Approved: March 1, 2001
Date

MINUTES OF THE HOUSE COMMITTEE ON ENVIRONMENT.

The meeting was called to order by Chairperson Joann Freeborn at 3:30 p.m. on January 30, 2001 in Room 231-N of the Capitol.

All members were present except: Representative Dennis McKinney - excused
Representative Clay Aurand - excused

Committee staff present: Raney Gilliland, Kansas Legislative Research Department
Mary Torrence, Revisor of Statute's Office
Mary Ann Graham, Committee Secretary

Conferees appearing before the committee: Dr. Marc Johnson, Dean/Director, College of Agriculture, Kansas State University, Manhattan, KS 66506
Dr. Joseph Harner, Professor/Extension Agricultural Engineer, Kansas State University, Manhattan, KS 66506
Dr. Bill Hargrove, Director, KCARE, Kansas State University, Manhattan, KS 66506
Doug Musick, Watershed Specialist, Kansas State Extension, Haskell University, 155 Indian Avenue, Lawrence, KS 66046-4800
Terry Duvall, Kansas Water Office, 901 S. Kansas, Topeka, KS 66612-1249

Others attending: See Attached Sheet

Chairperson Joann Freeborn called the meeting to order at 3:30 p.m. She welcomed the large group of guests attending the meeting and had committee members introduce themselves and identify the district they represent. She announced that today is the last day in this committee to request bills and opened the floor for bill introductions.

Bill Fuller, Kansas Farm Bureau, spokesperson; Richard Jones, Kansas Association of Conservation Districts; and John Strickler, Interested Citizen, requested a bill to create the Kansas Natural Resource Legacy Alliance. (See attachment 1)

Rep. Dan Johnson made a motion the bill requested by Bill Fuller be introduced. Rep. Jeff Peterson seconded the motion. Motion carried.

Ron Klataski, Audubon of Kansas, requested a bill that would change Prairie Dog statutes 80-1201 thru 80-1208. (See attachment 2)

Rep. Don Myers made a motion the bill requested by Ron Klataski be introduced. Rep. Dan Johnson seconded the motion. Motion carried.

Theresa Hodges, Kansas Department of Health and Environment, requested a bill for the Elimination of Requirement to Publish Policies and Guidelines. (See attachment 3)

Rep. Sharon Schwartz made a motion the bill by KDHE be introduced. Rep. Bill Light seconded the motion. Motion carried.

The Chair asked if there were other bill requests. She closed the floor for bill requests.

Chairperson Freeborn welcomed Dr. Marc Johnson, Dean/Director, College of Agriculture, Kansas State University, to the committee. Dr. Johnson and staff gave a briefing on K-State Research and Extension programs in Water Conservation and Management, which has a team comprised of Irrigation Engineers,

Agronomists, Agricultural Economists, and County Agents. The outcomes for which they strive include: (1) Optimize the utilization of water for irrigation, through improved methods, scheduling, and equipment. (2) Increase economic water use efficiency through crop selection, management, and technology adoption; and by minimizing water losses. (3) Increase use of alternative water resources, such as wastewater. (4) Protect groundwater quality through utilization of integrated crop, pest, nutrient, and water management that will optimize crop production while not impairing water quality . (5) Conduct policy review and analysis, and educate decision makers. (See attachment 4)

Dr. Johnson announced that Dr. Chuck Rice, Department of Agronomy, was scheduled to attend today's briefing, but was ill and could not appear. He was scheduled to brief the committee on Sources of Fecal Coliform in Kansas Surface Waters. Bacteria contamination is one of the primary or secondary contaminants in the majority of the twelve major river basins in Kansas. Microbial contamination of water resources results in impaired use due to the increased risks to humans and the degradation of recreational and drinking water quality. Fecal Coliform limits in surface water vary depending on the intended use. (See attachment 5)

Dr. Bill Hargrove, Director, KCARE, was welcomed. He briefed the committee on K-State Research and Extension's programs aimed at meeting water quality standards in Kansas. A voluntary compliance approach to meeting TMDLs is being utilized in Kansas by the Governor's Water Quality Initiative and KDHE. Fundamental to the success of a voluntary compliance approach in agriculture are several key steps: (1) Producers are aware of and understand water quality issues related to their operation. (2) Producers have management options (based on scientific information and evaluation) for changing practices to address issues and enhance water quality. (3) Producers have access to technical and financial assistance to implement practices. A statewide TMDL communications plan has been developed. The goal of the communications plan is to provide objective, science-based information, that will inform citizens on: (1) what are TMDLs; (2) their responsibility in meeting TMDLs; and (3) how to improve water quality and help them meet TMDL requirements on a local and voluntary basis. (See attachment 6)

Doug Musick, watershed specialist, was welcomed to the committee. K-State Research and Extension is boosting its water quality initiative with the appointment of five new watershed specialists. These specialists will provide watershed management expertise and develop watershed educational program activities in multi-county areas. They will be working with landowners and farmers within the watersheds to develop action plans, based on the concerns within the watersheds. The specialists will strive to improve water quality through educational programs, including on-farm demonstrations, workshops, seminars and other teaching methods. (See attachment 7)

Dr Joseph Harner, Professor/Extension Agricultural Engineer, was welcomed to the committee. He addressed Environmental Concerns in Dairy Production. Preliminary evaluation of the Black Vermillion watershed indicated 37 dairies were located within the 216 square mile watershed. These dairies ranged in herd size from 30 to 150 cows. Many of the dairies had small lagoons for complying with regulations to control milk parlor discharges. The dairy environmental cooperative mission is to control manure and effluent nutrients leaving a farmstead and to effectively manage controlled nutrients with cropping practices. The overall objective of the project is to reduce the runoff of nutrients, fecal coliform and sediment from dairies in the Black Vermillion and adjacent watersheds. (See attachment 8) Committee discussion and questions followed.

Dennis Metz, Wellington, Kansas, a dairyman in attendance, responded to the issue raised concerning the type of chemicals used in the cleaning process of dairy parlors. He indicated the product he uses is equivalent to ordinary dish soap and is biodegradable.

Chairperson Freeborn thanked Dr. Johnson and staff members from K-State for their presentations. She welcomed Terry Duvall, Kansas Water Office to the committee.

Terry Duvall, KWO, briefed the committee on Water Marketing Contracts. Under the State Water Marketing Program, created in 1974, municipal and industrial water supply users may contract with the State of Kansas for water supply from state-owned storage space in large federal reservoirs located in the eastern half of the

state. The reservoirs currently used for the Water Marketing Program include: Big Hill, Clinton, Council Grove, Elk City, Hillsdale, John Redmond, Marion, Melvern, Milford, and Perry. There are currently 34 contracts with municipal and industrial users for water supply from these reservoirs. Each time a new contract is negotiated with a water user, the Kansas Water Authority must review and approve the contract. The statutes also require that new contracts be submitted to the Kansas Legislature. The Legislature has 30 days to adopt a concurrent resolution to disapprove a contract. A map on Public Water Supply Lakes in Kansas was displayed and discussed . (See attachment 9) Questions and discussion followed.

Chairperson Freeborn thanked Ms. Duvall for the presentation. She asked if there was a motion to approve minutes of January 11, 16, and 18 committee meetings that had been distributed to committee members.

Rep. Jonathan Wells made a motion the minutes be approved. Rep. Jeff Peterson seconded the motion. Motion carried.

The meeting adjourned at 5:00 p.m. The next meeting is scheduled for Thursday, February 1, 2001.

HOUSE ENVIRONMENT COMMITTEE GUEST LIST

DATE: January 30, 2001

NAME	REPRESENTING
Clare Gustin	Sunflower Elec.
Bill Fuller	Kansas Farm Bureau
John Strickler	Manhattan
Richard L. Jones	Ks Coun. Salina
Larry Mosier	Wichita
Ray Hammadick	KDOCH
Edward Rowe	League of Women Voters/KS
Rebecca Lord	KDA
Mary Johnson	K-State Research & Extension
Lee Hamer	K State Research & Extension
Ramona Carpenter	Farm Bureau
Alice Casey	" " Greenwood Co.
Mike Beam	Ks. Lvstk. Assn.
Paul Johnson	PACK
Donna Bates	Kansas Farm Bureau
Melvin Casey	KFB
Janice Fuller	KFB
Andy Shaw	Kearney Law Office
Roy Taylor	MANHATTAN

HOUSE ENVIRONMENT COMMITTEE GUEST LIST

DATE: January 30, 2001

NAME	REPRESENTING
KERRY WEDEL	State Conservation Commission
Ryan & Jenny Higbie	Jo Co Farm Bureau
Kerri Ebert	Kansas Dairy Association
SCOTT SCHNEIDER	GBBA
David Romine	KFB
Cordis Romine	KFB
Jack Wray	KFB Franklin Co
Linda Sauerssig	KFB Franklin Co
Dan Peterson	KFB Labette Co.
Caleb Phillips	KFB
Eric Lomas	KFB Labette Co.
Almeda Edwards	KFB Franklin Co
Halan Page	KFB Franklin Co.
LAURA KELLY	KS RECREATION & PARK ASSN
Ralph A Claassen	Butler Co FB
Chris Wilson	KS Dairy Ass'n

HOUSE ENVIRONMENT COMMITTEE

RE: Bill request to create the "Kansas Natural Resource Legacy Alliance."

January 30, 2001
Topeka, Kansas

Requested by:
Bill Fuller, Public Policy Division
Kansas Farm Bureau

Richard Jones, Executive Director
Kansas Association of Conservation Districts

John Strickler, Interested Citizen
Dedicated to Environmental Education, Natural Resource Protection and Forest Resources

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A Working Group organized to develop a quality of life initiative related to natural resources, the environment and economic development was formed and has been working several months examining needs, programs and resources. The core group has consisted of representatives of private organizations (Kansas Association of Conservation Districts, Kansas Farm Bureau, Kansas Chapter of the Nature Conservancy, Kansas Recreation and Parks Association) and state agencies (Kansas Department of Agriculture, State Conservation Commission, Kansas Water Office, Kansas Department of Wildlife and Parks, Kansas Forest Service and Kansas Department of Health and Environment). In addition to the core group, other organizations were brought into the discussions (Kansas Wildlife Federation, Kansas Livestock Association, Kansas Audubon Society, Pheasants Forever and Kansas Land Improvement Contractors Association).

At the most recent meeting on Friday, January 25, Rep. Joann Freeborn, Chair and Rep. Don Myers, Vice Chair of the House Environment Committee and Kelly Levi, Legislative Director for House Speaker Rep. Kent Glasscock, provided leadership in developing this request for proposed legislation:

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- Create the "Kansas Natural Resource Legacy Alliance" of 11 to 17 members;
- Develop a system of selecting members to the Alliance that involves appointments by the leadership of the House and Senate, legislative committees responsible for natural resource and environmental issues and the Governor;
- Select citizens for the Alliance that would assure a balance of knowledge and experience among the various interests in natural resources, environmental, and related economic development interests:
    - Parks and recreation
    - Soil and water conservation
    - Travel and tourism
    - Economic development
    - Outdoor recreation
    - Landowners and homeowners
    - Fish and wildlife
    - Forest resources
    - Municipalities
- Secure input, assistance and staff from various state agencies;
- Examine current natural resource and environmental programs;
- Develop a vision for the State's natural resources that will assure an economic standard, healthy environment and quality of life for Kansas families and individual citizens;
- Conduct public meetings across the state to provide information and seek citizen input;
- Consider impact on economic development;
- Examine current and future resource needs;
- Expand the private/public partnerships;
- Develop goals and establish priorities in the various natural resource and environmental areas, including, but not necessarily limited to:
    - Outdoor recreation
    - Tourism
    - Economic development
    - Natural resource and environmental education
    - Quality of life
    - Water quality

- Water supplies
- Fish and wildlife resources
- Forest resources
- Parks and lakes
- Wetlands and riparian areas
- Soil and water conservation
- Air quality

- Provide reports to legislative leadership, appropriate committees and the Governor:
  - Progress Report -- 2002 Session of the Kansas Legislature
  - Final Report -- 2003 Session of the Kansas Legislature

We respectfully request the House Environment Committee request a bill draft that includes provisions that will initiate the actions we have suggested and develop the recommendations we have requested on how natural resource and environmental issues impact quality of life and economic development priorities in Kansas.

Thank you!

PROPOSED CHANGES TO PRAIRIE DOG STATUTES 80-1201 THRU 80-1208

Replace 80-1201 and 80-1202 with the following:

80-1201. Management and/or control of prairie dogs, control of moles and gophers; expense from general fund. The township board of any township in this state or the county commission of any county in the state, at any regular or special meeting, is hereby authorized to purchase materials and to employ one or more suitable persons to control moles and gophers, manage and/or control prairie dogs within the limits of such township or county, any material so purchased and compensation for such services to be paid out of the general fund of such township or county. The Kansas Department of Wildlife and Parks, Kansas Department of Agriculture and Kansas Extension Service are authorized to assist counties, township boards and landowners with management and/or control of black-tailed prairie dog colonies. Assistance may include development and distribution of educational information; technical assistance with preparation and implementation of management plans; research; cost-share assistance and distribution of equipment and materials used for purposes of management and/or control of prairie dog colonies or populations, and/or to curtail dispersal; incentive payments for cooperative wildlife habitat enhancement and species conservation programs associated with prairie dog colonies, and related range and livestock management practices, range restoration and grassland conservation programs. State sponsored and cooperative conservation programs with landowners who are receptive to management of black-tailed prairie dog colonies may be designed to prevent the species from becoming threatened or endangered.

