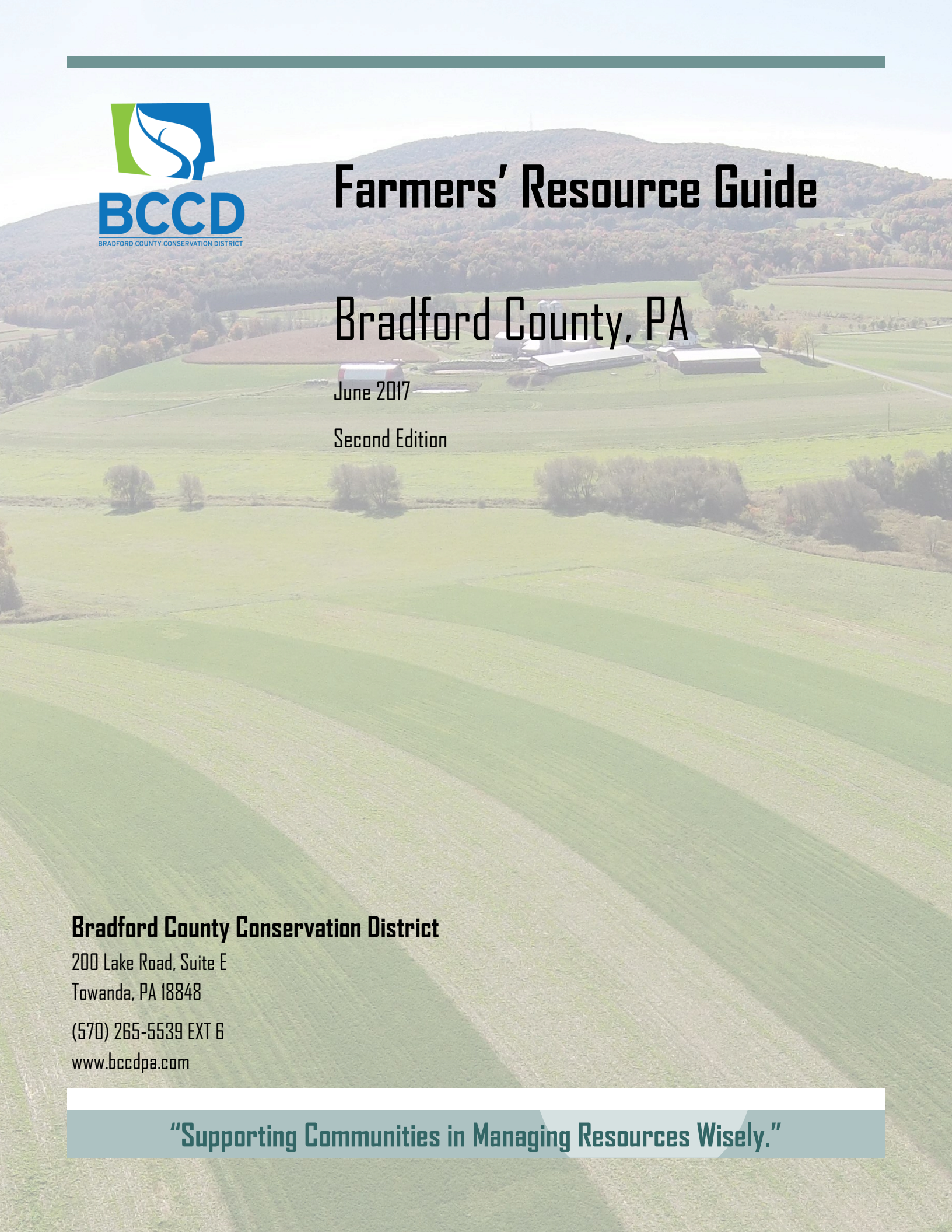

Farmers' Resource Guide

Bradford County, PA

June 2017

Second Edition

Bradford County Conservation District

200 Lake Road, Suite E

Towanda, PA 18848

(570) 265-5539 EXT 6

www.bccdpa.com

"Supporting Communities in Managing Resources Wisely."

Introduction

Farmers' Resource Guide 2017

Resources abound to assist the farmer in making critical management decisions. One of the most valuable are farmers themselves. The community of farmers that make up the agricultural operations of Bradford County share the common resource base, climate, and market conditions. Each of them approaches the challenges of farming in their own way to make or break the success of their individual operation.

