Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Vegetative Filter Strip Project

Overview

The Vegetative Filter Strip Project is a multi-year initiative led by Agriculture and Agri-Food Canada (AAFC) that will help develop knowledge and information on the capacity of vegetative filter strips to remove nutrients from runoff water collected from outdoor livestock pens. Project findings will help support on-farm decision making regarding the management of livestock operations. AAFC is committed to an integrated approach to sustainable agriculture in Canada which recognizes that environmentally responsible agriculture and competitive agriculture are part of an integrated system.

Background

Many cow-calf, background and feedlot operations utilize outdoor confinement systems (e.g. corrals and loose housing). Exposed to rain and snow, these areas may pose risks to water quality when nutrients and pathogens from manure, feeding and bedding areas begins to accumulate in runoff. As a result, practices to manage water movement in and around confinement areas are becoming increasingly popular with farmers and ranchers.

Managing farmyard runoff requires 1) control of water entering a confined livestock area, and 2) management and treatment of any water leaving the area. A common approach is to divert “run-on” water away from the livestock area while directing runoff water into a constructed basin for temporary storage. Any runoff that is collected must be managed appropriately to reduce environmental risk.

The study of practical, effective runoff treatment options for small-scale cattle operations in the semi-arid prairie environment is limited. One option that requires further investigation is the use of a vegetative filter strip system to collect, temporarily store and transport runoff to an infiltration area that is densely vegetated and has been engineered and constructed to manage runoff nutrients by settling, filtration, absorption and infiltration processes. If effective, this runoff system may be a viable, practical solution for many livestock producers.

Objectives

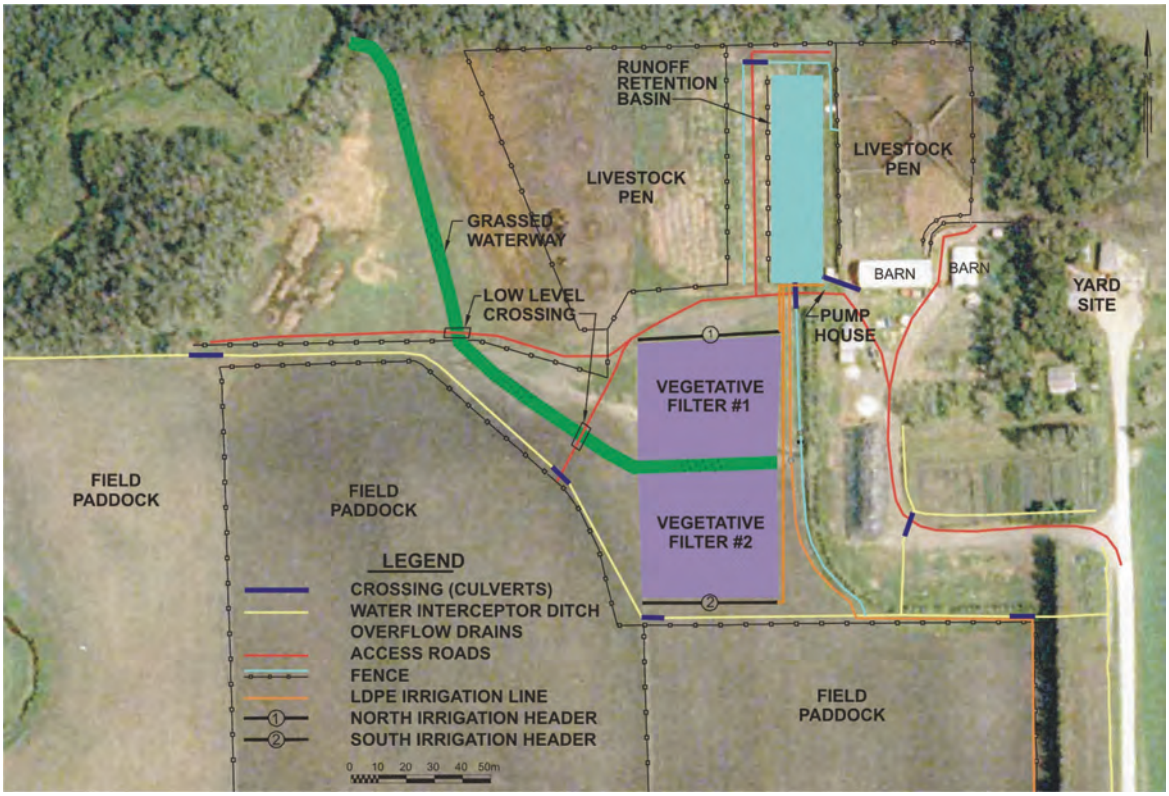
- To investigate the effectiveness of vegetative filter strips in retaining and utilizing nitrogen and phosphorous from livestock-pen runoff collected and irrigated onto perennial forage; and
- To investigate the practicality of using stationary header pipe irrigation systems to apply collected runoff to vegetated filter strips at controlled rates and with controlled timing.