80-1202. Management and/or control of prairie dogs; duties of township trustees and county commissions; entry upon land, exceptions, assessment of costs. (a) Upon receiving a complaint from a landowner who is directly affected by an unmanaged or uncontrolled population of prairie dogs, the township board or county commission will determine that the said colonies poses a serious threat of destructive, injurious or detrimental effect upon surrounding lands. The township board or county commission shall provide written notice of the determination. Said written notice shall indicate that and the specific location to the landowner or landowners,whether corrective management and/or control measures have been deemed necessary to abate the detrimental or potentially injurious effect. If control measures are deemed necessary a landowner is obligated within 90 days of the written notice to either; (1) Commence a management and/or control plan, developed in conjunction with the Kansas Department of Wildlife and Parks, with the purpose of such plan being prevention of spread of the identified prairie dog population to adjoining lands not owned by the landowner; or (2) permit the township or county to undertake prairie dog control and/or management measures on each landowner's property, and reimburse the township or county for costs accrued for such measures if requested by the township or county; or (3) contest the decision by the township or county.

(b) For the purpose of enabling them to carry into effect the provisions of this act, the township or county is authorized and empowered to employ all such assistance and to purchase such appliances and materials as they may deem necessary to implement prairie dog control and/or management measures. Following the 90-day notice period, regarding lands pursuant to subsection (a), the township or county shall give 30 days written notice to any landowner who shall fail to adopt either subsection (a)(1), (a)(2), or (a)(3) after the date specified in the notice, before the township or county may enter upon the land to undertake prairie dog control measures.

(c) After employment of control measures pursuant to subsection (b), the township or county shall immediately notify the landowner or landowners with an itemized statement of the costs thereof, and stating that unless such amount is paid within thirty (30) days from the date of the notice, that the amount shall become a lien upon their real estate. If such costs are not paid within thirty (30) days they shall be assessed against the property of the landowner and the

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township clerk shall, at the time of certifying other township taxes to the county clerk, certify the costs of such control and the county clerk shall extend the same on the tax roll of the township against such property and said costs shall be collected by the county treasurer and paid to the township as other township taxes are collected and paid.

(d) A landowner implementing an approved management and control plan pursuant to subsection (a)(1) shall not be subject to the provisions of subsections (b) or (c). However, if a landowner who submits a management and control plan to the township or county is found to have failed or refused to implement such plan, the township or county may undertake the measures described in subsections (b) and (c).

80-1203 through 80-1208: Either repeal in part or in whole, or edit to add "county" throughout, and to delete terms such as "infested" and "exterminate" and replace with terms such as "management and/or control" where appropriate.

Article 12.—PRAIRIE DOGS, MOLES AND GOPHERS

Attorney General's Opinions:
Extermination of prairie dogs; tax levy. 89-136.

80-1201. Destruction of prairie dogs, moles and gophers; expense from general fund. The township board of any township in this state, at any regular or special meeting, is hereby authorized to purchase material and to employ one or more suitable persons to destroy prairie dogs, moles and gophers within the limits of such township, any material so purchased and compensation for such services to be paid out of the general fund of such township.

History: L. 1901, ch. 273, § 1; R.S. 1923, 80-1201; L. 1965, ch. 548, § 1; June 30.

Research and Practice Aids:
Bounties ⇐ 8.
C.J.S. Bounties § 13.

80-1202. Eradication of prairie dogs; duties of township trustees; entry upon land, exceptions; assessment of costs. In addition to the duties now prescribed by law for township trustees, in counties infested by prairie dogs, they may do and perform the following services: That the township trustees of the several townships in this state infested by prairie dogs may enter upon the lands so infested in their respective townships and make diligent efforts to exterminate all prairie dogs thereon. For the purpose of enabling them to carry into effect the provisions of this act, the trustees are authorized and empowered to employ all such assistance and to purchase the poison or such appliances and material as they may deem necessary to exterminate such dogs. The work of such extermination shall all be done under the supervision and direction of the trustees: *Provided*, That in any county having a population of more than four thousand (4,000) and less than five thousand two hundred (5,200) which contains no city of the second class and not more than two (2) cities of the third class, the trustees shall before entering upon the lands give written notice to any landowner who shall fail or refuse to make use of the materials offered or provided, that unless he or she endeavors to control such prairie dogs according to the methods prescribed by the board of trustees will, within fifteen (15) days after the date specified in the notice enter upon his or her land and use the necessary materials to eradicate the prairie dogs thereon; and the trustees or their agents, may thereafter enter upon the land and proceed to eradicate such prairie dogs.

After eradication of such prairie dogs, the trustees shall immediately notify the landowner or landowners with an itemized statement of the costs thereof, and stating that unless such amount is paid within thirty (30) days from the date of the notice, that the amount shall become a lien upon their real estate. If such costs are not paid within thirty (30) days they shall be assessed against the property of the landowner and the township clerk shall, at the time of certifying other township taxes to the county clerk, certify the costs of such eradication and the county clerk shall extend the same on the tax roll of the township against such property and said costs shall be collected by the county treasurer and paid to the township as other township taxes are collected and paid.

History: L. 1909, ch. 181, § 1; L. 1919, ch. 315, § 1; R.S. 1923, 80-1202; L. 1965, ch. 548, § 2; L. 1969, ch. 472, § 1; L. 1972, ch. 384, § 1; March 20.

Source or prior law:
L. 1903, ch. 378, § 1.

Attorney General's Opinions:
Prairie dog eradication; duty of township trustees. 83-127.

80-1203. Same; report of expense to county commissioners; tax levy. The trustees of the several townships infested by prairie dogs shall appear before the board of county commissioners of their respective counties at their annual meeting in August of each year, when they convene to make the annual tax levy, and make a report of the probable expense to exterminate the prairie dogs in their respective townships. And the commissioners of the respective counties, after receiving said reports, shall cause to be levied on real estate assessed for taxation in each township thus infested by prairie dogs the approximate amount estimated by the several trustees as herein provided, or any part thereof: *Provided, however*, That no assessment for this purpose shall be greater than seventy cents on each one hundred dollars valuation as herein provided.

History: L. 1909, ch. 181, § 2; April 3; R.S. 1923, 80-1203.

Source or prior law:
L. 1903, ch. 378, §§ 2, 3.

80-1204. Same; compensation of trustees and assistants. The trustees of each township and their assistants shall receive as compensation for their services for the time actually and necessarily employed. Such compensation shall be paid only out of the fund of the county created by this act for that purpose and shall be in an amount determined by the township board as provided by K.S.A. 80-207, and amendments thereto.

History: L. 1909, ch. 181, § 3; L. 1919, ch. 315, § 2; R.S. 1923, 80-1204; L. 1996, ch. 184, § 9; May 2.

Source or prior law:
L. 1903, ch. 378, § 5.

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Cross References to Related Sections:
General provisions, see 80-302.
Other special provisions, see "Cross References to Related Sections" under 80-302.

Attorney General's Opinions:
Township clerk; duties. 81-288.
Compensation of members of township boards. 95-113.

80-1205. Same; custody and disbursement of funds. The township trustees shall be the custodians of the fund created by this act, and disburse the same on vouchers audited by the township boards at their regular quarterly meetings and warrants drawn on the treasurer for the same: *Provided*, That no part of this fund shall be subject to the payment of claims other than those specified in this act.

History: L. 1909, ch. 181, § 4; April 3; R.S. 1923, 80-1205.

Source or prior law:
L. 1903, ch. 378, § 6.

80-1206. Same; payment of moneys to township treasurers. The county treasurers of the several counties of this state are hereby authorized and directed to pay over to the several township treasurers of their respective counties all the moneys collected for the purpose designated in this act, in the mode and manner as other township funds are paid over to said township treasurers.

History: L. 1909, ch. 181, § 5; April 3; R.S. 1923, 80-1206.

Source or prior law:
L. 1903, ch. 378, § 7.

80-1207. Same; surplus funds; use. Whenever any township of this state shall have rid itself of the prairie dogs and there shall cease to be a necessity of any future procedure under this act (which question shall be determined by the board of county commissioners and the trustee of such township), the surplus fund, if any, in the hands of the township treasurers shall be merged into the general township funds of said townships and to be used for general township purposes.

History: L. 1909, ch. 181, § 6; April 3; R.S. 1923, 80-1207.

Source or prior law:
L. 1903, ch. 378, § 9.

80-1208. Same; penalty for failure to perform duties. Any township trustee or board of county commissioners failing to perform any of the duties imposed upon them by this act shall be deemed guilty of a misdemeanor, and upon conviction thereof be subject to a fine of not less than fifty dollars nor exceeding one hundred dollars for each offense thus committed.

History: L. 1909, ch. 181, § 7; April 3; R.S. 1923, 80-1208.

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Kansas Department of Health and Environment
BILL BRIEF

Title: Elimination of Requirement to Publish Policies and Guidelines

I. Purpose/Reason for Proposed Legislation

K.S.A. 75-5662 requires the Division of Environment to publish all policies and guidelines by January 1, 1997 and to publish annual updates thereafter. To date only eleven copies of the publication have been requested. This statute is not needed since policies/guidelines are available from all regulatory programs in the Division of Environment at no cost (or minimal photocopying cost) to any entity.

II. Bill Summary

This legislation would repeal K.S.A. 75-5662 which required an initial publication January 1, 1997 of all Division of Environment policies and guidelines and publication of an annual update thereafter

III. Legislative History

The 1996 legislature enacted K.S.A. 75-5662 in response to a League of Municipalities request to require that all policies and guidelines be compiled and published by the Division of Environment. The document was available January 1, 1997. Copies were distributed to the State Library and the majority and minority leaders or the House and Senate. Nine copies were requested in 1997 (2-Utilities; 3- Consultants; 2- Manufacturing plants; and 1- Attorney). Only two requests were received in 1998 (1- Manufacturing plant for a complete set; 1- Consultant for update only). No requests have been received the past two years.

IV. Impact on Other Agencies or KDHE Bureaus

None

V. Fiscal Impact

The cost in staff time for compiling the annual updates would be saved. The fees collected ($75 for 1997 document and $15/annual update) covers only the reproduction and shipping costs.

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BILL NO. _____

BY:_____

AN ACT concerning publication of certain documents required; fee: K.S.A. 75-5662 is repealed.

Be it enacted by the Legislature of the State of Kansas:

Section 1. K.S.A. 75-5662 is hereby repealed.

Sec. 2. This act shall take effect and be in force from and after its publication in the statute book.

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K-STATE RESEARCH AND EXTENSION PROGRAMS IN WATER CONSERVATION AND MANAGEMENT

Presented to the House Environment and Senate Natural Resources Committees
January 30 and February 9, 2001

Overview

We have a Water Conservation and Management Research and Extension Team comprised of Irrigation Engineers, Agronomists, Agricultural Economists, and County Agents. The outcomes for which we are striving include:

- Optimize the utilization of water for irrigation, through improved methods, scheduling, and equipment
- Increase economic water use efficiency through crop selection, management, and technology adoption; and by minimizing water losses
- Increase use of alternative water resources, such as wastewater
- Protect groundwater quality through utilization of integrated crop, pest, nutrient, and water management that will optimize crop production while not impairing water quality
- Conduct policy review and analysis, and educate decision makers

Program Highlights

For Non-Irrigated Production and Conversion from Irrigated to Non- or Partially Irrigated:

- Reduced tillage - one faculty member in Agronomy dedicated to research and extension related to no- and reduced tillage
- Cropping systems/crop rotations - Several years of work at Tribune, Garden City, and Colby comparing crop rotations under dryland management; initiating work on rotations of irrigated and non-irrigated crops
- Research and extension programs on alternative crops that require less water: sunflowers, grain sorghum

For Irrigated Production:

- Evaluation of improved nozzle packages and other equipment
- Collaboration with producers in South Central KS to evaluate irrigation scheduling; developed and using KANSCHED.
- Research on subsurface drip irrigation; 10+ yrs experience with "fresh water", 3 yrs experience with livestock wastewater.
- Research on application of livestock wastewater to cropland
- Development of a Mobile Water Conservation Learning Center (to be funded from the State Water Plan)
- Initiating evaluation of nitrate leaching under irrigated conditions

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K-STATE Kansas State University

Total Maximum Daily Loads

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

The Clean Water Act of 1972 required states to set water quality standards. The standards for any given body of water depend on the designated uses (public drinking water, fish and wildlife, recreation, agricultural, industrial, etc.) that apply to that water.

The act required states to identify and set priorities on waters not meeting those standards. These waters include streams, rivers, reservoirs, lakes, ponds (except private ponds), and wetlands.

If one or more pollutants are found to exceed the water quality standards for a given body of water, the state is required to establish a Total Maximum Daily Load (TMDL) for that body of water.

A TMDL is the maximum amount of pollution a water body can receive without violating water quality standards. Despite the seemingly simple term, Total Maximum Daily Load, a TMDL is not just a simple number that sets a maximum limit on the amount of, a given pollutant in a water body on any given day.

Rather, a TMDL establishes a range of acceptable values that vary with flow conditions. For example, a TMDL for atrazine for a lake may state that the Water Quality Standard (WQS) of 3 parts per billion (ppb) can only be exceeded in the April through September period 1 day every 3 years at seasonal flood pool levels, and in less than 10 percent of samples during spring flood conditions.

Kansas will be establishing about 900 TMDLs between 2000 and 2006. Many of the TMDLs will be in rural settings and will rely on participation of agricultural producers to be successfully implemented. For streams in Kansas, the major issue will be reduction of bacteria levels. For lakes, the major issue will be reduction of pesticide and phosphorus levels. TMDL implementation will be done on a watershed basis.

The TMDL Plan

A TMDL plan is a written document specific to a given pollutant and a given stream segment or lake in a watershed. The TMDL document takes into account:

1. Recent water quality monitoring data over a period of 2 or more years
2. Which pollutants are occurring at levels above the WQS levels in the stream segment or lake
3. The frequency of WQS violations
4. The flow conditions existing when the high levels of pollutants were recorded
5. The sources of the pollutant within the watershed and how much each source may be contributing to the problem

Implementing a TMDL

Once the desired endpoints of pollution levels are established, the TMDL document sets into motion several important processes. First, KDHE is able to quantify how much reduction in the pollutant load is needed in the watershed area to meet the desired water quality endpoints. Second, KDHE is then able to divide responsibility for reducing pollution among possible point and nonpoint sources of the pollutant within the watershed during a specified number of years.