Farmer-to-Farmer networking is one of the most effective ways to share practices, experiences, and farming pros and cons. In this guide are just a few basic practices in which the featured farmers are making themselves available to educate and share their experiences in developing and managing these best management practices (bmp's) to address environmental issues relating to farming operations in Bradford County. Individuals that provide technical assistance to farmers are able to discuss these practices, plan, and eventually implement them, however the farmers have to decide what works BEST FOR THEIR OPERATION and management style. While those resource agency people can best explain the practice function and design, there is no better source of management information than those that have been working with the practices themselves. The individuals featured in this publication have offered to discuss those operation and management issues with other farmers seeking such information. This publication is meant to supplement site-specific planning efforts at individual farms.

ACKNOWLEDGEMENTS

The Bradford County Conservation District wishes to gratefully acknowledge the contributions of those farmers featured in this book. They have generously agreed to share their experiences with others to not only help the future of farming in Bradford County, but also to maintain and improve the quality of the environment that is shared by all who live, work, and visit.

Technical and financial assistance for some of the installed projects mentioned were provided by USDA-Natural Resources Conservation Service (NRCS).

Thank you to Dick Allyn for taking many of the photographs shown here and everyone that had a hand in information gathering and review of this work.

Funding for this project and publication was generously provided by Pennsylvania's Department of Environmental Protection through it's Chesapeake Bay Special Project grants.

For information and/or assistance, please contact the Bradford County Conservation District by calling (570)265-5539 ext. 6 or by visiting our website www.bccdpa.com.

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Barnyards

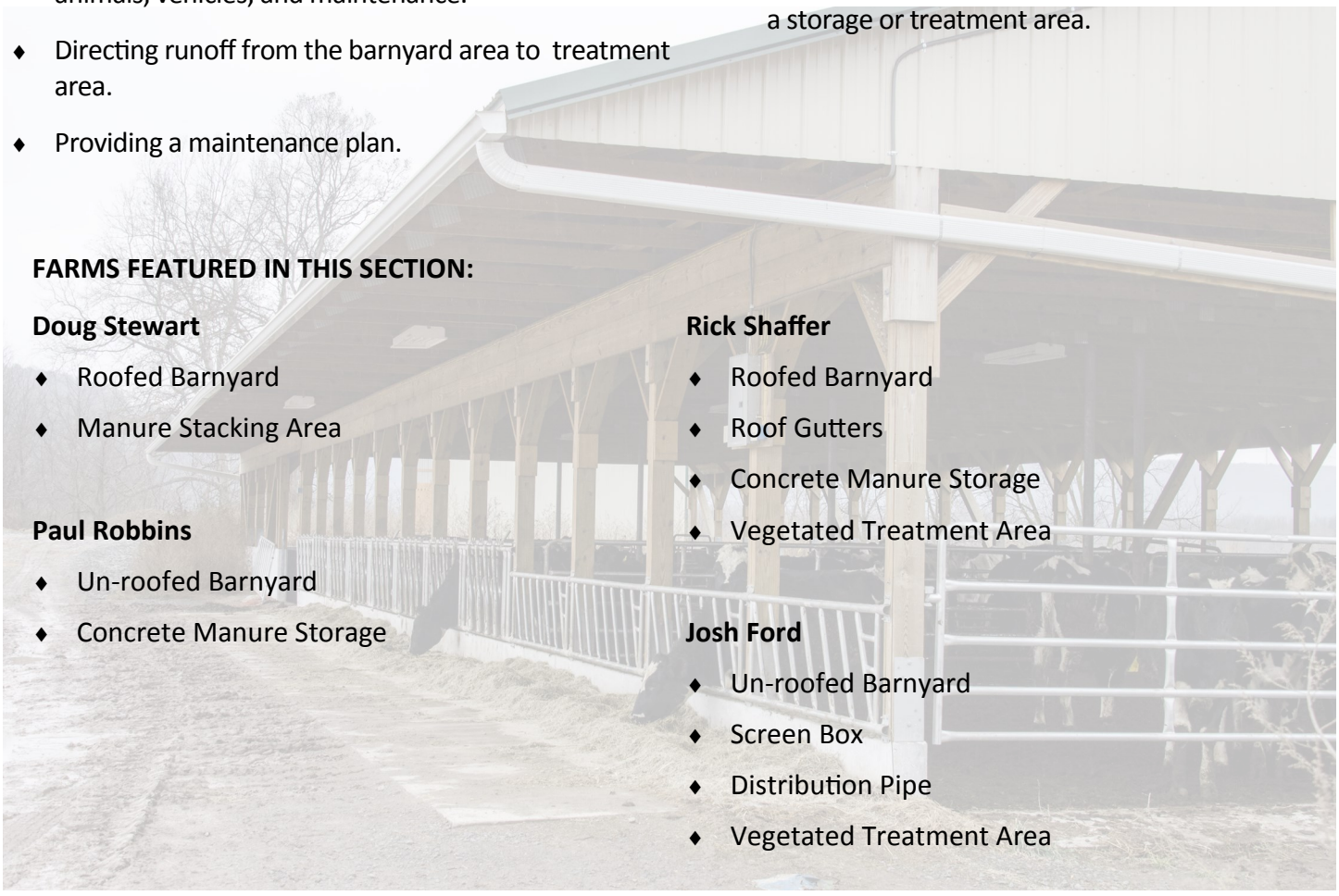
Barnyards are critical areas for many livestock producers. The primary purpose of installing a barnyard structure is to provide a stable area that facilitates animal health, ease in maintenance, and avoids negative water quality impacts. The term "heavy use area protection" is used to describe a reinforced or improved barnyard with runoff controls

