Control of Agrichemical Loading To Streams Using Grassed Buffers In Great Plains Watersheds

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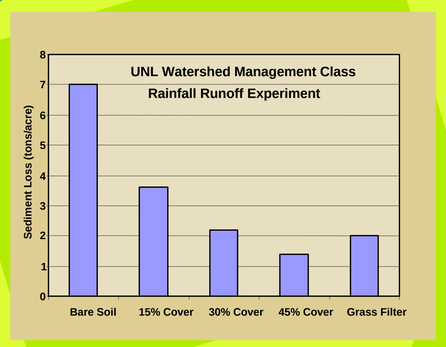
Education Component

The education component is focused at the UNL Rogers Conservation Farm, a 320-acre, dryland farm, typical of Southeastern Nebraska. No-till rotations of corn and soybeans are complimented with wheat or grain sorghum. UNL and ARS agronomic and engineering research is routinely conducted at the farm, including long-term tillage and erosion plots. The farm includes terraced upland, with both tile-outlets and grass waterway outlets. A third order stream passes trough the farm, where, in 1997, a grass filter strip was added to create a 2-zone (forest and grass) riparian buffer. One upland field also was planted with contour stiff-grass hedges. Undergraduate education related to conservation buffers uses these buffers for tours and field exercises. A third-year "Soil Conservation and Watershed Management" course includes exercises focused on the multiple use of buffers, water quality impacts and runoff and flow path evaluation. A rainfall simulator study using an indoor simulator is conducted to collect data on water runoff, sediment runoff and soluble chemical runoff from buffered and unbuffered systems. Approximately 30-40 students are enrolled in the course annually.



Rogers Farm Riparian Buffer

UNL Watershed Management Class—

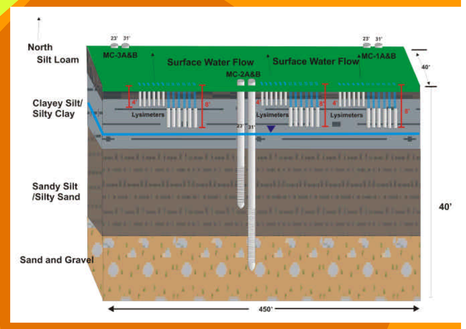
Educational Objectives
- To understand how erosion losses are measured and computed
- To study the effect of residue cover and vegetative filters on erosion loss

Rainfall Runoff Lab Exercise
- Rainfall simulated with single spray nozzle
- Intensity is 14 in/hr
- Rainfall duration was about 10 minutes
- Soil erosion pans are 11 in x 21 in
- Five teams with 4-6 members per team conducted experiment
- Each team responsible for one treatment

Grass Filter Treatment
- Planted to warm season grass mixture in growth chamber two weeks before experiment
- No residue cover on this treatment

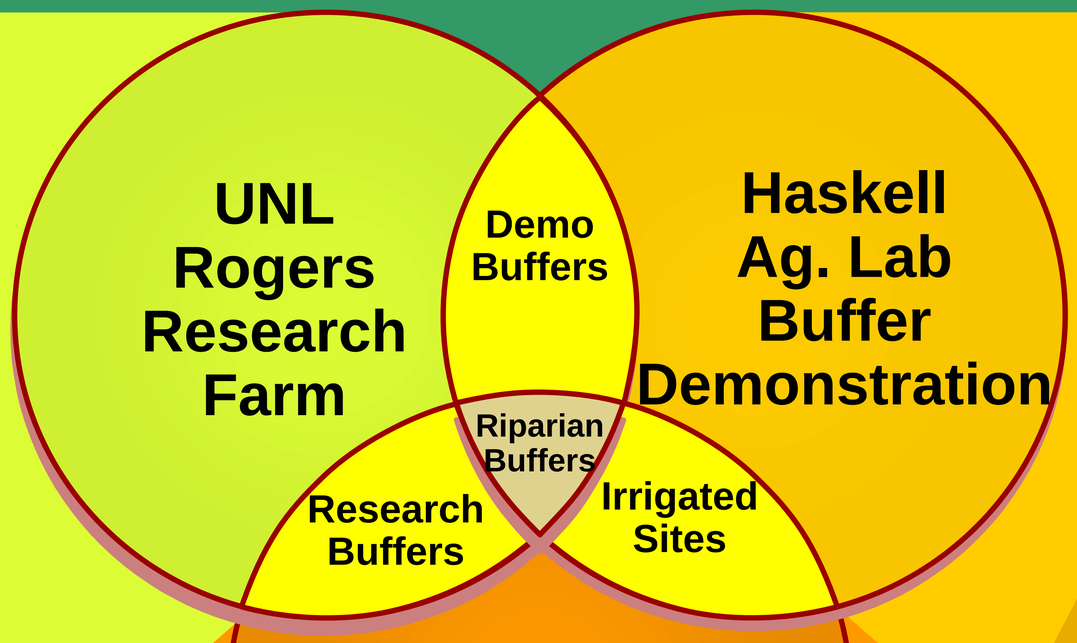
Conclusions
- Residue cover reduced erosion by as much as 80%
- Grass filter alone reduced soil loss by 71%