For nonpoint pollution sources, voluntary actions will be set in place to achieve compliance. This will consist of efforts to demonstrate, promote, design, and implement Best Management Practices for water quality improvement. These voluntary efforts will be a partnership between the private sector; K-State Research and Extension; and various state, local, and federal agencies and organizations.

If future water quality monitoring shows that the body of water is no longer impaired, no additional action is needed to reduce pollution. But if pollution levels are still too high at the end of the time period for voluntary action, KDHE will determine what measures must be taken and by whom to reduce the pollution to acceptable levels. These measures may be mandatory at that time.

The Goal of TMDLs

Monitoring data indicate the historic number of violations of WQS levels. The goal of TMDLs will be to reduce the number of those violations. It is the hope of the state that violations will occur in less than 10 percent of the samples. Violations during high flow are indicative of nonpoint source pollution, the state's primary type of pollution. The key to successful implementation of TMDLs will be setting reasonable goals for pollution reduction, focusing on specific watersheds with highest priority, concentrating on activities that occur near streams, getting voluntary participation among those who

contribute to nonpoint source pollution, providing those sources with enough time and money to implement BMPs, and making state programs available for assistance.

Water Quality Monitoring in Kansas

The Kansas Department of Health and Environment (KDHE) monitors the quality of surface waters of Kansas. KDHE prepared lists of impaired surface waters in 1994, 1996, and 1998. The 1998 list includes more than 770 impaired stream segments and 130 impaired lakes within the 12 major river basins, requiring the establishment of TMDLs.

The 1998 list of impaired waters was based on monitoring data from 1996 and 1997. This data is taken from 291 monitoring sites throughout Kansas. Sites are monitored on a bimonthly basis.

The TMDL Process

TMDLs will be established for bodies of water not meeting their designated uses due to violations in water quality standards. The TMDL assessment outlines the amount of a pollutant that needs to be reduced to meet WQS levels, allocates control responsibilities among pollution sources in a watershed, and provides a basis for taking actions to restore water quality. The process of developing and implementing TMDLs involves:

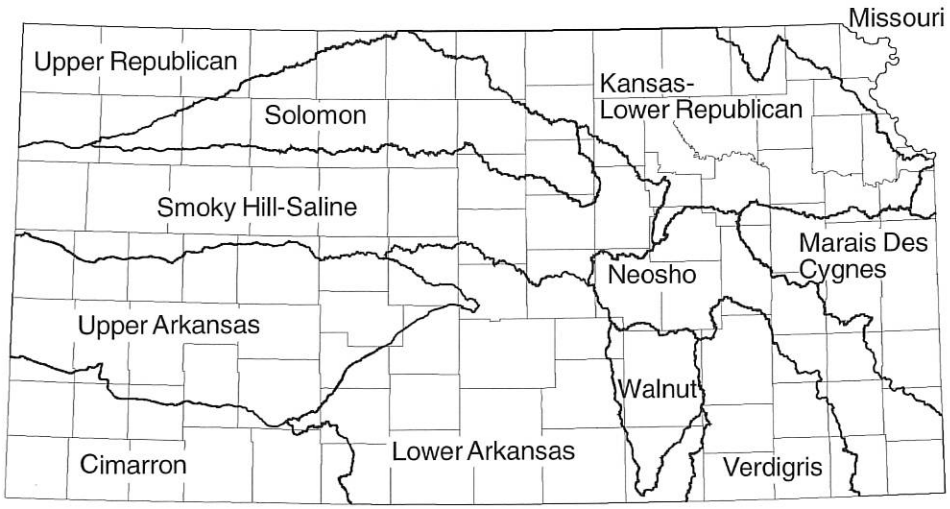
1. Identifying the impaired water body, the pollutant(s) causing the impairment, and defining the goal for improved water quality.
2. Determining to what extent the impaired water body can assimilate the pollutants.
3. Estimating the type, location, and magnitude of the sources contributing pollutants to the water body.
4. Estimating the relationship between each source and the pollutant load in the impaired water body.
5. Allocating permissible loads of each pollutant among point, nonpoint, and background sources. Assigning responsibility for reducing pollutants among the various sources. Establishing a margin of safety for each pollutant.
6. Follow-up monitoring of water quality.
7. Establishing a mechanism to ensure that the TMDL process is working effectively so that the water body will meet established water quality standards for all designated uses.

The TMDL Schedule for Kansas

Kansas was required to submit TMDLs to the Environmental Protection Agency for impaired stream segments and lakes in each of the 12 major river basins in Kansas over an 8-year period, ending June 30, 1996. Kansas plans to accelerate this schedule. The first TMDLs were submitted on June 30, 1999 for the Kansas-Lower Republican Basin. The accelerated schedule for TMDLs in Kansas is:

1999: Kansas-Lower Republican River Basin (completed June 30, 1999)
2000: Lower Arkansas, Upper Arkansas, and Cimarron River Basins
2001: Marais des Cygnes and Missouri River Basins
2002: Neosho, Verdigris, and Walnut River Basins
2003: Smoky Hill-Saline, Solomon, and Upper Republican River Basins

Twelve River Basins in Kansas



Daniel L. Devlin
Extension Specialist and Coordinator
Environmental Quality

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

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Total Maximum Daily Load (TMDL) Fact Sheet No. 2

K-STATE Kansas State University

Atrazine Herbicide: A Water Quality Concern for Kansas

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

Atrazine herbicide is widely used in Kansas for selective weed control in corn and grain sorghum. It has wide application flexibility and is one of the lowest-cost herbicides on a per-acre basis. In addition, atrazine has been shown to be one of the most effective soil-applied herbicides for weed control in corn and grain sorghum. Atrazine is often used by itself, but also is included in many postemergence herbicide tank-mix programs. However, there are environmental concerns regarding the use of atrazine.

Water Quality Concerns

In recent years, there have been concerns about the level of atrazine herbicide runoff entering surface waters.

This particularly became a concern when the Environmental Protection Agency (EPA) announced that a maximum contaminant level (MCL) for atrazine had been set at an annual average of 3 parts per billion (ppb). This is an enforceable level for public drinking water systems and, according to EPA, is a concentration that is safe to drink over a 70-year lifetime with no adverse effects. Municipal water treatment plants do not typically remove atrazine during the treatment process.

In addition, an aquatic life standard for atrazine concentrations in Kansas surface water has been set at 3 ppb. A number of rivers, streams, and lakes in eastern Kansas routinely exceed the 3 ppb standard for brief periods, following herbicide application in the spring.

In 1998, the Kansas Department of Health and Environment submitted its list of impaired waters (303(d) list) to EPA in which several lakes were identified as impaired by runoff of atrazine. For the atrazine-impaired watersheds, a Total Maximum Daily Load (TMDL) will be set and an implementation plan developed to reduce atrazine levels.

It is hoped that the reductions called for in the TMDL plan will be reached voluntarily by farmers using atrazine best management practices (BMPs). However, if voluntary adoption does not bring the atrazine concentrations into compliance with water quality standards, regulatory actions may need to be implemented.

How Atrazine Can Move Into Water

Kansas State University researchers have found annual atrazine runoff losses often range from 1 to 3 percent of the total applied. The amount of atrazine lost from crop fields is determined by the chemical characteristics of atrazine; soil and site characteristics; tillage practices; and rainfall duration, intensity, and timing.

Atrazine is lost from the top inch of the soil surface. In general, the greater the slope and the lower the infiltration rate of the surface soil, the greater the atrazine runoff potential. Reducing tillage intensity may or may not reduce atrazine runoff. The surface soil moisture at time of herbicide application, length of time from herbicide application until the first runoff event, and the intensity and duration of the first runoff event greatly influence the amount of atrazine lost in surface runoff. The drier the soil surface at atrazine application time, the more water and atrazine that will infiltrate into the soil and the less atrazine will be available to run off.

Up to two-thirds of the total atrazine runoff from a field may occur with the first major runoff event following atrazine application. The longer the time period between atrazine application and the first major runoff event, the less atrazine runoff that will occur. The most atrazine runoff often occurs during the peak atrazine application period of May, June, and July, which is also the period with the highest amount and intensity of rainfall.

Controlling Atrazine Runoff

The most effective way to minimize atrazine runoff into surface water is to implement a series of research-proven BMPs. K-State researchers have determined those BMPs that, when adopted by farmers, will minimize atrazine runoff. These atrazine BMPs are designed to:

- reduce the amount of atrazine on the soil surface at any one time, especially during high-rainfall periods in late spring and early summer;
- reduce the rate of atrazine used in a field;
- reduce the impact of the first runoff event on atrazine loss; and
- provide a mechanism for deposition of the atrazine before it leaves the field.

12 Best Management Practices for Atrazine

1. *Incorporate atrazine into the top 2 inches of soil.* Apply preplant atrazine alone or as part of a tankmix and incorporate into the top 2 inches of soil with a field cultivator, tandem disk, or other appropriate tillage implement. This can reduce atrazine runoff by **60 to 75 percent** compared to a surface application without incorporation.
2. *Use fall or early spring applications.* Atrazine runoff can be reduced by **50 percent** by applying atrazine the previous fall or prior to April 15 of the current cropping year. Rainfall intensity, duration, and amount is lower during these time periods.
3. *Use postemergence atrazine premix products.* Many postemergence herbicide premix products are available that, when used at recommended rates, result in less atrazine being applied than with typical soil-applied atrazine applications. Using these products can result in **50 to 67 percent** less atrazine runoff.
4. *Reduce soil-applied atrazine application rates.* The lower the atrazine rate applied, the less potential for atrazine runoff. This can reduce the amount of atrazine applied by as much as **33 percent**.
5. *Use split applications of atrazine.* Using split applications reduces the amount of atrazine available for runoff at any given time. This has the potential to reduce atrazine runoff by **25 percent** compared to applying all the atrazine at planting.
6. *Use reduced soil-applied atrazine rates followed by a postemergence herbicide application.* Applying atrazine at a reduced soil-applied rate of approximately 1 pound per acre at planting, followed by a postemergence application of a premix product that contains low rates of atrazine, results in **25 percent** less atrazine runoff compared to surface applying all atrazine at planting time.
7. *Use non-atrazine herbicides.* New herbicides that do not contain atrazine are available for use in corn and grain sorghum. These alternative herbicides may require greater management or be more expensive. This can reduce the amount of atrazine applied by as much as **100 percent**.
8. *Use integrated pest management strategies.* Integrated weed management strategies combine prevention, suppression, monitoring, and pesticides to control weeds while minimizing the amount of herbicide needed. These strategies have the potential to reduce atrazine runoff by **0 to 100 percent**.
9. *Band herbicides at planting or cultivation.* Applying atrazine over the row in a 10- to 15-inch band reduces the total amount of atrazine applied to a field by **50 to 67 percent** resulting in a corresponding reduction in atrazine runoff compared to a broadcast surface application without incorporation.
10. *Establish vegetative and riparian buffer areas.* These buffers are effective at slowing down runoff and settling out soil particles from erosion. The buffers also may reduce the amount of water runoff by increasing infiltration of runoff water within the buffer. To the extent that water infiltrates into the buffer strip soils, atrazine loss will also be reduced.
11. *Use proper atrazine rates, mixing, loading, and disposal practices.* Read and follow all label directions. Develop and implement a spill prevention and response plan.
12. *Utilize conservation practices and structures.* Conservation practices and structures that slow or reduce water runoff and soil erosion reduce atrazine runoff.

Daniel L. Devlin
Extension Specialist and Coordinator
Environmental Quality

David L. Regehr
Extension Weed Scientist

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

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Total Maximum Daily Load (TMDL) Fact Sheet No. 3

K-STATE Kansas State University

Phosphorus and Water Quality In Kansas

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

A report in 1994 by the Kansas Department of Health and Environment indicated that 24 percent of stream miles and 89 percent of lakes in Kansas were impaired by excessive levels of nutrients.

Phosphorus is the nutrient that is most often responsible for the impairment of surface water. Phosphorus is essential for crop plant growth, and economic yield increases to phosphorus fertilizer occur where there are soil deficiencies. In some cases, however, phosphorus can move into surface waters and cause impairments of normal uses. Phosphorus is primarily a surface water quality problem, rather than a groundwater problem. In most soils, nearly all the phosphorus exists in organic and inorganic compounds of very low solubility. As a result, phosphorus generally does not leach downward far enough to reach groundwater.

Concerns About Phosphorus in Water

Excess phosphorus in water is not considered to be a human health concern, according to the Kansas Department of Health and Environment (KDHE).

Excess phosphorus, however, is a concern for aquatic ecosystems. Under most natural conditions, phosphorus is the limiting factor in the growth of aquatic plants.

When large amounts of phosphorus enter lakes and streams, it enhances the growth of algae and other aquatic weeds, leading to excessive aquatic plant growth, often referred to as algae blooms. This unwanted burden of aquatic plant growth is termed "eutrophication." Water clogged with overabundant aquatic plant growth can lead to a number of undesirable consequences. The water can become undesirable for recreational activities. In addition, when these aquatic plants die and decompose, they consume oxygen in the water and severe fish kills may occur. Decaying algae and plants may cause undesirable odor and taste in drinking water.

Improving water quality in a lake impaired by excessive phosphorus is difficult and takes considerable time. Therefore, it is best to take preventive steps to limit phosphorus movement into surface waters.

Sources of Phosphorus

Phosphorus comes from both point and nonpoint sources. Point sources include municipal waste treatment plants, industrial operations, and large, confined livestock operations. These sources generally are regulated by federal and state laws requiring them to have environmental controls.

Phosphorus also comes from nonpoint sources. Nonpoint sources of phosphorus include soil erosion and water runoff from cropland, lawns and gardens; private waste treatment systems; urban areas; small livestock confinement operations; and livestock grazing operations. It is believed that much of the excess phosphorus in surface water comes from agriculture, with both crop production and livestock operations contributing.

Phosphorus in the Environment

In the environment, phosphorus exists either in the particulate or dissolved form.