THE PRINCIPLES INVOLVED IN THE PLANNING AND MANAGEMENT OF A BARNYARD INCLUDE:

- Keeping clean water clean by eliminating it from entering the barnyard area.
- Sizing and adjusting the barnyard for the type and frequency of use.
- Providing a durable, yet livestock friendly, surface for animals, vehicles, and maintenance.
- Directing runoff from the barnyard area to treatment area.
- Providing a maintenance plan.

COMPONENTS OF BARNYARD SYSTEMS USUALLY INCLUDE THE FOLLOWING:

- A diversion to direct uphill water from entering the barnyard area.
- Roof runoff collection and diversion from the barnyard area.
- Sizing and reinforcement of the barnyard.
- Collection of runoff from the actual barnyard to a storage or treatment area.



FARMS FEATURED IN THIS SECTION:

Doug Stewart

- Roofed Barnyard
- Manure Stacking Area

Paul Robbins

- Un-roofed Barnyard
- Concrete Manure Storage

Rick Shaffer

- Roofed Barnyard
- Roof Gutters
- Concrete Manure Storage
- Vegetated Treatment Area

Josh Ford

- Un-roofed Barnyard
- Screen Box
- Distribution Pipe
- Vegetated Treatment Area

Barnyards—Roofed with Manure Stacking

Rick Shaffer

Dairy

*Roofed Heavy Use Area Protection for young stock

*Roofed Manure Stacking Area

*Roof Runoff Control

(For more Roof Runoff Control options See Page 6)

Keeping Clean Water Clean is a key focus when installing large Best Management Practices (BMP's). The photo on the right shows a roof gutter system with an outlet to a stabilized area, away from manure, heavily used traffic areas, and animal walkways.

(Below: Solid manure stacking area at one end of the covered barnyard.)

Both solid and liquid manure are utilized on this operation. See pages 7-10 for additional manure storage structures and information.

Barnyards

Don Feusner

Beef

Roofed Heavy Use Area Protection & Manure Stacking Area

This roofed barnyard features a pen/gate system with a feed lane on one end of the facility and the other end serves as a solid manure stacking area. The stacking area has 5 ft. walls surrounding it to keep any liquids contained as well as the solid, stackable manure.

Paul Robbins

Dairy

Concrete Barnyard directed to manure storage.

Improved barnyards can be connected by a manure push -off ramp directly to a liquid manure storage tank. (Tractor guards are installed for safety.) Concrete barnyards can be used as exercise lots for cattle with curbing to contain any manure or nutrient runoff. Connecting directly to a concrete manure storage makes manure handling simpler and low maintenance.

Barnyards—Barnyard Runoff to Filter Area

Josh Ford

Dairy

Screen box and outlet to grass filter area.

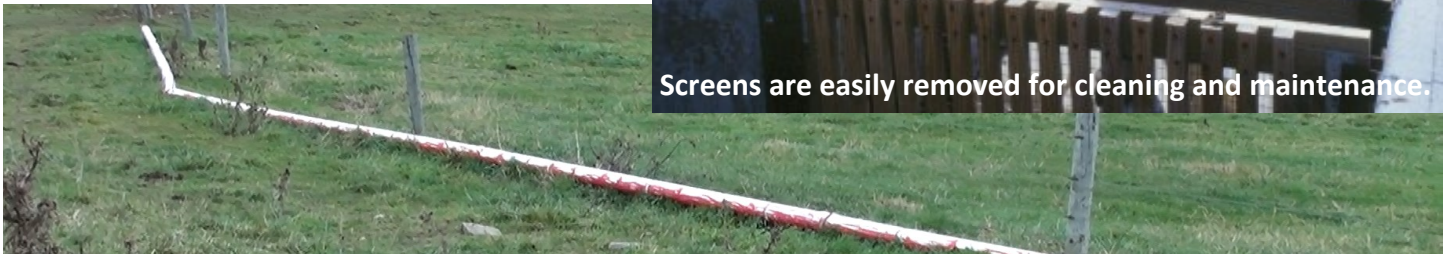
Cattle are fed and exercised on this pad (with no direct connection to a liquid manure storage facility). Any rainwater that is collected on this pad passes through a “screen box” (photo on right).