Groundwater Sampling



- Conservation Buffer Outdoor Lab
- Conservation Systems Demonstration
- Surface Water Runoff Monitoring
- Undergraduate Education
- Graduate Research
- Extension Education

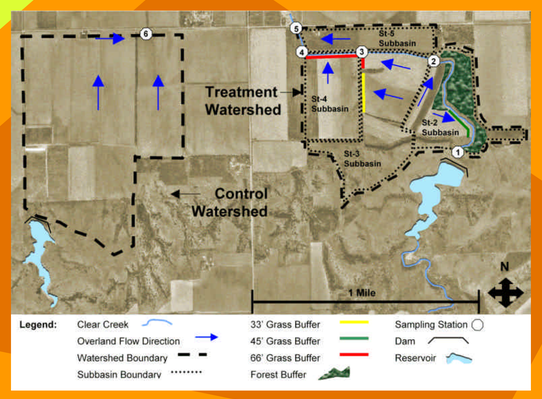
Upland Stiff Grass Hedges



- Specialty Crops
- Alternate Buffer Designs
- Forest Crops
- Alternate Grass Species
- Extension Education

- Watershed Scale Data
- Surface & Groundwater Data
- Landowner / Produce Cooperators

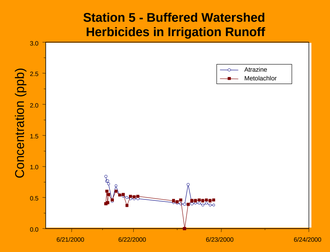
- Paired Study
- GIS Data Set
- In-Buffer Sampling

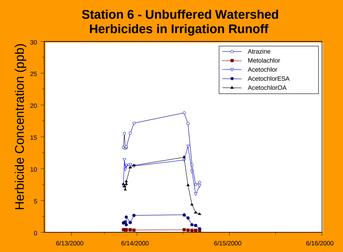


Research Component

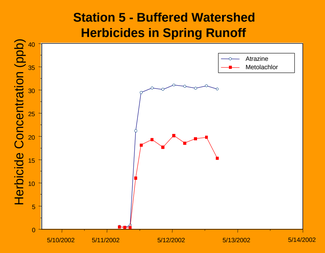
The research focus is at an irrigated farm site along Clear Creek in Polk County, Nebraska, part of the Platte River drainage. Five grasses buffers have been installed on the treatment subwatershed. These have been situated to collect runoff from soybean and corn fields, which, along with the existing riparian forest buffer, intercept runoff from greater than 80% of the subwatershed area. Irrigated row crops are oriented so runoff flows into the buffers. The control subwatershed has corn and soybeans grown, but no buffers. Five stream sampling sites are oriented to sample runoff from Clear Creak at several points with in the treatment watershed and at one point in the control watershed. A newly designed "in-buffer" sampler is used to measure and sample runoff from the buffers. A flow splitter collects a fixed proportion of overland flow and allows estimation of the total runoff. Inflow and outflow runoff volumes from the buffers is estimated, and samples are taken from every runoff event following planting through the end of the growing season, including irrigation runoff. Unique to this project is evaluation of irrigation runoff. The groundwater evaluation component includes three sets of clustered monitoring wells in the buffered watershed and eight multilevel samplers below the confluence of two streams for monitoring impacts of local ground water quality. Changes in pesticide and nitrate concentration is evaluated as function of infiltration into the buffer, nitrate reduction and pesticide biodegradation.