1. Particulate phosphorus includes phosphorus that exists in one of three forms: (a) associated with soil particles; (b) in mineral form as aluminum, iron, or calcium compounds; or (c) incorporated in organic matter. This form of phosphorus can move into surface waters attached to soil and organic matter particles through soil erosion. Particulate phosphorus is largely unavailable to aquatic organisms. But if particulate phosphorus levels are high in surface waters, such as in areas where significant erosion problems occur, this form of phosphorus can play a role in eutrophication.

2. Dissolved phosphorus includes phosphorus compounds dissolved in water. A small amount of dissolved phosphorus exists naturally in all soils. Runoff water also can contain dissolved phosphorus, either from the top layer of the soil or from recently applied fertilizer or manure still on the soil surface. Dissolved phosphorus can be quickly utilized by aquatic organisms and even low levels can cause eutrophication.

In Kansas, about 75 to 90 percent of phosphorus movement into surface water occurs is particulate phosphorus with soil erosion. About 10 to 25 percent is dissolved phosphorus in water runoff. Therefore, generally, preventing soil erosion is very important in limiting phosphorus movement from cropland, rangelands, and pastures.

Factors that affect the level of nonpoint source phosphorus pollution from cropland include soil phosphorus content and the rate and method of phosphorus applied as either fertilizer or manure. Generally, the higher the soil test phosphorus level, the greater the potential phosphorus runoff to surface waters.

Dissolved phosphorus becomes more important where: (a) soil test levels are high, (b) higher fertilization rates are applied, (c) phoshorus fertilizer is not incorporated or is surface applied on frozen soils during a time of year when runoff is likely, or (d) livestock waste is spread on pastures or cropland and not incorporated.

Livestock waste washed from livestock confinement areas, pastures, or other feeding areas also can be a significant source of phosphorus entering surface waters.

Failing septic systems disposing of toilet and wash water from indoor plumbing can contribute phosphorus locally. Failing septic systems can be generally categorized in the following manner: (1) septic systems that discharge directly into a stream or ditch from the tank without any lateral field or lagoon; or (2) septic systems that discharge domestic wastewater to the soil surface due to a failing lateral field or lagoon. In failing systems, human waste and wastewater comes to the soil surface where it can then be transported by water runoff to surface water.

In urban areas, construction sites where soil is disturbed may lead to soil erosion and phosphorus losses to surface water. In addition, phosphorus runoff losses can occur from lawns, gardens, and turfgrass areas through soil erosion or surface water runoff containing dissolved phosphorus. Fertilizer applied to lawns, gardens, and turf can be lost in runoff waters, particularly if fertilizer is spilled on driveways, sidewalks, or roadways.

Eutrophication

Lakes and ponds naturally support a healthy population of aquatic life. But if nutrient levels, especially phosphorus, become too high, the following undesirable changes can occur:

- Increased algae growth
- Reduced water clarity
- Unpleasant odor and taste
- Increased filtration costs
- Reduced oxygen in the water
- Changes in fish populations, or fish kills
- Toxins from bluegreen algae

Controlling Phosphorus Runoff

Point source phosphorus pollutant sources are largely controlled through federal and state regulations and permits.

Nonpoint source phosphorus pollutant sources are generally controlled through the voluntary actions of citizens. Technical assistance and cost share are available from local and state agencies to assist in implementing pollution control practices.

Cropland. In cropland, phosphorus losses can be controlled by implementing a series of best management practices (BMPs). These BMPs for phosphorus fall into two categories:

Particulate phosphorus can move into surface water through soil erosion.

(1) Phosphorus use practices. Producers can help reduce the potential for phosphorus runoff by applying phosphorus fertilizer only when needed and by using application timing and placement methods that minimize rate and incorporate the phosphorus below the soil surface. Manure also should be incorporated. Producers can use buffer areas, where no phosphorus is applied, around water resources.

(2) Erosion control. Most phosphorus under field conditions is strongly attached to soil particles. In this form, it will not dissolve and move off-site in runoff water, but it can move off-site with soil particles as soil erosion occurs. BMPs that reduce soil erosion play a major role in reducing the potential for phosphorus movement. Vegetative filter strips also can reduce erosion losses.

Livestock Production. With confined livestock operations, facilities need to be located away from surface water drainage ways. Waste collection, storage, and handling operations need to be properly designed. In addition, a nutrient management plan for land application of animal wastes needs to be developed and implemented. Improved grazing management systems may reduce soil erosion in pastures and rangelands. In addition, developing alternative water sources and improving riparian areas along streams also may reduce phosphorus runoff into streams.

Domestic Sources. Repairing or replacing failing septic systems will substantially reduce phosphorus runoff losses associated with septic systems. Controlling erosion from construction sites also can help reduce phosphorus losses.

Daniel L. Devlin
Extension Specialist and Coordinator
Environmental Quality

David A. Whitney
Extension Specialist, Soil Testing

Kent A. McVay
Extension Specialist, Soil and Water Conservation

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

MF-2463 August 2000

K-STATE Kansas State University

Water Quality Protection: Best Management Practices for Cropland

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

Best Management Practices for Cropland Pollutants

	Potential to Reduce Pollutant Loss					
	Pesticides		Nutrients			
Best Management Practice	Alachlor	Atrazine	Soluble Phosphorus	Total Phosphorus	Nitrogen	Suspended Solids
Preplant incorporate into the top 2 inches of soil	High	High	High	Negative	High	Negative
Use postemergence herbicide applications	N/A	High	No Effect	No Effect	No Effect	No Effect
Use alternative herbicides	High	High	No Effect	No Effect	No Effect	No Effect
Use in-season cultivation to minimize herbicide use	Low	Medium	No Effect	Negative	No Effect	Negative
Band herbicides, nitrogen, or phosphorus prior to or at planting	High	High	High	Medium	High	No Effect
Band herbicides or nitrogen at cultivation or sidedress	N/A	High	N/A	N/A	Medium	N/A
Apply atrazine in fall for next year's row crop	N/A	High	No Effect	No Effect	No Effect	No Effect
Apply herbicide in early spring, prior to May 1	Medium	Medium	No Effect	No Effect	No Effect	No Effect
Use split applications of herbicide, e.g. 1/2 to 2/3 prior to May 1 and 1/2 to 1/3 at planting	Medium	Medium	No Effect	No Effect	No Effect	No Effect
Use reduced soil-applied herbicide application rates followed by a postemergence application	N/A	Medium	No Effect	No Effect	No Effect	No Effect
Crop rotations	Medium	Medium	Medium	Medium	Medium	Medium
Establish vegetative buffer strips	Medium	Medium	Medium	High	Medium	High
Do not spray / apply herbicides or nutrients near streams or near where runoff enters a stream	High	High	High	Medium	High	No Effect
Do not apply herbicide/phosphorus/or nitrogen to saturated or wet soil	Medium	Medium	Medium	Medium	Medium	No Effect

Best Management Practices for Cropland Pollutants

Best Management Practice	Potential to Reduce Pollutant Loss					
	Pesticides		Nutrients			Suspended Solids
	Alachlor	Atrazine	Soluble Phosphorus	Total Phosphorus	Nitrogen	
Retain and reuse application equipment rinse waters	Medium	Medium	Medium	No Effect	Medium	No Effect
Read and follow herbicide label directions	Low to High	Low to High	No Effect	No Effect	No Effect	No Effect
Use weed scouting / integrated pest management	Low	Low to High	No Effect	No Effect	No Effect	No Effect
Use nonchemical cultural weed control methods to minimize herbicide use	Low to High	Low to High	No Effect	No Effect	No Effect	No Effect
Avoid overspray and drift, back siphoning, and do not mix, load, or clean equipment near wells and water bodies	Medium to High	Medium to High	Medium to High	Low	Medium to High	No Effect
Conservation tillage farming	Low to Medium	Low to Medium	Low to Medium	High	Low to Medium	High
No-tillage farming	Low to Negative	Low to Negative	Low to Negative	High	Low to Negative	High
Contour farming	Medium	Medium	Medium	High	Medium	High
Contour strip farming	Medium	Medium	Medium	High	Medium	High
Terraces with tile outlets	Low	Low	Low	Medium	Low	Medium
Terraces with grass waterways	Low to Medium	Low to Medium	Low to Medium	Medium	Low to Medium	Medium
Use lowest soil-applied herbicide rate necessary to control weeds	Low	Low	No Effect	No Effect	No Effect	No Effect
Soil sampling and testing	No Effect	No Effect	High	High	High	No Effect
Use optimum phosphorus / nitrogen fertilizer rate	No Effect	No Effect	High	High	High	No Effect
Spill response plan for pesticides and fertilizers	High	High	High	High	High	No Effect

Daniel L. Devlin
Extension Specialist and Coordinator
Environmental Quality

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

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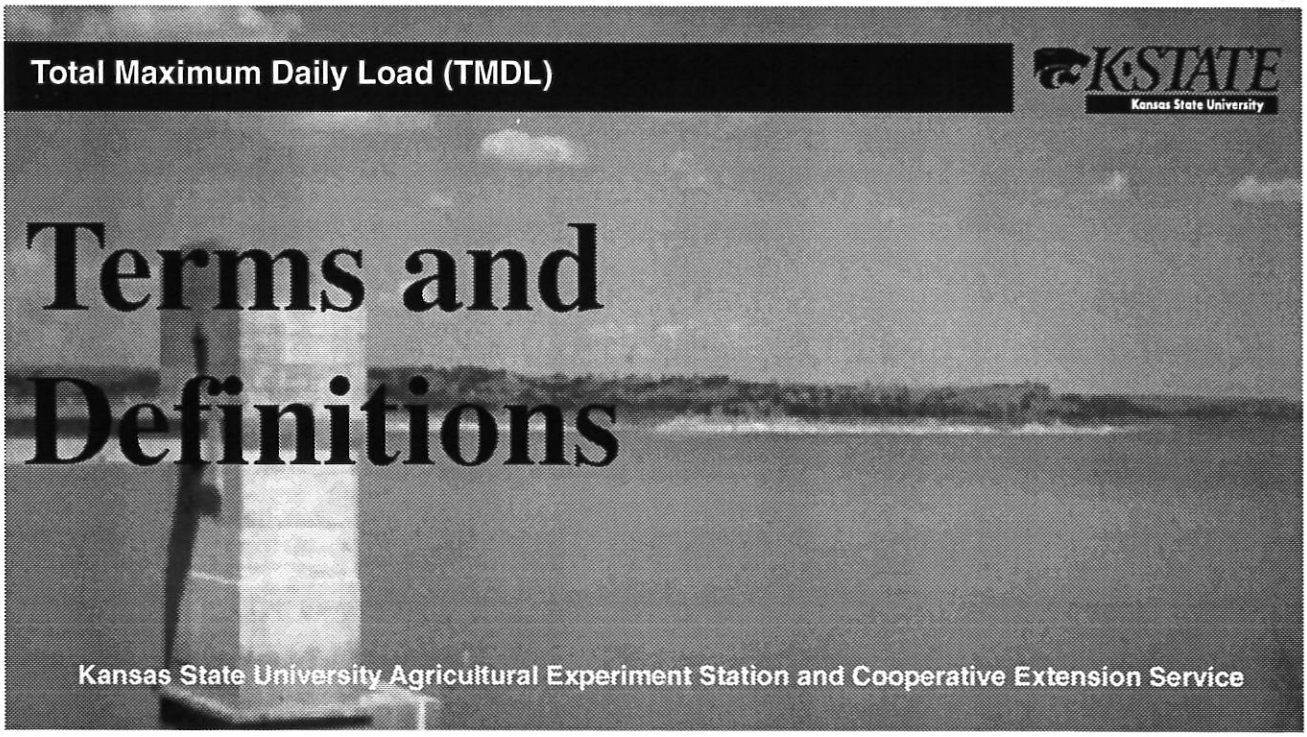


Atrazine - A herbicide widely used to control broadleaf and grass weeds in corn and grain sorghum. It is the most commonly used herbicide in the United States.

Best Management Practices (BMPs) -Management practices used to reduce the amount of a pollutant generated or delivered from human activities to water resources.

Bioremediation - The process by which living organisms act to decompose or transform hazardous contaminants into nonhazardous forms. Examples include filter strips and wetlands.

Buffer Strip - A type of vegetative filter strip that can help prevent potential pollutants from getting into surface waters, such as streams and rivers. Types of buffers include grassed waterways, contour grass strips, field borders, field windbreaks, shelterbelts, and riparian (streamside) buffers.

Clean Water Act - Act established by Congress in 1972 with the objective of restoring and maintaining the nation's waters. Under the act, states are required to develop and implement water quality standards, including TMDLs. For more information, see *http://es.epa.gov/oeca/ag/lcwa.html*.

Cost sharing - Financial aid, often from federal, state, or local government sources, to assist landowners implementing best management practices.

Designated Use - Refers to how a body of water is being used. Designated uses include drinkable, swimmable, and fishable.

Drinkable - The highest classification of water quality.

Fecal coliform - Bacteria living in the digestive tract of warm-blooded animals that are excreted in solid wastes. Fecal coliform is an indicator of fecal contamination in water and the most common reason for impaired waters in Kansas.

Fishable - The third highest classification of water quality.

Impaired streams - Streams that do not fully meet the water quality standards for their designated use established by the Kansas Department of Health and Environment. 1,692 streams in Kansas are classified as impaired.

Maximum Containment Levels (MCLs) - Legally enforceable public drinking water standards. MCLs as set by EPA establish the maximum permissable concentration of contaminants in public water supplies.

Non-point source pollution - Pollution that originates from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, depositing them into water bodies.

Point source pollution - Pollution that originates from a well-defined source. Examples include large feedlots, industry, or municipal waste water discharges.

Riparian - Vegetated areas next to water resources that protect them from non-point source pollution and provide bank stabilization and aquatic and wildlife habitat.

Swimmable - The second highest classification of water quality.

Total Maximum Daily Load (TMDL) - The maximum amount of pollution a surface water body can receive without violating water quality standards.