The screenbox has three screen panels with different gauges of filtration. The first (bottom of photo) are wooden pickets, the second is a wider pattern screen, and the third is a fine screen. These screens are meant to filter out any debris, feed, or manure, that could be on the barnyard before the water runs through the drain pipe (top of photo) and is gravity fed (or pumped in some cases) to a “distribution pipe”.

The distribution pipe is raised off the ground, and has small holes drilled in the bottom to allow the wastewater to be released in doses to a permanent, vegetated filter area.

Milkhouse waste can also be treated in a similar manner. (See pages 11 & 12)

Screens are easily removed for cleaning and maintenance.



Roof Runoff Collection

Roof Gutters to collect and divert water to a clean, stable outlet.

Jon and Jeff Jenkins

Drip Trench/Rock lined under roof eaves. An alternative to adding roof gutters.

Manure Storage

Storage structures can be as simple as a stacking area or can be more complex such as earthen storage, concrete, or steel structures. For farmers that need to store manure, especially in winter months, in order to reduce nutrient discharge to surrounding water, manure storage is a significant management and financial commitment.

Benefits to having manure storage include: land applying manure during optimum crop uptake periods, convenience for the operator, helps protect water quality, improves animal health, and can improve aesthetics of a farming operation. Manure structures should be installed as a component of a comprehensive, farm-specific, nutrient management plan.

THE PRINCIPLES INVOLVED IN THE PLANNING AND MANAGEMENT OF A MANURE STORAGE INCLUDE:

- Matching the site and environmental conditions to the appropriate structure
- Designing and constructing a storage facility that meets engineering and environmental standards and the farmer's management needs
- Sizing for needed storage duration
- Eliminating any possible surface or groundwater intrusion
- Providing adequate safety protection
- Developing a proper maintenance plan

COMPONENTS OF A MANURE STORAGE SYSTEM USUALLY INCLUDE:

- Site evaluation and selection of structure type
- Proper sizing and design based on a nutrient/ manure management plan
- Collection and transfer of manure from livestock areas
- Surface and groundwater collection and diversion
- Storage structures
- Unloading structures
- Safety facilities and emergency contingency plans

FARMS FEATURED IN THIS SECTION:

Ryan Shores

- Concrete Manure Storage
- Boat Agitation

Bill Houseknecht

- HDPE-Plastic Lined, Earthen Manure Storage

Rick Shaffer

- Concrete Manure Storage Tank
- Solid Manure Stacking Area

Jay Good

- Slatted Floor to Storage

Manure Storage

Ryan Shores

Concrete manure storage tank; sand bedding; pump to storage; ramp access.

Agitation boat used to get manure solids and bedding in suspension for field application — specifically suited for sand or very large storages.

Dean Jackson

PTO-driven agitation pump.

Manure Storage

Bill Houseknecht

HDPE Lined, Earthen Manure Storage; Gravity Flow to Storage

Rick Shaffer

Concrete Dairy Manure Storage; Pump to Storage

Some other examples of Liquid Manure Storages:

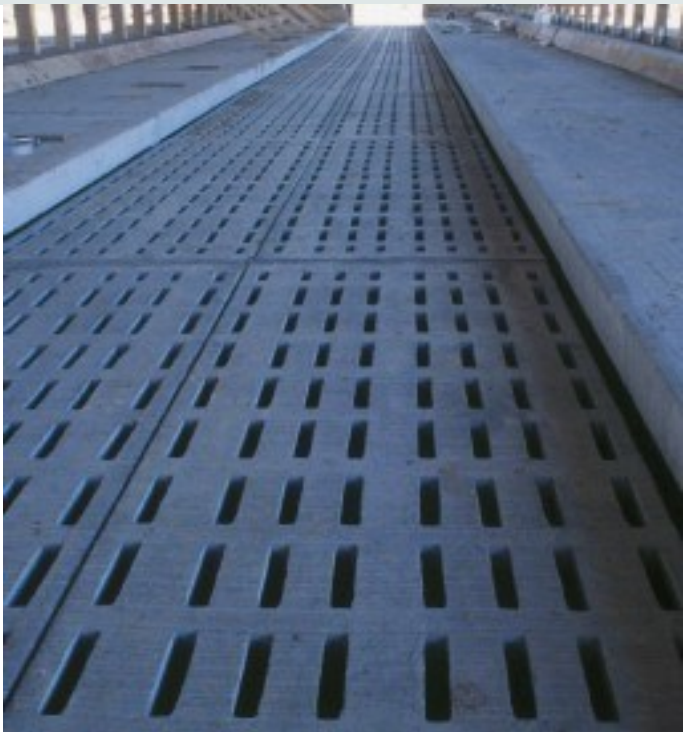
Steel Tank ←

Clay-Lined Earthen Lagoon →

Manure Storage

Jay Good

Slatted Floor Over Manure Storage



Rick Shaffer

Roofed Manure Stacking Area for
Solid, Stackable Manure

Milk House Waste Treatment

Providing a clean environment in and around the milk house is critical. This usually entails a good drainage system in the milk house which drains to some type of collection system for later utilization or disposal. Milk house waste can be legally utilized on cropping areas, either as part of the nutrient management plan disposal strategy or as part of a grass filter system.

THE PRINCIPLES INVOLVED IN THE PLANNING AND MANAGEMENT OF A MILK HOUSE WASTE SYSTEM INCLUDE:

- Matching the site conditions and the management styles of the farmer with a collection and storage system as well as a disposal/utilization plan
- Designing and constructing a collection, transfer, and storage system
- Developing a proper maintenance plan

COMPONENTS OF A MILK HOUSE WASTE SYSTEM USUALLY INCLUDE:

- Site evaluation and selection on approach
- Proper sizing and design
- Construction

FARMS FEATURED IN THIS SECTION:

Rick Shaffer

- Milk house waste to storage

Bob Taylor

- Milk house waste to spreader

Ron & Melissa Forbes

- Milk house & barnyard runoff to sprinkler

Bob Taylor

Milk House Waste to Spreader

Rick Shaffer

Milk House Waste to Manure Storage

Milk House Waste Treatment

Ron & Melissa Forbes

Dairy

Milk House Waste & Barnyard Runoff to Sprinkler Irrigation

Milk house waste settling tanks (prior to backfill)

Barnyard runoff collection during construction

Spray irrigation; 2 sprinklers; 80 ft radius each

Contour Strips

Ron Kline

No-Till Contour Strips

Contour farming involves tilling, planting, and harvesting operations around the hill or slope as near to the contour as practical. Tillage crops are interspersed with grass or forage crops. The purpose of this practice is to slow down the water running across the field and to intercept any top soil leaving the crop areas. This practice reduces runoff, increases soil moisture and decreases soil erosion.

THE PRINCIPLES INVOLVED IN CONTOUR STRIP FARMING INCLUDE:

- Farming as near to the contour of the hill or slope as possible
- Alternate annual crop strips with hay strips
- Use crop rotations that alternate, to maintain the integrity of the contour strips

Dean Jackson

No-Till Contour Strips

Diversions

Jon and Jeff Jenkins

Diversion

Diversions are commonly used by many County farmers to help break up the long slopes where crops are raised or to keep water away from high use areas such as farmsteads or animal concentration areas. They reduce the rate of runoff and minimize soil erosion. They are cross slope structures that are permanently vegetated and outlet into a stable area.

THE PRINCIPLES INVOLVED IN THE PLANNING AND CONSTRUCTION OF DIVERSIONS INCLUDE:

- Sizing for the amount of water draining in to it.
- Constructing and stabilizing the channel to minimize erosion that may result from the water flow.
- Assuring a stable outlet for the end of the diversion.
- Maintaining the diversion to maximize proper vegetative cover.
- Maintenance plan

Grazing Management

Dean Jackson

Paddock Grazing with Stabilized Lane-way

A well managed grazing system maximizes forage potential, efficiently utilizes fields where soils may not be suitable for row crops, minimizes soil and nutrient pollution, encourages animal health and can provide good economic return.

THE PRINCIPLES INVOLVED IN THE PLANNING AND MANAGEMENT OF A GRAZING SYSTEM INCLUDE:

- Design and tailor paddock size for the animal types and herd size so that rotations maximize forage health and efficiency and considers water quality.
- Utilizes forage species that meet animal and farm management needs.
- Provides a dependable source of drinking water.

