at this location was to restrict livestock access to the stream to prevent further degradation. In order to accomplish this, 400m of five-strand barbed wire fence was installed along the field side of this tributary. A 100m section of previously existing fence was connected to this. As the stream is the field boundary, this effectively eliminated cattle from both sides of the stream, creating a riparian buffer five meters wide on both sides. In addition to the fencing, 900 shrub willows, donated by J.D. Irving Limited, were planted along approximately 250m of the fenced streambank to enhance the riparian buffer and shade the stream.

The following is a list of results achieved at this site:

- 400m of fencing installed
- 5,000m^2 riparian zone protection
- 15 cows excluded from waterways
- 900 shrub willows planted
- 1,250m^2 riparian zone enhancement via planting of shrub willows
- Stewardship agreement signed

Lawrence

This is a medium sized dairy farm located at the foot of the North Mountain in Clarence. There is a stream running through a field used to pasture cattle at this site. This stream is a spring fed mountain stream with good flow year round. There is ample tree cover along both sides of this stream, though the understory is sparse and degraded due to uncontrolled livestock access.

The priority at this site was to eliminate cattle from the watercourse and riparian zone in order to allow the vegetation to recover, and to prevent sedimentation and contamination of the watercourse. In order to accomplish this, single strand electric fencing was installed along both sides of the stream over a 500m section. The average width of the riparian buffer zone protected is approximately 10m per side.

The following is a list of results achieved at this site:

- 1,000m fencing installed
- 10,000m^2 riparian zone protected
- 35 cows excluded from waterways
- Stewardship agreement signed

MacMurtry

This farm is a beef producing operation located between Highway 101 and the Brooklyn Road in Brooklyn. The cows are pastured in a large field with several watercourses running through it. The landowner has some riparian zone protection measures in place, and there is much yet to be done. The priority at this site was to eliminate cattle access to a 200m long stretch of Burbidge Brook. There was an existing livestock crossing in this reach, allowing total exclusion from the watercourse while allowing free movement for the cows to cross the stream. An area of marsh downstream from the crossing was identified for livestock exclusion.

Two-strand electric fence was installed along both sides of a 200m long section of stream at this site. This was joined to either side of the cattle crossing, ensuring complete exclusion from this section of watercourse. The width of the fenced section was increased to encompass the area of marsh. The width of riparian zone to be protected at this site ranges between 5-20m on each side.

The following is a list of results achieved at this site:

- 400m fencing installed
- 2,590m^2 riparian zone protected
- 40 cows exclude from waterways
- Stewardship agreement signed

Bruendel

This small farm, located on the Hebb's Landing Road near Bridgetown, raises various types of livestock including sheep, goats, pigs and cattle. There is a 100m long section of stream running through one of the sheep pastures on the property. This pasture is grazed by 40 sheep in an average season. Due to the absence of fencing along the watercourse, the riparian zone and streambanks were becoming degraded.

Bruendel Continued

Preventing the sheep from accessing the riparian zone around the stream became the priority at this location. In order to accomplish this goal, page wire fencing was installed along both sides of this stream leaving a protected riparian buffer five meters wide. In order to allow livestock access to both sides of the field for grazing, a means of crossing the waterway without impact was devised. A mobile crossing constructed of untreated lumber was built in such a way to span the watercourse without impacting the channel or banks. It was fitted with a gate to allow grazing to be restricted to either side of the stream. This crossing can be taken up when not in use. In order to rehabilitate and enhance the riparian buffer, approximately 250 shrub willows were planted along both sides of the watercourse. These were spaced approximately 1m apart.

The following is a list of results achieved at this site:

- 240m of fencing installed
- 1,200m^2 riparian zone protected
- 40 sheep excluded from waterways
- 250 shrub willows planted
- 1,200m^2 riparian zone enhanced
- Mobile crossing constructed
- Stewardship agreement signed

Whitman

This site is located on the South side of the Annapolis River where an unnamed tributary joins the main river. The land is rented out for use as pasture for beef cattle. The owner of this property, formerly a beef farmer, was concerned about the damage and possible contamination being caused by cattle access to both watercourses at this site. Cattle were accessing the Annapolis River for drinking water along one section of riverbank, causing severe soil disturbance and erosion. The cattle were also accessing the riparian area surrounding the tributary at this site for grazing. Though this area had ample tree cover, the understory was left bare by trampling and grazing.

The priority at this site became eliminating cattle access from the Annapolis River and the tributary, as well as the riparian zones of these watercourses. In order to accomplish this goal, single strand electric fencing was installed along the Annapolis River over a 100m stretch, and along a 200m stretch of the tributary leaving a riparian buffer between 5-10m in width. As the cattle had been accessing the Annapolis River for drinking water at this site before the fence was installed, it became necessary to provide an alternate source of drinking water at this site. A nose pump was installed in this pasture for this purpose.

In addition to fencing and the installation of a watering system, red pines from the site were transplanted into the protected riparian buffer zone. These were trees between approximately four and seven years in age, and were planted in a line with a five-meter spacing between trees. The trees were fertilized with composted manure, mulched with hay, and were watered by hand every two days during the summer to help ensure their survival. Seventeen of these pines were planted in this way.

Whitman Continued

The following is a list of results achieved at this site:

- 100m of fence installed along Annapolis River
- 200m of fence installed along tributary
- 1,500m^2 riparian zone protected
- 20 cows excluded from waterways
- 17 pines transplanted to riparian zone along Annapolis River
- 500m^2 riparian zone enhanced
- 1 alternative livestock watering system (nose pump) installed
- 1 field demonstration day held on site
- Stewardship agreement signed

Summary

The Habitat Friendly Farming Project was successful in achieving and exceeding the goals set through its creation. The implementation of the project led to the realisation of positive results in four areas: riparian habitat enhancement, riparian zone protection, riparian habitat stewardship, and public awareness of the importance of riparian habitat stewardship. Through the cooperation and contributions of project partners and participating landowners, progress has been made toward bettering local land use practices in and adjacent to riparian habitat. With local landowners exemplifying riparian habitat stewardship practices, a foundation for continuous improvement in land use practices throughout the Annapolis Watershed has been established.

As a result of implementing the Habitat Friendly Farming Project, the following results were achieved:

- Eight farmers engaged in riparian habitat stewardship initiatives
- 2,300m fencing installed along waterways
- 20,100m^2 riparian habitat protected
- 110 cows eliminated from waterways
- 40 sheep eliminated from waterways
- 1,150 trees and shrubs planted in riparian zones
- 5,500 willow stakes used in staking/live sill construction
- 1,840m^2 streambank stabilized via willow staking/live sills
- 4,690m^2 riparian zone rehabilitated/enhanced
- 1 alternative watering system installed
- 1 mobile livestock crossing constructed
- 8 stewardship agreements signed
- 2 public displays
- 1 field demonstration day