Vegetative filter strip - An area along a ditch, gully, stream, pond, lake, or sink hole that is covered by vegetation such as grass, hay, or timber. The vegetation reduces or removes sediments, chemicals, nutrients, and organic materials carried in runoff.

Watershed - The land area that drains into a body of water by surface or subsurface flow. Kansas has 12 major watersheds: Kansas-Lower Republican, Upper Arkansas, Lower Arkansas, Cimmaron, Upper Republican, Neosho, Missouri, Marais des Cygnes, Smoky Hill - Saline, Solomon, Walnut, and Verdigris. These are composed of smaller watersheds and subwatersheds.

Fecal Coliform in Kansas Surface Waters

Charles W. Rice
Department of Agronomy, Kansas State University, Manhattan, KS 66506-5501
Phone 785-532-7217, Fax: 785-532-6094 E-mail: cwrice@ksu.edu

Bacteria contamination is one of the primary or secondary contaminants in the majority of the twelve major river basins in Kansas. Microbial contamination of water resources results in impaired use due to the increased risks to humans and the degradation of recreational and drinking water quality. Fecal Coliform (FC) limits in surface water vary depending on the intended use. For recreational primary contact, e.g. swimming, the maximal allowable standard for FCs is 200 colony forming units (CFU)/100 mL water. For secondary contact, e.g. fishing, the standard is 2000 CFU/100 mL water. For finished drinking water the standard for fecal coliforms (FC) is <1CFU/100 mL. Sources of coliform bacteria include runoff from animal feedlots, livestock grazing lands, and urban areas; wildlife, and waste handling systems including septic and treatment plants.

In 1998, Kansas State University developed a study in collaboration with state agencies to 1) assess water quality at several locations to determine: a) level and pattern of bacterial contamination in Kansas waters; and b) bacteria from on-site waste systems; and 2) determine effectiveness of best management practices particularly vegetative filter strips for reducing bacteria in runoff.

Key results were:

- Areas with minimal human impact, i.e., wildlife areas, had low levels of fecal coliforms. Wetland areas decreased bacteria concentrations in the inflow.
- Ponds in grazing lands were consistently less than 200 CFU/100 mL
- Stream segments without significant livestock near streams and without community development did not have high levels of fecal bacteria.
- For on-site wastes systems
    - Failing systems that had surface discharge: fecal bacteria in the soil surface traveled less than 300 ft. away from the discharge point
    - Downward movement under leach fields in the Equis Bed area was minimal unless the system was overloaded in which bacteria and nitrate moved to at least 8 ft.
- Vegetated filter strips effectively reduce bacteria loading from feedlots. Only one runoff event out of 16 was fecal bacteria reduction less than 80%. Maintenance of the filter strip is extremely important.

We are currently collecting and storing bacteria from different fecal sources to build a database of techniques to determine source. We do not have sufficient information at this time to recommend which technique is best or identify sources. We also are conducting research on fecal bacteria survival in soil and sediments.

House Environment
1-30-01
Attachment 5

K-STATE Kansas State University

Bacterial Contamination

Of Surface Waters In Kansas

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

Water is important to the citizens of Kansas. All of us depend on water for drinking, agriculture, industry, recreational, and household use. In addition, wildlife and aquatic life depend on quality surface water for their existence.

Concerns exist in Kansas about the quality of our surface water. The most common health-threatening contamination of Kansas surface waters is bacterial contamination. Monitoring of surface water in 1994 by the Kansas Department of Health and Environment (KDHE) found that 75 percent of Kansas streams and 7 percent of lakes were impaired by bacterial contamination. Bacteria are considered to be an impairment of primary and secondary water uses in most river basins in Kansas. Because of the threat to human health and widespread surface water contamination, concern and awareness of bacterial contamination of surface water in Kansas are increasing.

Understanding Bacterial Contamination

Surface water often contains a variety of pathogens including viruses, fungi, protozoans, and bacteria. Human health risks generally occur when there is fecal contamination from human sources. However, certain pathogens deriving from animal sources, such as domestic livestock, pets, and wildlife, can be human health threats. Some common waterborne diseases include typhoid, hepatitis, dysentery, giardiasis, and cryptosporidiosis. Bacteria represent the largest number of organisms present in surface water, are easily grown under laboratory conditions, and have been the most closely scrutinized. For that reason, fecal coliform bacteria (FCB) levels in surface water are monitored and used as indicators of other fecal contamination and for risk of disease associated with drinking, swimming, or other uses of the water. It is assumed that if FCB levels in water are high, there is a high probability that there are other fecal pathogens present.

FCB are associated with fecal material, but similar organisms may be found naturally in soil, the surface of leaves, and water. Bacterial levels in water vary widely depending upon the time of the year, rainfall, environmental conditions, and distance from the source of contamination. Typically, bacterial levels in water decrease with distance from the source of contamination. FCB are always present in the digestive tracts of warm-blooded animals and are found in their wastes. Fecal bacteria require a food source and warm, moist conditions for survival and once in the water and the environment, begin to die. Therefore, FCB presence in surface water is considered an indication of a nearby source of contamination.

Kansas Water Quality Standards for Bacterial Contamination

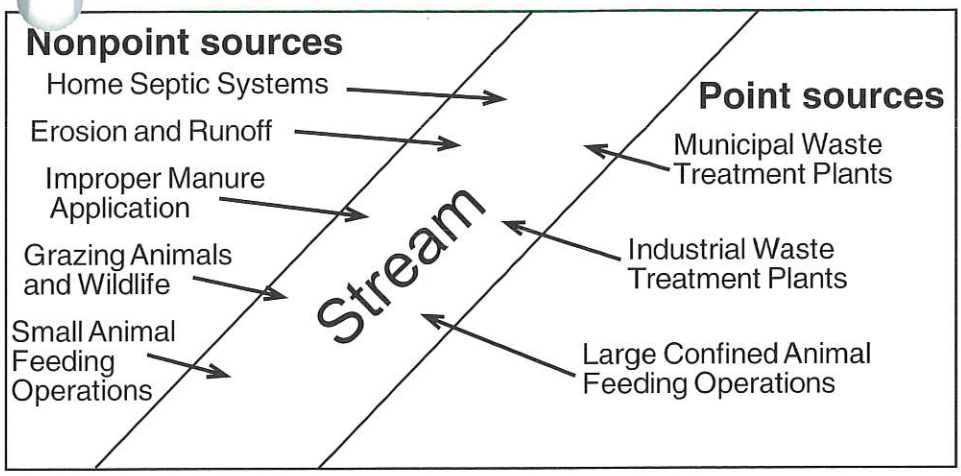
KDHE has responsibility for water quality monitoring of surface waters of Kansas for environmental pollutants, including FCB. Surface water samples are systematically collected and tested to determine if the water meets the water standards for FCB contamination.

Allowable levels of FCB in surface water depend upon the intended use of the water. The allowable limit for finished drinking water for FCB is less than one colony forming unit (CFU) per 100 mL of water. Since Kansas surface water may be impaired by FCB, surface water used for drinking purposes must undergo considerable treatment before use.

Allowable FCB levels for recreation vary depending upon the type of recreational use. The standards are based on a geometric mean of five separate daily samples. For primary recreational contact use, the allowable standard for FCB is 200 CFU/100 mL of water. Primary contact would include swimming and other recreational uses in which it is likely that water would be ingested by humans. For secondary recreational contact, e.g., boating and fishing, the standard is 2,000 CFU/100 mL of water.

Sources of Bacterial Contamination

Most surface waters in Kansas contain FCB. Most FCB enter streams and rivers through direct deposition of wastes into water, or runoff of wastes from areas with high concentrations of domestic livestock, wildlife, or human wastes. Potential sources of FCB include feedlots, grazing lands, septic systems, municipal wastewater treatment plants, and sewer overflows. Wildlife is thought to be less a contributing source of FCB than are domestic livestock or humans.



Sources of bacterial contamination

Since the passage of the Federal Clean Water Act in 1972, significant improvements have been made to municipal and industrial wastewater treatment plants. In addition, large confined livestock operations were required to eliminate the off-site movement of their livestock wastes. This has resulted in reduced levels of FCB in Kansas surface water. The reduction in these point sources of FCB has resulted in greater emphasis being placed on nonpoint sources of FCB contamination. Nonpoint sources of FCB contamination include runoff from small livestock feeding operations, pastures, and failing septic systems. Typically, individual nonpoint sources of pollution are more difficult to identify and regulate. In addition, there may be thousands of individual nonpoint sources in a watershed, each contributing only a small amount to the problem. The accumulative effect can impair water resources.

Controlling Bacterial Contamination

Reductions of FCB levels in surface water can be accomplished through proper waste collection, treatment, disposal, and land management. Practices that reduce bacterial survival and introduction into surface waters are most effective. In municipal treatment plants, chemical or ultraviolet treatment kill pathogens in the waste water. Bacteria can be reduced by urban storm water management systems that reduce runoff rates and volumes and allow for filtering by vegetative buffer areas. With septic systems, proper site selection and management uses the soil to filter out bacteria and eliminate it. With livestock feeding operations, it may be necessary to construct livestock waste containment structures and develop management plans for land application of wastes. Reducing bacterial contamination from grazing lands may be accomplished by improved grazing management and, in certain situations, by limiting livestock access to streams.

With livestock feeding operations, it may be necessary to construct livestock waste containment structures and develop management plans for land application of wastes.

Health Hazards

What are the health hazards associated with bacterial contamination of streams and lakes? Will high FCB levels in surface water mean that we should not swim, fish, or use the water as a source of drinking water? These are difficult questions to answer. The source of contamination is just as important as the level of contamination. If the source of the water contamination is human, there is a much higher likelihood of illness. Most illnesses are caused by pathogens that are species specific. There is a much lower chance of human illnesses being caused by a disease that affects swine. Therefore, if high FCB levels in water are derived primarily from domestic livestock or wildlife, there is less risk to humans of swimming in the water than if the FCB is derived from a human source.

Surface water FCB monitoring and testing results indicate the level of contamination by fecal wastes of all warm-blooded animals, not just humans. New methods are being developed to identify the animal source of a FCB sample. The bacteria may get in the water from runoff containing the wastes of livestock, wildlife, or pets. In addition, some coliform bacteria live naturally in soil or water.

Daniel L. Devlin
Extension Specialist and Coordinator
Environmental Quality

Charles Rice
Department of Agronomy

George Marchin
Division of Biology

Kevin Anderson
Department of Agronomy

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

MF-2460 August 2000

K-STATE RESEARCH AND EXTENSION'S PROGRAMS AIMED AT MEETING WATER QUALITY STANDARDS IN KS

TESTIMONY PRESENTED TO HOUSE ENVIRONMENT AND SENATE NATURAL RESOURCES COMMITTEES JANUARY 30 AND FEBRUARY 9, 2001

W.L. HARGROVE, DIRECTOR, KCARE

A voluntary compliance approach to meeting TMDLs is being utilized in Kansas by the Governor's Water Quality Initiative and KDHE. Fundamental to the success of a voluntary compliance approach in agriculture are several key steps:

- *producers are aware of and understand water quality issues related to their operation*
- *producers have management options (based on scientific information and evaluation) for changing practices to address issues and enhance water quality*
- *producers have access to technical and financial assistance to implement practices*

K-State Research and Extension plays a key educational role in making producers aware of water quality issues, evaluating and identifying management options for improving water quality, educating citizens about best management practice options, and identifying sources of technical and financial assistance. We wish to highlight some of the new initiatives and ongoing programs of K-State Research and Extension that are aimed at helping citizens meet TMDLs in KS under a voluntary compliance approach. These programs are carried out in collaboration with state and federal agencies, agricultural producer groups, and other private organizations.

Watershed Specialists

This new initiative is the "centerpiece" of our program aimed at providing educational assistance to agricultural producers and meeting TMDLs on a voluntary basis. The program was initiated in November, 2000 and is funded primarily by an EPA 319 grant with additional support from the State Conservation Commission, the KS Department of Agriculture, and K-State Research and Extension. It provides support to six Watershed Specialists (five extension agents and one NRCS conservationist), assigned to high priority TMDL watersheds, and dedicated to working one on one with producers to identify problems and management options to address issues that will lead to improved water quality. Watershed Specialists have been hired for the Upper Big Blue River, the Upper Delaware River, the Lower Kansas River, the Lower Arkansas River, the Cheney Reservoir watershed, and the Upper Arkansas between Garden City and Dodge City. The Cheney Reservoir Watershed Specialist is a joint program with USDA/NRCS.

Statewide TMDL Communications Plan

Additionally, we have developed a statewide TMDL communications plan. The goal of the communications plan is to **provide objective, science-based information, that will inform citizens on: 1) what are TMDLs; 2) their responsibility in meeting TMDLs; and 3) how to improve water quality and help them meet TMDL requirements on a local and voluntary basis.** Target audiences include our own county level extension staff, agricultural producers and

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commodity groups, media, urban residents, and decision makers. Current and planned actions include disseminating fact sheets and background information, supporting the work of the watershed specialists, news releases on TMDLs for local newspapers, hosting a media day, sharing success stories, and hosting a tour for decision-makers.

Integrated Agricultural Management Systems: Evaluating BMPs for Water Quality

This is an ongoing program, started three years ago, and funded primarily by the KS Corn Commission, KS Grain Sorghum Commission, KS Soybean Commission, KS Wheat Commission, KS Fertilizer Research Fund, and K-State Research and Extension. The goal is to develop, evaluate, and disseminate to producers, cost-effective management options that will protect water quality. A network of six experimental sites has been established around the state in the Kansas River Basin, the Marais des Cygnes Basin, the Neosho Basin, and the Lower Ark Basin. Sites are designed to capture runoff from field size areas with various combinations of BMPs and monitor water quality as impacted by the BMPs. Funding from the commodity commissions is scheduled to end next year.

State and Federally Funded Programs

A listing of other projects funded by grants from federal and state sources follows.