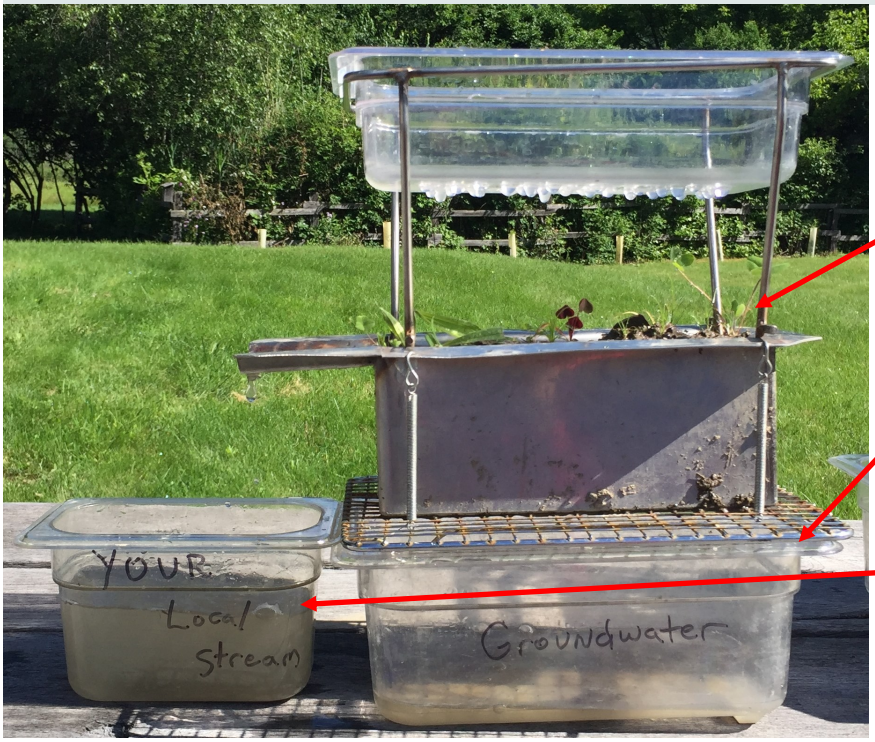
COMPONENTS OF A GRAZING SYSTEM INCLUDE:

- Fencing layout
- Vegetation selection
- Watering system
- Access lane or alleys
- Maintenance

Don Russell

Spring Development
Watering System for Paddock Grazing

Soil Health—Conventional Till vs. No-till



Conventional Tillage:

Soil has been plowed and disked with minimal soil coverage by regrowth.

Ground water infiltration is minimal due to a lack of soil structure.

Most of the rain fall runs off into "Your Local Stream". The water is often muddy with loose surface soil.

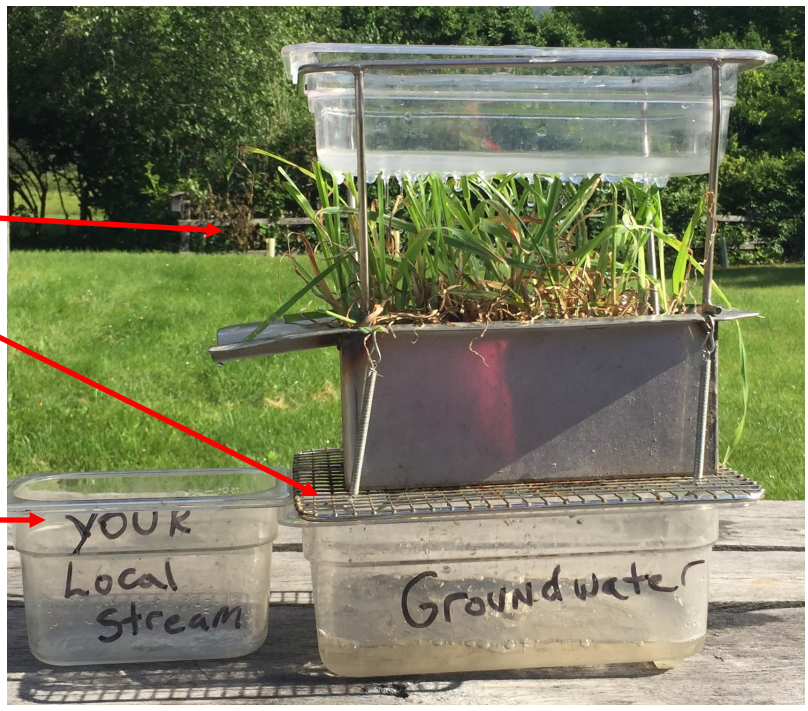
A rainfall simulator is effective in showing the contrast between conventional tillage versus no-till. Equal amounts of water are added to the top basin which has evenly spaced holes to allow water to "rain" on the soil samples below. The soil trays allow water to pass through, simulating water/soil infiltration, which is collected in the bottom basin labeled "Groundwater". "Your Local Stream" is captured in the same manner that an actual runoff event would occur.

No-Till:

Soil has a dense vegetated cover protecting it from the rainwater impact.

Ground water infiltration is high. Soil structure allows water to enter.

Runoff into "Your Local Stream" is minimal due to absorption by a healthier soil.