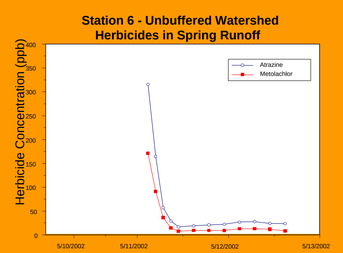
Preliminary Results Irrigation Runoff





Preliminary Results Rainfall Runoff





Project Description

Water quality degradation in the Missouri River and its tributaries has been attributed to runoff contaminated with pesticides, sediment and nutrients from agricultural land. While conservation buffers have been used for erosion and surface water pollution control in agricultural watersheds, very little information is available on reduction of contaminant levels in streams from buffer use, or their impact on local ground water.

This project includes research in paired watersheds targeted because of elevated levels of agrichemical runoff. This site is a part of a comprehensive education and demonstration project to enhance landowner adoption of conservation buffers. The project's objective is to demonstrate the efficacy of grassed buffers on improving and protecting stream water quality by measuring agrichemcial loading in stream water in two adjacent watersheds - one with grass buffers and one without. This site also provides for evaluation of the effects of agrichemical infiltration in buffers on ground water quality.

The results from this research will be integrated using GIS with data from two other buffer strip evaluation areas in Nebraska, and transferred to producers, managers and students through a symposium, extension programs and laboratory sessions in an undergraduate watershed management course. Unique extension efforts include several riparian buffer demonstration sites, a "farmer to farmer" project to promote adoption of conservation buffers, and riparian plantings of income producing woody and decorative florals, all supported through collaboration with other grants. Unique education activities include riparian buffer field tours and rainfall/runoff simulation laboratory exercises to demonstrate how grass buffers reduce sediment and chemical runoff.

University of Nebraska Lincoln

Institute of Agriculture and Natural Resources

IANR

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Nebraska Department of Agriculture

Nebraska Corn Growers Association

USDA-CREES Project "Accelerating Riparian Buffer Adoption to Enhance Water Quality and Farm Income"

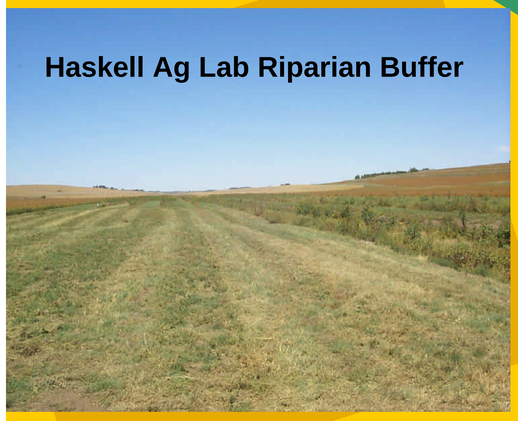
USFS National Agroforestry Center

ARD Baker Fund

USDA National Needs Fellowship

University of Nebraska Cooperative Extension

Haskell Ag Lab Riparian Buffer



Extension Component

Riparian buffers protect and enhance water quality in two ways: sediment and other particulate-bound pollutants are trapped within the buffer; and runoff water, often containing soluble nutrients and pesticides, is reduced through increased infiltration in the buffer. Although farmers and landowners may recognize these benefits, they are often reluctant to install buffers because land must be taken out of production which decreases income, and maintenance is required which increases expenses. This project is designed to address these and other concerns.

Peer-based Outreach

FarmLink - farmers or other community leaders individually contact farmers and landowners to promote buffer adoption.

Multi-faceted Education

- Meetings
- Tours
- Workshops
- Training Sessions
- Website (conservationbuffers.unl.edu)
- Electronic Presentations
- Publications

Field Demonstration Sites

- Array of buffer maturities and types
  - Newly planted to long established
- Plantings that have income generating potential
  - Woody florals, fruits, and hybrid hazelnuts
- Alternative buffer designs and plant materials
  - Reduce maintenance requirements
  - Maintain/improve uniform flow across buffer

In Buffer Sampler

Additional Information See

Accelerating Riparian Buffer Adoption to Enhance Water Quality and Farm Income

Poster #

Poster Preparation Courtesy of Dave Shelton