State Contracts

- BMPs for Reducing Fecal Coliform Contamination of Streams - Dr. Chuck Rice; funded by State Conservation Commission, Department of Agriculture, and KS Water Office
- Ecological Livestock Pollution Control Project - Dr. Kyle Mankin; funded by KDHE from State Water Plan funds
- Demonstration of Sediment Load Reduction on a Watershed Scale - Dr. Richard Nelson; funded by KDHE from State Water Plan funds

Federal Grants

EPA 319

- Dairy Environmental Cooperative - Dr. Joe Harner
- Grazing Land Water Quality Project - Dr. Paul Ohlenbush
- Kansas Environmental Leadership Program - Dr. Morgan Powell
- KS Urban Water Quality Restoration and Protection Planning - Dr. John Leatherman
- Farmer Water Quality Monitoring to Achieve TMDL Goals - Dr. Rhonda Janke
- Reducing Atrazine Runoff in the Blue River and Delaware River Basins - Dr. Dan Devlin
- Lime Application to Reduce P Loading in Cheney Watershed - Dr. John Schmidt
- Water Quality Improvement of Vegetated Riparian Areas - Dr. Charlie Barden
- Waste Management Water Quality Protection Learning Center - Dr. Bill Hargrove

USDA

- BMPs in the Blue River - Dr. Chuck Rice
- River Friendly Farm Training - Dr. Bill Hargrove

US Forest Service

- Green Topeka: Tree-Based Buffer Planning - Dr. Bill Hargrove

USGS

- Phosphorus in Surface Runoff: Evaluation of BMPs - Dr. Gary Pierzynski

Watershed Specialist Summary

K-State Research and Extension is boosting its water quality initiative with the appointment of five new watershed specialists. These specialists will provide watershed management expertise and develop watershed educational program activities in multi-county areas. The specialists, who are currently undergoing training and assessing the needs of their assigned watersheds, are:

- **Mike Christian,** Upper Blue watershed specialist. Christian is located in the northeast area office and can be reached at 785-532-5833.
- **Ron Graber**, Lower Arkansas watershed specialist. Graber is located in the south central area office and can be reached at 316-663-5491.
- **Doug Musick**, Lower Kansas watershed specialist. Musick is located Douglas County and can be reached at 785-843-8058.
- **Milton Krainbill**, Upper Delaware watershed specialist. Krainbill is located in the Jackson County office and can be reached at 785-364-4125.
- **Bob Frisbee**, Upper Arkansas watershed specialist. Frisbee is located in Edwards County and can be reached at 316-659-2149.

As watershed specialists, the five will provide management expertise and develop educational program activities in multi-county areas. They will be working with landowners and farmers within the watersheds to develop action plans, based on the concerns within the watersheds. The specialists will strive to improve water quality through educational programs, including on-farm demonstrations, workshops, seminars and other teaching methods.

The watershed specialists will work with K-State Research and Extension agents, specialists and researchers – as well as industry representatives and other water quality experts – to develop and implement action plans to improve water quality throughout the state. This initiative is one of many that illustrates K-State Research and Extension's dedication to improving water quality in Kansas.

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Addressing Environmental Concerns in Dairy Production

J.P. Harner, D. Key, J.P. Murphy and T.D. Strahm[1]

Goals and Mission

Preliminary evaluation of the Black Vermillion watershed indicated 37 dairies were located within the 216 square mile watershed. These dairies ranged in herd size from 30 to 150 cows. Many of the dairies had small lagoons for complying with regulations to control milk parlor discharges. However, manure deposited on open lots or in loafing areas was generally uncontrolled during rainfall events. A portion of these nutrients left the dairies in runoff during rainfall events. Sediment entered surface water from uncontrolled flow of earthen loafing areas. Current facilities often did not provide adequate housing for the existing herd much less any future expansion. Therefore, future herd size was considered in addressing the environmental issues.

The dairy environmental cooperative mission is to control manure and effluent nutrients leaving a farmstead and to effectively manage controlled nutrients with cropping practices. The overall objective of the project is to reduce the runoff of nutrients, fecal coliform and sediment from dairies in the Black Vermillion and adjacent watersheds. The specific objectives are:

Develop and install demonstration systems for storage of dairy manure and effluent leading reduction of nutrients, fecal coliform and sediment in runoff.

Develop and deliver educational programs to dairy farmers to assist them in implementing best management practices for on-farm utilization of stored nutrients in lagoons or solids storage basins.

Develop local dairy environmental cooperatives to assist dairy farmers in designing and installing waste management systems and in understanding the management of the system.

Background of Dairies

Many of the dairies in the watershed were certified under the Kansas regulations that were effective from 1976 to 1996. These dairies do not exceed the 300 animal units (210 milk cows) in confinement for mandatory registration with current guidelines. However, control of the dairy milk parlor water results in most dairies having to address regulatory issues irrespective of size. In addition, many dairies were considered a potential pollution problem due their inability to handle manure, in particular scraped manure from loafing areas and concrete lots, during wet weather. Manure was often applied to wet or frozen ground in an effort to minimize potential animal health problems or because of a lack of adequate storage facilities. Figure 1 shows a flow diagram of locations on a dairy where a dairy cow may be located.

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1 Joseph P. Harner, Professor/Extension Agricultural Engineer, Biological & Agricultural Engineering, David V. Key, Nemaha County Extension Agent, James P. Murphy, Professor, Extension State Leader, Biological & Agricultural Engineering, Trent D. Strahm, Extension Assistant, Biological & Agricultural Engineering, Kansas State University

Another change during the past decade was a switch from organic bedding such as straw to inorganic bedding such as sand. Sand bedding improves health and milk quality by reducing mastitis and somatic cell counts, respectively. However, moisture from the manure is not retained or absorbed in the sand when compared to "biomass" types of freestall bedding. Therefore, the consistency of sand bedded manure is similar to a slurry when wet and cannot be stack on concrete areas like manure containing straw, paper or wood shavings. Areas designed for handling stacked manure did not work when the dairy producers switched to sand. Sand bedding decreases the life of equipment due to abrasion during handling but improvements in herd health offset this disadvantage.

One-on-one meetings with the dairies found they were generally more concerned with the storage, handling and runoff of the solid portion of manure. Environmental regulations tend to focus on controlling the runoff from the manure stack and confinement areas and milk parlor wash water. KSU/CES began working with several Nemaha County dairy producers in 1993 to develop waste management plans to meet environmental regulations and structures to store sand laden manure.

Procedures

A system's approach including expansion, potential new facilities, and storage and management of the manure scraped from freestalls was considered when working with the dairies. All of the dairies increased their animal units or cow numbers during the permitting process. The average increase in size was 20 percent. The waste management systems were designed to provide 120 days storage. The increased volume allowed the dairies more time to manage their cows, 3 to 4 concentrated periods per year to haul manure and the opportunity to expand further without having to change their manure handling structures.

Previous experience with the dairymen, who installed structures, indicated there was an educational opportunity to help producers understand how to manage the manure handling system and obtain maximum benefit from the nutrients. The manure management phase of the dairy was previously not considered as a part of the system. In the watershed, there was open cropland during the fall, spring and summer or about every 120 days. This enabled the dairies to empty basins prior to spring rains, after wheat harvest and prior to ground freezing during the winter. Also, the basins could be emptied immediately prior to tillage operations to minimize nitrogen losses to the atmosphere.

Manure and effluent samples from the storage basin and lagoon are being analyzed for available nutrients. These results along with field soil testing will be utilized to determine optimum manure and effluent application rates and commercial fertilizer needs for crop use. Educational meetings with the producers will be used to share information on managing the system.

Accomplishments

The Dairy Environmental Cooperative (DEC) has been successful overall. Dairies in adjacent watersheds are currently seeking cost share support. Producers who have cooperated are willing to share their ideas with other producers.

The current projections indicate over 2,000 cows will be impacted since the program has expanded to dairies beyond the Black Vermillion watershed. Cow numbers based on proposed expansion will be over 3,000. The estimated annual loads brought under control include 2,100,000 lbs of BOD, 526,000 lbs of nitrogen and 126,000 lbs of phosphorus. Table 1 shows a summary of the dairies completing waste management plans and participated in the DEC program.

Cost Share Money

Guidelines were based on installation of a concrete storage basin and earthen lagoon. The present estimated cost per completed system is $275 to $450 per cow. Cost share provides up to 65 percent of the estimated cost with a maximum of $21,000 per dairy. This compared to other programs providing 70 percent cost share with a $10,000 limit. The program will also supplement other cost share programs up to $21,000. Other programs receiving assistance include EQIP, NPS, and NRCS monies. Currently, the concrete basins cost $200 to $250 per cow based on 120 days storage. The earthwork for controlling the effluent and runoff from the dairy is site dependent.

Summary

An environmental cooperative was established to address controlling manure and effluent nutrients leaving a farmstead and to effectively manage controlled nutrients with cropping practices. Dairies sought CES in evaluating their facilities as a production system rather than just addressing environmental issues. Production systems include evaluating potential future expansions and potential changes in housing as well as environmental issues. Working with CES also offered the dairies the opportunity to consider runoff control structures other than just lagoons such as vegetative filters and wetlands. Systems installed to address environmental concerns have resulted in reducing the runoff of nutrients, fecal coliform and sediment from dairies in the Black Vermillion and adjacent watersheds. Most of the dairies involved in the cooperative increased the number of lactating cows once the systems were constructed.

Figure 1. Flow diagram of where cows may deposit manure on at a dairy.

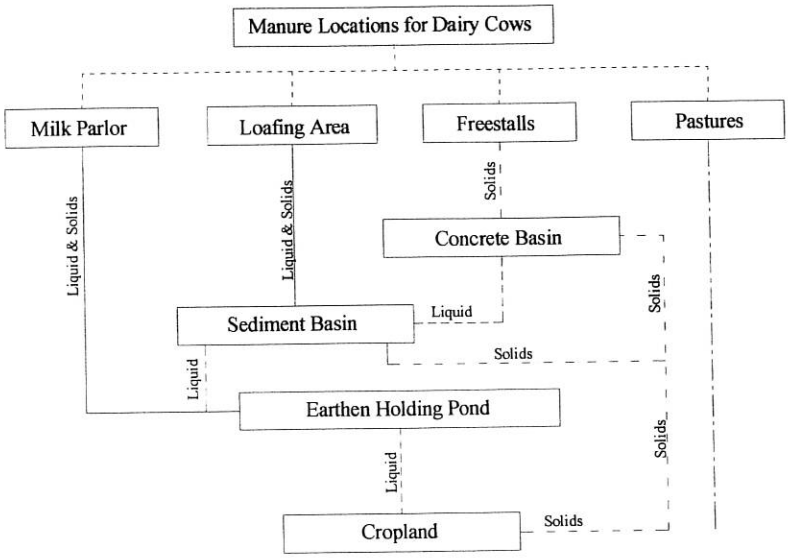

Table 1. Listing of dairies participating in the Dairy Environmental Cooperative with completed projects by December 31, 2000 along with an estimated of daily nutrient loads from each dairy.

Dairy ID	Watershed	CO	Milking Cows head	Animal Units	Percent Control	Additional A.U.	BOD lb/dy	Nitrogen Lb/dy	Phosphate lb/dy
1	Nemaha	NM	120	168	0	168	336	84	20
2	Black Vermillion	NM	80	112	0	112	224	56	13
3	Black Vermillion	MA	120	168	20	134	268.8	67	16
4	Black Vermillion	NM	60	84	20	67	134.4	34	8
5	Black Vermillion	NM	100	140	0	140	280	70	17
6	Mardia Cynes	AN	200	280	0	280	560	140	34
7	Black Vermillion	NM	80	112	20	90	179.2	45	11
8	Nemaha	NM	80	112	0	112	224	56	13
9	Black Vermillion	NM	60	84	0	84	168	42	10
10	Black Vermillion	NM	120	168	0	168	336	84	20
11	Nemaha	NM	300	420	75	105	210	53	13
12	Nemaha	NM	60	84	0	84	168	42	10
13	Black Vermillion	NM	160	224	0	224	448	112	27
14	Marion	MN	120	168	10	151	302.4	76	18
15	Nemaha	NM	150	210	0	210	420	105	25
16	Nemaha	NM	150	210	75	53	105	26	6
17	Nemaha	NM	200	280	75	70	140	35	8
			500	700	10	630	1260	315	76
	Totals		2,660	3,724		2,882	5,764	1,441	346
	Goals		1,000	1400		1,400	2,800	700	168
	Percent of 1,000 Cow Goal		266%	266%		206%	206%	206%	206%
	Totals in lbs/year						2,103,787	525947	126227
	Black Vermillion Watershed		620	868		795.2	1590.4	397.6	95.424
	Percent of 1,000 Cow Goal		62%	62%		57%	57%	57%	57%

News and Features

K-STATE Kansas State University

From Kansas State University's Agricultural Experiment Station and Cooperative Extension Service

K-State Research and Extension
Department of Communications
News, 113 Umberger Hall
Manhattan, KS 66506-3402
785-532-5806 Fax: 785-532-6458
http://www.oznet.ksu.edu/news

Released: Jan. 30, 2001

New Approach to Manure Management
Benefits Marshall, Nemaha County Dairies

MANHATTAN, Kan. – In the dairy business, manure management is an everyday fact of life. But, because manure can affect nearby water supplies and invoke environmental restrictions, it's also an on-going worry.

For small-and medium-size dairies, in particular, that management can threaten their bottom line, as well as limit the ability to expand and take advantage of scale economies.

Ten Marshall and Nemaha county dairies agreed to try a new approach to the problem in 1997. They enrolled in a unique K-State ag engineering program called the Dairy Environment Cooperative. The DEC combined in-field education and research with US Environmental Protection Agency (EPA) cost-sharing funds for constructing modern manure management systems.

The systems included storage structures that allowed the producers to concentrate periods of field application; make fewer trips into the field; make better use of manure's soil nutrients; and time applications for when seasonal cycles limited runoff. They also allowed producers to improve returns by milking more cows.

Marshall County Extension agent Mike Vogt not only helped with the program but also analyzed its economic impacts, as part of his advanced degree study.