Soil Health—Cover Crops, Planting Green

Cover Crops

Cover crop means planting a secondary crop after harvest of the primary one, providing ground cover for fall, winter and spring months. In Northern PA, this often means planting an annual grain or mix in September/ October following corn or soybean harvest. Year round ground cover is integral to building productive soil.

Cover Crop's Important Jobs Include:

- Gather and store nutrients for the next crop
- Protect the soil surface from erosion
- Build organic matter and feed the good soil bugs
- Increase soil's water holding capacity

Planting Green

Planting green refers to no-till planting of primary crops into actively growing cover crops. This practice can be used when planting a grain crop like corn or soybeans into a cover crop. Both the planter and attachments need to be in good physical condition and properly adjusted.

Planting Corn in standing Rye.

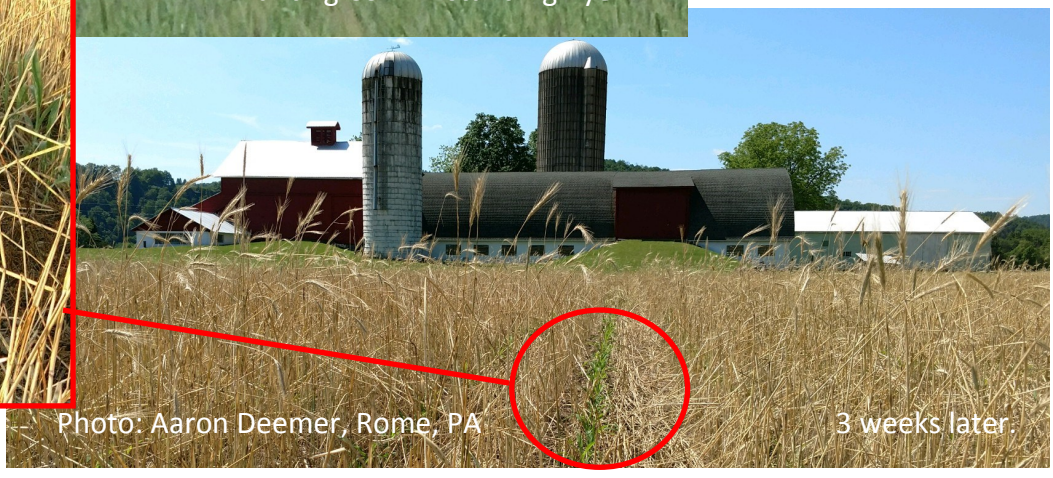


Photo: Aaron Deemer, Rome, PA

3 weeks later.

Stream Improvements

Streams and their banks are critical areas as an interface between the farm and the environment. The proper management of these areas can help protect and enhance water quality, wildlife habitat and surrounding crop fields. Streams and their immediate borders, called riparian areas, can do much to filter runoff and stabilize banks. In areas where the stream banks are eroding, structural, vegetative or management approaches are used to correct the unstable conditions.

Contact the BCCD for assistance with any stream issues. We can offer technical assistance, help with permitting, and in some cases provide funding for stream projects. For more information on any of the practices listed on the following pages and/or contact information for farmers with experience in stream rehabilitation, give us a call or stop in to the office.

THE PRINCIPLES OF FARM STREAM STABILITY

- Manage riparian areas to avoid disturbance by livestock or tillage
- Restore eroding stream banks through vegetative or structural approaches
- Establish controlled access to streams
- Maintain stream riparian areas
- Protect and utilize prime agricultural land

COMPONENTS OF STREAM IMPROVEMENT PROJECTS

- Assessment of stream rehabilitation needs
- Selection of rehabilitation practices
  - Livestock exclusionary fencing
  - Structural bank protection sizing, design and installation
  - Vegetative bank protection design and installation

Stream Improvements

Streamside Buffer

Often the most effective (and cheapest) way to stabilize a stream is to leave it alone. If erosion problems haven't reached a critical point yet, simply eliminating or limiting the impacts (livestock access, plowing, lawn maintenance, ATV activity, etc.) to a streambank and its surrounding area may allow it to heal itself. By allowing a strip of land along a stream to revert to it's native state, you are giving sensitive seedlings a chance to get established and create root structure in the soil. Planting trees can kick start this process and allow control over the species growing along your creek.

Along with the stabilizing effect on the streambank, streamside trees and vegetation improve water quality. The shade cast on the stream by trees and shrubs keeps water temperatures down, limiting algae growth and maintaining suitable habitat conditions for aquatic life. The vegetation along the stream intercepts and utilizes sediment and nutrients that would otherwise end up in the creek. The natural area created by a streamside buffer provides habitat for wildlife. While a view of the stream can be pretty, a hidden stream is usually healthier and more stable.