Deliverables

- Science-based knowledge and information to assist on-farm decision making;
- A demonstration site that illustrates the operation and management of a farmyard runoff control system for a smaller-scale cow-calf operation;
- Recommendations on the potential for vegetative filter strips to effectively retain and utilize nitrogen and phosphorous found in runoff from outdoor livestock pens under semi-arid conditions; and
- Recommendations on the design and operation of vegetative filter strips, as well as stationary header pipe irrigation systems for the purpose of irrigating runoff collected from outdoor livestock pens under semi-arid conditions.

Canada

The Project Site



Source: Agri-Environment Services Branch, June 2010

Demonstration Site Description

The demonstration site is located in the Rural Municipality of Springfield in eastern Manitoba, and is bordered by two watercourses – Cooks Creek and the Swede Drain – that empty into the Red River north of Selkirk and the City of Winnipeg. The project area is characterized by fine-textured clay soils and minimal topographic relief, which results in imperfect to poor drainage. The project site naturally slopes gently to the north and towards the two adjacent water bodies.

Data collected from 1961-1990 at Environment Canada's Dugald weather station (approximately 14 km from the project site) indicates average precipitation in the project area is 553 mm per year (1,296 mm of snowfall, 424 mm of rainfall). Long-term historical records for the growing season months (April-October) indicate: average total precipitation 505 mm (95 mm of snowfall, 410 mm of rainfall) and an average daily temperature of 12.1 C.

2009 growing season data collected by Manitoba Agriculture Food and Rural Initiatives weather stations in Dugald is as follows: minimum temperature -10 C (April); maximum temperature 30.9 C (August); and total precipitation 475 mm.

A weather station was installed at the project site in the spring of 2010 to collect data on rainfall, relative humidity, air temperature, solar radiation, GDD, wind speed and wind direction.

The farm co-operator for this project manages a cow-calf operation and typically backgrounds his calves. As a result, the number of animals in the livestock pens varies seasonally with the calving.

Project Status and Future Plans

Construction of the project was completed in the fall of 2009. Sampling and monitoring at the site commenced in the spring of 2010 and will continue for a number of years.

Parameters to be examined at the site are outlined in the table below. Ongoing activities will include harvest and removal of vegetation from the vegetative filter strips and sampling of manure packs, soil and runoff at the site. A weather station and soil-moisture sensors will also be used at the site.

Irrigation events will be scheduled regularly throughout the active growing season, taking into account precipitation, soil moisture conditions and evapotranspiration to maximize infiltration of runoff water into the vegetative filter strips.

Sampling and monitoring at the site will involve the following:

Sample Type	Location	Analysis
Runoff	Retention pond, north and south headers, exit point of vegetative filter	BOD, COD, Total Kjeldahl N (TKN), Ammonia (NH_3), Nitrates (NO_3), Nitrite (NO_2), TSS, SUSPN, TDN, P-ortho-sol, SUSPP, TDP, Salinity, Total Coliform, Fecal Coliform
Manure packs	East and west livestock pens	General manure analysis
Soils	North and south vegetative filters, grassed waterway	pH, salts, N (lbs/ac), P-Olsen (ppm) K (ppm), S (lbs/ac), TKN (%), Total P (ppm)
Vegetation	North and south vegetative filters	Yield, total N, total P
Meteorological data	North vegetative filter	Rainfall, relative humidity, air temperature, solar radiation, GDD, wind speed and direction

This project will help to examine the effectiveness of vegetative filter strips in utilizing nitrogen and phosphorous from collected and irrigated runoff effluent, and will also provide insight into the practicality of using stationary header pipe irrigation systems to apply collected runoff. It should be noted that this site was designed for demonstration purposes. The approaches and designs used in this project may need to be modified or adapted to suit other project locations and situations.

For more information on this project, contact:

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