He found that previous research had undervalued manure for its soil-improving qualities — particularly when it can be stored as a semi-solid or liquid and then applied to crop fields through irrigation stems. In turn, he found the dairies had improved their bottom line.

They'd even surpassed their projected returns for expanding without the new system. Each cost-sharing dollar had brought $2.86 in environment-improving benefits for the participating dairy operations. Funds for this project have been provided by EPA through the Kansas Department of Health and Environment.

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Story by:
Kathleen Ward, Communications Specialist
kward@oznet.ksu.edu
K-State Research and Extension

For more information:
Michael Vogt is at 785-562-3531

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Vegetative Filter Strip Systems for Animal Feeding Operations

K-STATE Kansas State University Research and Extension

Introduction

Vegetative filter strips, in conjunction with sediment basins, are recognized by the Kansas Department of Health and Environment (KDHE) as an effective system for controlling and reducing nutrient runoff into surface water from confined feeding operations. Only feeding operations with fewer than 1,000 animal units can utilize this type of waste management system. Also, the use of a "discharging" filter system may not be a viable option in a watershed where water quality in the receiving water body is impaired by nutrients or fecal coliform bacteria. In these cases, total retention may be the only alternative.

The Environmental Protection Agency (EPA) Nonpoint Discharge (NPDES) permits apply to operations of more than 1,000 animal units. Table 1 shows the number of head per 1,000 animal units for different types of livestock.

A vegetative filter strip system is a designed, constructed, and maintained area of vegetation that receives runoff during a rainfall event from a confined animal feeding operation. Milk parlor wash water cannot be discharged onto a vegetative filter strip. The filter strip system is a simple method of reducing pollutants. Its purpose is to prevent the pollutants associated with livestock waste from leaving the producer's property. This type of animal waste treatment system has been shown to reduce the amount of ammonia, total nitrogen, total solids, COD, phosphorus, and potassium in effluent runoff by as much as 96 percent.

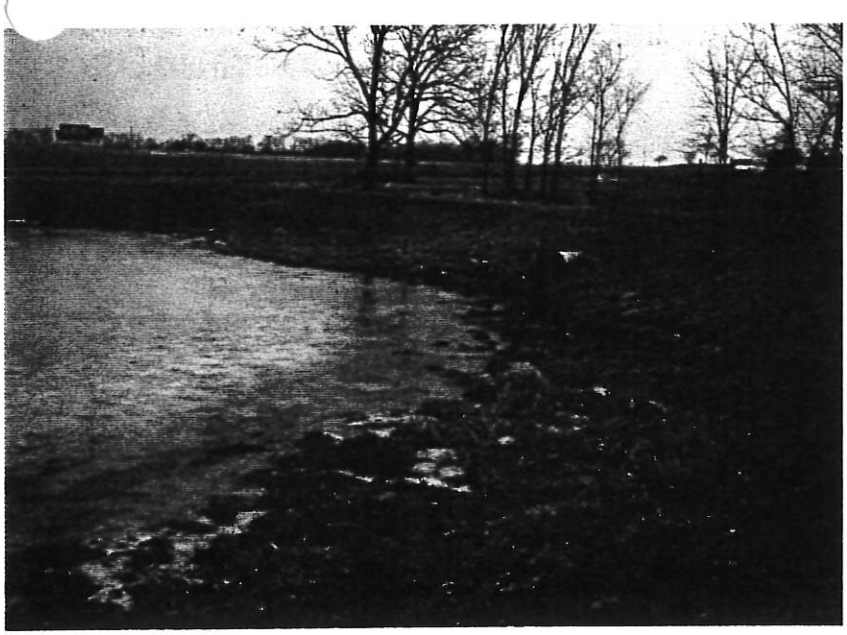
Uniform, level slope across a filter strip.

In cropland, a vegetative buffer strip should be an area greater than 50 feet wide around the edge of the field. A vegetative filter for animal feeding operations is designed differently. In this situation, a filter strip often requires an area of land equal to or greater than the drainage area. The livestock production area should be located at least 400 feet from streams or property lines before a vegetative filter can be considered.

The purpose of this publication is to help producers determine if a vegetative filter system might be an acceptable alternative waste treatment method for their confined feeding areas. KDHE has final approval for any vegetative filters designed to

Table 1. Number of Head Per 1,000 Animal Units

Livestock	1,000 Animal Units
Beef < 700 lbs	2,000 Head
Beef > 700 lbs	1,000 Head
Dairy	700 Head
Swine < 55 lbs	10,000 Head
Swine > 55 lbs	2,500 Head
Sheep	10,000 Head



Water being held in sediment basin prior to release.

reduce nutrient runoff from a confined feeding area.

Design Considerations

A vegetative filter strip system consists of three distinct parts: a sediment basin, a flow distribution device, and the filter strip area. Many different designs are possible.

Sediment Basin

Runoff from confined feeding operations typically contains solid material such as manure, feed, or debris, which may settle out. Vegetative filters are not designed to receive large volumes of such solids. To prevent these solids from directly entering the vegetative filter strip area, feedlot runoff must first be retained in a settling basin for at least 30 minutes.

The size of a sediment basin depends on the total amount of acreage in the drainage area, including any extraneous drainage areas. For most of Kansas, capacity of the sediment basin should be 2 acre-inches per acre of drainage area. This capacity will achieve the 30-minute retention objective. As an example, a drainage area of 4 acres would require a sediment basin with a storage capacity of 8 acre-inches (0.67 acre-foot), or approximately 29,000 cubic feet.

Such a design will retain approximately 50 percent of the nutrients that leave the lot. The sediment basin should have a depth of 3 to 4 feet. This will enable it to dry out during the summer. The bottom of the basin should be at least 10 feet wide to allow room for cleaning equipment. A sediment basin could consist of a broadbased terrace with closed ends across the back of a set of pens.

Flow Distribution Device

The flow distribution device is a critical component of the filter strip system. Uniform application across the face of the filter helps distribute solids, nutrients, and flow. It also reduces channeling of flow. If channel flow occurs, treatment effectiveness is significantly reduced.

Vegetative Filter Strip Area

Preliminary considerations

The larger the drainage area contributing to the vegetative filter, the larger the filter area requirement. For this reason, all unnecessary runoff should be excluded from the system. Many livestock waste management systems fail because extraneous surface water is not diverted away from the system. Runoff from clean surface areas, such as roofs, driveways, the farmstead and land adjacent to the feedlot, and so forth, should be directed away from the feedlot, settling basin, and vegetative filter.

Size requirements

KDHE recognizes two methods for sizing the filter area for controlling the nutrient loads leaving a feedlot. The first is a mass balance method based on the amount of nitrogen excreted per animal. In some watersheds, phosphorus may be the limiting nutrient and the filter area must handle the P_2O_5 loads. Table 2 shows how much nitrogen is produced by various livestock enterprises. It is necessary to estimate how much of the N or P produced by an animal will enter the filter area.

out 75 percent of the N produced by an animal is lost in the pen and never leaves the area. Of the remaining N which leaves the pen, about 50 percent will settle out in a sediment basin, which provides a 30-minute retention time. Therefore, about 12.5 percent of the total N produced by an animal will enter the filter strip. For the preliminary design and estimation of the filter area requirements, assume that 10 percent of the total N produced will remain on the filter. An animal producing about a half-pound of N per day in waste will place about 1/20 pound of N per day into a vegetative filter. Based on the 10 percent factor, Table 2 shows an estimate of the annual N production that will be deposited in the vegetative filter strip. The values in Table 2 can be adjusted according to the number of days per year the facility is being used. The filter strip is sized according to the annual nutrient requirements of the vegetation.

The second method can be used with beef operations, and is based on rainfall events. This method assumes that 22 pounds of N per acre-inch of runoff per acre of drainage unit leaves a feedlot operating year-round (30 pounds of N for a backgrounding operation).

If cattle are not in the lots, the method assumes there is no N production. However, research indicates about 9 pounds of N per acre-inch of runoff leaves a lot when cattle are not present.

For preliminary design considerations, it can be assumed that 30 percent of the rainfall during the feeding period will run off. For example, assume a 3-acre backgrounding lot is located in an area that receives 9 inches of rainfall between October 1 and April 1. The expected runoff would be 2.7 acre-inches (9 inches × 30 percent) and the total runoff for the 3-acre lot would be 8.1 acre-inches. The expected

Table 2. Animal Capacity Per Year Per Acre of Vegetative Filter Strip

Kind and size of animal	Nitrogen produced per year (lbs)	Nitrogen available to filter strip (lbs)	Number of head per year per acre of filter strip*
Dairy			
150 lb	22	2.2	110
250 lb	37	3.7	67
500 lb	73	7.3	34
1,000 lb	186	18.6	13
1,400 lb	208	20.8	12
Beef			
500 lb	62	6.2	40
750 lb	95	9.5	26
1,000 lb	124	12.4	20
1,250 lb	157	15.7	16
Swine			
35 lb	25	2.5	100
65 lb	47	4.7	49
150 lb	110	11.0	21
200 lb	142	14.2	18
Sheep			
100 lb	33	3.3	76
Horse			
1,000 lb	96	9.6	20

* Based on using a cool-season grass, such as tall fescue.
Source: Midwest Plan Service MWPS-18 *Livestock Waste Handbook*

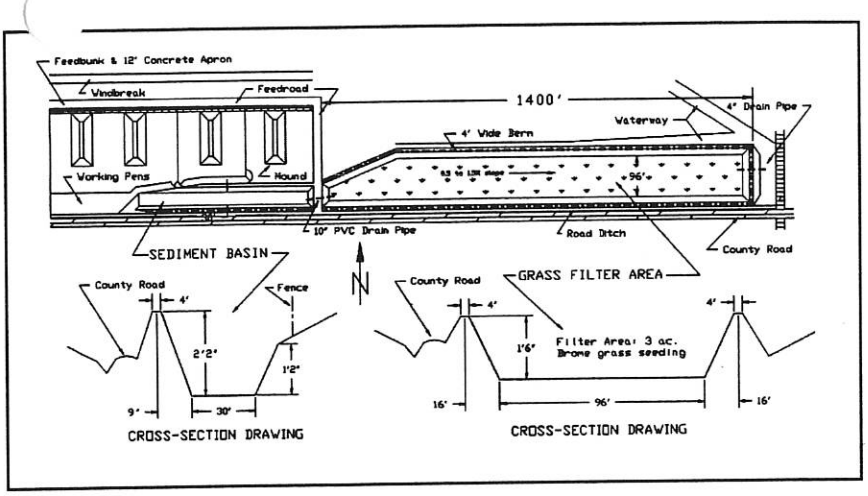


Figure 1. Engineer-designed grass filter strip that has been approved by KDHE.

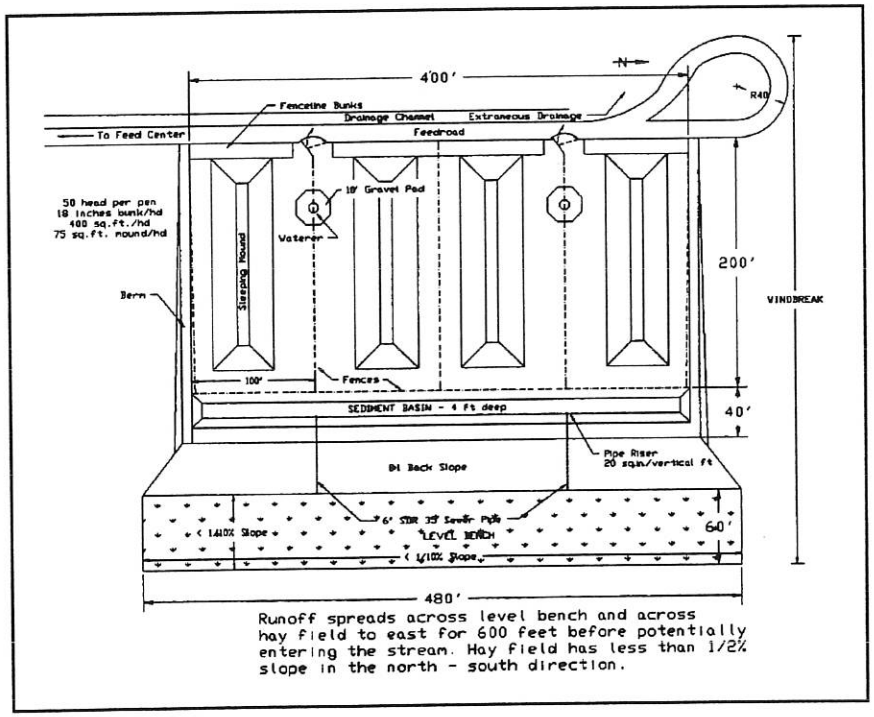


Figure 2. Modified vegetative filter area used with a 100-animal unit operation.

N leaving the lot would be 243 pounds (8.1 acre-inches of runoff × 30 pounds N per acre-inch of runoff). In environmentally sensitive areas, consideration also should be given to the N leaving the lots during non-usage. The grass filter area is then sized according to the N requirements of the grass.

The filter strip size must be large enough to retain the flow from the sediment basin for a minimum of 30 minutes. Many runoff events enter a vegetative filter and never reach the discharge end of the filter. During an intense storm, however, a discharge may occur from the filter.

Slope and length

To be effective in removing nutrients and other pollutants, runoff water and effluent must be evenly distributed over the vegetative filter strip. This requires a broad, gently sloping area for the filter strip. It is recommended that suitable grass filter sites have a uniform slope of between 0.5 and 4 percent.

Slopes of less than 0.5 percent create maintenance problems and may result in inadequate movement of runoff water. Slopes of more than 4 percent should not be used because of excessively high runoff velocities, reduced filter effectiveness, and possible erosion. Proper slope is often the factor that limits whether a filter strip system can be used for a livestock operation or whether some land grading will be required.

Existing guidelines suggest that vegetative filters be a minimum of 200 feet long per 1 percent slope. Therefore, if the slope is 2 percent, the filter strip must be at least 400 feet long before the water leaves the filter strip area. As a general site appraisal guideline, the filter strip area must be at least equal to the size of the drainage area.

To accomplish a uniform distribution of flow over the filter strip area, it is necessary to use perforated or gated pipe, overflowed ditches, sills, or other methods. The filter strip should be constructed with a uniform slope along the length and level across the slope to promote uniform depth and velocity of runoff. Differences across slope should be no more than 0.1 foot from a level line, and these differences should be random along the length of the filter. It is recommended that a berm be placed across the filter every 200 to 400 feet to redistribute the runoff.

E.. ..ples of vegetative filter strip systems are shown in Figures 1 through 3. Figure 1 shows an engineer-designed grass filter strips that has been approved by KDHE. The filter strip is approximately 5 acres in size and contains runoff from a 3-acre, 300-head backgrounding lot. This particular lot is limited to 120 days of utilization per year. The grass filter area is approximately 100 feet wide and a quarter-mile long and has a slope of about 1.2 percent throughout its length.

Figure 2 shows a modified vegetative filter area used with a 100-animal unit operation. The existing terrain was such that the field could naturally be surface irrigated. A level bench at the outlet was used to distribute the water across a 6-acre bromegrass field located between the pens and a nearby stream.

Figure 3 shows a filter strip with ridges. An easy way to create ridges is with ridge-till equipment or equipment used to create furrows for surface irrigation. Earth moving equipment cannot make ridges as uniformly.

Operation and Maintenance Considerations

Sediment Basin

The sediment basin must be properly maintained in order for the system to function adequately. Some of these guidelines are:

1. Remove solids from the settling basin when 2 to 4 inches accumulate. When the sediment basin dries, it should be scraped and cleaned. The nutrients should be applied to suitable crop land.
2. Scrape the feedlot regularly. However, do not scrape the waste into the settling basin. Place it in a separate area and utilize as soon as possible on suitable cropland or pasture.

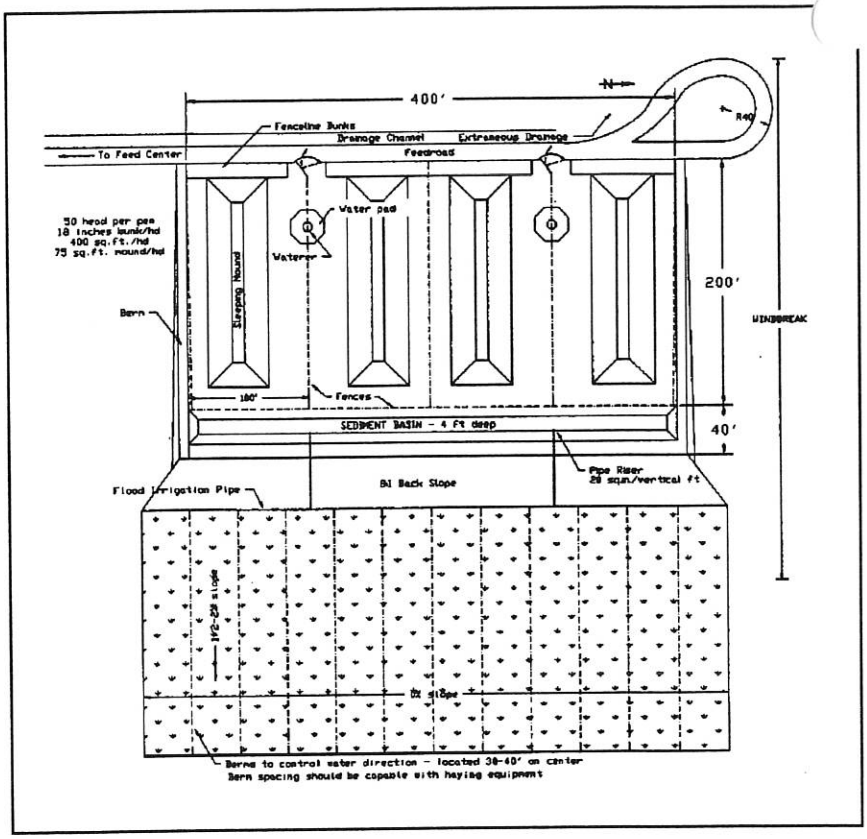


Figure 3. Filter strip with ridges.

Vegetative Filter Strip

The effectiveness of vegetative filter strips depends on:

1. selecting the most appropriate plant species;
2. proper establishment of the plant species; and,
3. maintenance of the vegetative filter strip following establishment.

Selecting the Most Appropriate Plant Species

The plant species used in vegetative filter strips should have dense crown and root development; rapid top growth to reduce the velocity of runoff water; a fibrous root system to reduce

Haying the filter strip.

Poor filter strip maintenance. Equipment was used on the filter strip when wet, which led to channelization.

erosion; and a perennial growth habit that will persist over a long period of time. The plant species selected should be adapted to the soil and climate of the area. Because the vegetation will need to be hayed to remove accumulated nutrients, the species selected should have good hay quality at the time of year the hay is harvested.

Grass species are more effective than broadleaf species for reducing erosion in the filter strip. Cool-season grasses are desirable since most of their growth is in the spring and fall when runoff across the filter strip is most likely to occur. In addition, cool-season grasses establish more rapidly and with less cost than warm-season grasses. Sod-forming grasses are more effective than are bunch grasses. Bunch grass should only be used in a mixture with other plant species. The [illegible]s used must be able to tolerate waterlogged soil during some parts of the year.

Table 3 provides characteristics of the various types of grasses that producers can use for vegetative filter strip systems in Kansas.

Proper Establishment of the Plant Species

Practices used for establishment of the plant species are similar to those recommended for pastures and waterways. Land grading and other required soil surface alterations must be finished before seeding the filter strip. Runoff should not be allowed to run across the filter strip until the plant species are established. Any channels or gullies that are formed prior to plant establishment will reduce the long-term effectiveness of the filter strip. Lime and other nutrients must be applied and incorporated into the seedbed before seeding as recommended by soil tests. If extensive land grading was required before establishing the vegetative filter strip, a more thorough soil testing program may be needed. Organic matter or micronutrients may need to be added, too. Check with your local county Extension agent for assistance with soil testing.

The filter strip can be seeded with or without a companion crop. A companion crop, such as wheat or spring oats, may be required for plant species that require longer

Table 3. Characteristics of Species for Vegetative Filter Strips in Kansas

Species	Seedling vigor	Drought tolerance	Wet soil persistence	Growth habit	Forage quality	N uptake	P uptake
Cool-season grasses							
Smooth bromegrass	High	Medium	Low	Sod-forming	High	High	High
Tall fescue	High	Medium	High	Bunch grass	Medium	High	High
Tall Wheatgrass	Medium	Medium	High	Bunch grass	Medium	High	High
Warm-season grasses							
Eastern gamagrass	High	Low	High	Bunchgrass	High	High	Medium
Switchgrass (Kanlow)	Medium	Medium	Medium	Sod-forming	Low	Medium	Medium
Big bluestem	Low	Medium	Low	Sod-forming	Medium	Medium	Medium
Indiangrass	Low	Low	Low	Sod-forming	Medium	Medium	Medium

es .shment periods or if weed infestations are a concern. Companion crops should also be used if the area is subject to wind or water erosion. Vegetation should be planted at optimum planting times on a firm seedbed. It may be necessary to mulch the filter strip following planting to prevent channel or gully formation.

Maintenance of the Vegetative Filter Strip Following Establishment

Maintenance of the vegetative filter strip is essential to the effectiveness of the filter strip. Proper maintenance requires several steps:

1. Periodic inspection of the vegetative filter strips for gully erosion. Gullies should be repaired as soon as possible.
2. Reseed areas of the filter where vegetation is thin or bare.
3. Mow at least two or three times per year and harvest residue to promote a dense vegetative stand and remove accumulated nutrients. Mowing frequency needs to be based on the kind of grass present. Mowing should be no closer than 6 inches.
4. Apply additional fertilizer as recommended by soil tests to establish a vigorous stand of vegetation.
5. Do not use vegetative filter strips as roadways. Roadways should only be located on the downslope side of the filter strip.
6. Keep livestock from the filter strips at all times and particularly during periods of wet weather.
7. Regrade and reseed vegetative filter strips that have accumulated enough sediment to alter flow through the filter strip area.
8. Control brush, trees, and noxious weeds.

Importance of Adequate Maintenance

Failure of the operator to maintain a vegetative filter strip system in good operational condition could result in a violation of environmental laws or other applicable regulations.

Vegetative filter strips are often damaged by grazing and harvesting under wet conditions. While it is necessary to harvest the vegetation periodically in order to remove accumulated nutrients, every effort should be made to avoid damaging the vegetation during the process. Good year-round vegetative stands are important to the success of a vegetative filter strip system.

Advantages and Disadvantages of a Vegetative Filter Strip System

The biggest advantage of a vegetative filter is that the producer does not have to worry about pumping out or maintaining a storage structure. There is some maintenance requirement for the sediment basin, but this can normally be done with ordinary farm equipment. If excess nutrients accumulate near the inlet of the filter strip, the topsoil may have to be removed and replaced with other topsoil and the nutrient-rich soil distributed on cropland.

The main disadvantage of vegetative filter strips is the amount of land and earth work required to properly construct a filter. For the most part, only smaller livestock producers will be able to utilize vegetative filter strip systems. In many cases, it may cost more to build a filter strip system than it would to construct a holding pond. However, the cost of pumping equipment can be avoided with vegetative filters.

Filter strip systems are limited to locations where the feeding area is at least 300 to 400 feet (preferably 1,000 or more feet) from the nearest creek, stream, lake, or pond. Vegetative filters are not a viable alternative where the feeding area is located near a man-made or natural watercourse.

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SUMMARY

Kansas livestock facilities can utilize vegetative filter systems which are designed and constructed to meet the basic expectations of livestock control Kansas statutes and KDHE regulations. No livestock production enterprise can have a significant pollution potential. A properly designed, constructed, and maintained vegetative filter strip is an effective means for some producers to achieve this expectation. A vegetative filter plan must be submitted to KDHE for approval before implementing the design to insure the proposed plan can be used at the site.

K-State Research Shows Filter Strips Can Be Effective

Vegetative filter strips reduced concentrations of phosphorus and nitrogen from animal feeding operations at K-State research sites in Herington and Cheney Reservoir. Design of the filter strips had a major impact on their effectiveness.

Established grasses, particularly bromegrass and tall fescue, are most effective in removing sediments and nutrients. Grasses generally need three to four years to gain maximum cover, density, and strength. The bromegrass at Herington, in its fourth year, had better results than did 1- to 2-year-old stands at Cheney. The filter strip at Herington was 1,400 feet long, 100 feet wide, and set on a gradual slope. At Cheney, the filter strip was only 700 feet long and narrowed from a width of 50 feet. The slope on this filter strip increased from 1 to 4 percent at the tail end.

Few cattle were in the feedlot at either site during the study period. However, two runoff events were captured at the Herington site when 199 cattle were being fed.

The research found that a straight filter strip with consistent width and gradual slope was the most effective design. Mowing and occasional weeding also increased effectiveness. Getting an even flow across the filter strip was the major challenge. Runoff had a tendency to channel, rendering 70 to 80 percent of the filter strip area largely unused. To solve this problem, new research is being conducted that involves placing wooden berms every 200 feet to distribute water more evenly.

Joseph P. Harner
Extension Engineer, Grain and Livestock Systems
Biological and Agricultural Engineering

James P. Murphy
Extension Engineer and State Leader
Biological and Agricultural Engineering

Daniel L. Devlin
Extension Specialist and Coordinator, Environmental Quality
Department of Agronomy

Walter H. Fick
Associate Professor
Department of Agronomy

Gary L. Kilgore
Extension Specialist, Crops and Soils
Southeast Area

Kansas State University
Agricultural Experiment Station
and Cooperative Extension Service

MF-2454 Febuary 2000

TESTIMONY BEFORE
HOUSE ENVIRONMENT
JANUARY 30, 2001 AT 3:30 P.M. IN ROOM 231-N
WATER MARKETING CONTRACTS
By Terry Duvall

Under the State Water Marketing Program, created in 1974, municipal and industrial water supply users may contract with the State of Kansas for water supply from state-owned storage space in large federal reservoirs located in the eastern half of the state. The reservoirs currently used for the Water Marketing Program include: Big Hill, Clinton, Council Grove, Elk City, Hillsdale, John Redmond, Marion, Melvern, Milford, and Perry. There are currently 34 contracts with municipal and industrial users for water supply from these reservoirs.

Each time a new contract is negotiated with a water user, the Kansas Water Authority must review and approve the contract. The statutes also require that new contracts be submitted to the Kansas Legislature. The Legislature has 30 days to adopt a concurrent resolution to disapprove a contract.

During calendar year 2000 a contract with Miami County Rural Water District Number 1 was negotiated and approved by the Kansas Water Authority and that contract has been submitted for your review. The source of water for this contract is Hillsdale Reservoir. Miami County Rural Water District Number 2 will be treating the water for Miami County Rural Water District Number 1. Miami County Rural Water District Number 2 also has contracted for water supply from Hillsdale and has a newly upgraded treatment plant at the reservoir. Other customers for Hillsdale water supply include the City of Spring Hill, Johnson County Rural Water District Number 7 and the City of Gardner. These contracts combined, including Miami County Rural Water District Number 1, leaves 56% of the water supply yield from Hillsdale available for other users.

Also submitted to you this year were two contracts for surplus water from Marion Reservoir, negotiated with Jost Farms for short-term irrigation water use from that source. Since the contract period, June through September, has already expired there is no opportunity for legislative review of these contracts for disapproval. Water use from state-owned storage for irrigation use is only available if there is uncommitted "surplus" water supply in the reservoir. Such contracts are limited to no more than one year.

If you have any questions about these contracts, I will try to answer them. Thank you.

House Environment
1-30-01
Attachment 9