Stabilized Stream Crossing

In Bradford County alone, there are over 2000 miles of streams. Crossing the creek is unavoidable on most farms. Limiting livestock and equipment access to a single, stabilized lane can prevent your most productive (and erodible) soils from washing down the river.

A stabilized stream crossing should be constructed of rock riprap and topped with gravel. Slopes down to the crossing should be gradual enough to prevent storm runoff from eroding the lane. There are different options for fencing based on the size of the creek and the likelihood of flooding.

In a riffle/pool type stream the best place to create a crossing is in the "glide", or the tail end of a pool just before the top of the next riffle. The creek here will be relatively slow and shallow. Through the glide the bed gradually slopes up until it reaches the top of the next riffle, where it rushes downhill to the next pool. Due to the bed's rise in elevation through the glide, the crossing will actually be under compression during high water so it will be less likely to lose stabilizing material.

Stream Bank Protection

Riprap Bank Protection

Riprap consists of blocky, angular rocks of different sizes and shapes. In a streambank stabilization job, the riprap is placed on the bank in such a way that the rocks are not segregated by size. Smaller rocks should chink in the void spaces between the larger rocks. When properly placed, each rock will be locked in to place by the surrounding rocks, creating a virtually solid, immovable object. To add further stability, the riprap should be keyed in to the bank and bed.

In Bradford County, the highly erosive nature of our soils and steep topography, combine with transportation, residential, and agricultural impacts to create notoriously unstable streams. In many cases, riprap bank protection is the only effective treatment to stabilize an eroding bank.

Stream Barbs

Stream Barbs can stabilize an eroding streambank by directing the flow away from the toe of the affected bank. They are made out of rock riprap and are installed pointing upstream. They have a gradual rise from the tip of the structure in the stream bed to where they intersect the bank. Often a series of Stream Barbs is installed along an eroding bank. They can be quite effective through a relatively straight stretch of stream, but should not be used in a tight meander. Bank protection is accomplished not by armoring, but by deflecting the flow away from the bank and forcing the fastest, deepest part of the stream in to the middle of the channel. During high water, if the barbs are functioning properly there will be noticeably slower or nearly still water along the bank.

Stream Bank Protection—Live Stakes

An example of a shrub willow commonly found in Bradford County.

Live stakes are cuttings from hardwood trees or shrubs that have rooting ability. Some species of trees and shrubs can grow roots out of a cut branch when it's inserted in to moist soil. The stake will send shoots up that will grow in to a tree, while creating stabilizing root structure in the soil. The most common types locally are willow, sycamore, elderberry, and some species of dogwoods.

Live stakes should be cut and placed while the tree or shrub is dormant. Late winter / early spring is the best time for this. The stakes should be 1-2 feet long and not more than 1 $^{1}/_{2}$ inches in diameter. When placing the stakes, try to get as much of the stake in to the ground as you can. The goal in year 1 is to grow roots, not leaves. It is essential that the stakes have constant access to moisture so keep them low on the bank, and push them in as far as possible.

Willow live stakes shortly after installation.

One year later.

Stream Improvements—Log Structures

Multi-Log Vane Deflectors

Multi-Log Vane Deflectors function exactly like stream barbs. They stop erosion by slowing the flow down at the toe of the bank and effectively moving the fastest, deepest part of the stream towards the middle of the channel. The logs must be pinned together and anchored to the bed with rebar. At least a third of the logs must be keyed in to the bank for stability. These can be a cost effective solution if logs are available on site. Trees that are naturally resistant to rotting (such as hemlock) are commonly used. The lifespan of these structures is limited, but can be extended if they can be installed so they stay wet year round. In Bradford County, with the late summer dry out many of our streams experience, this can be a challenge. But it's possible that the deflectors will stabilize the bank long enough for vegetation to become established providing a permanent solution.

Modified Mud Sill Cribbing

Cribbing functions as a stabilization practice as well as fish habitat enhancement. Cribbing consists of logs which are pinned together, that project out of placed riprap. They are mounted parallel to the direction of stream flow and create a simulated undercut bank. The logs provide overhead cover and shade. Any stream angler knows that an undercut bank is a favorite hideout of big fish. This is why cribbing is sometimes referred to as a "lunker structure".

Stream Improvements—Gully Stabilization

Gullies usually form as the result of an interruption in natural landscape drainage patterns. Inadequate outlet protection on a diversion ditch, messy logging operations, unmanaged stormwater runoff from land development, etc. can all concentrate water flow and erode valuable soil. Since gullies form on steep slopes, once accelerated erosion has begun it can be difficult to stop.

If the flow cannot be diverted away from the gully, the bottom of it must be stabilized and the side slopes should be shaped in to a stable form. Rock riprap is effective at holding the bottom, and vegetation must be established to hold the sides.

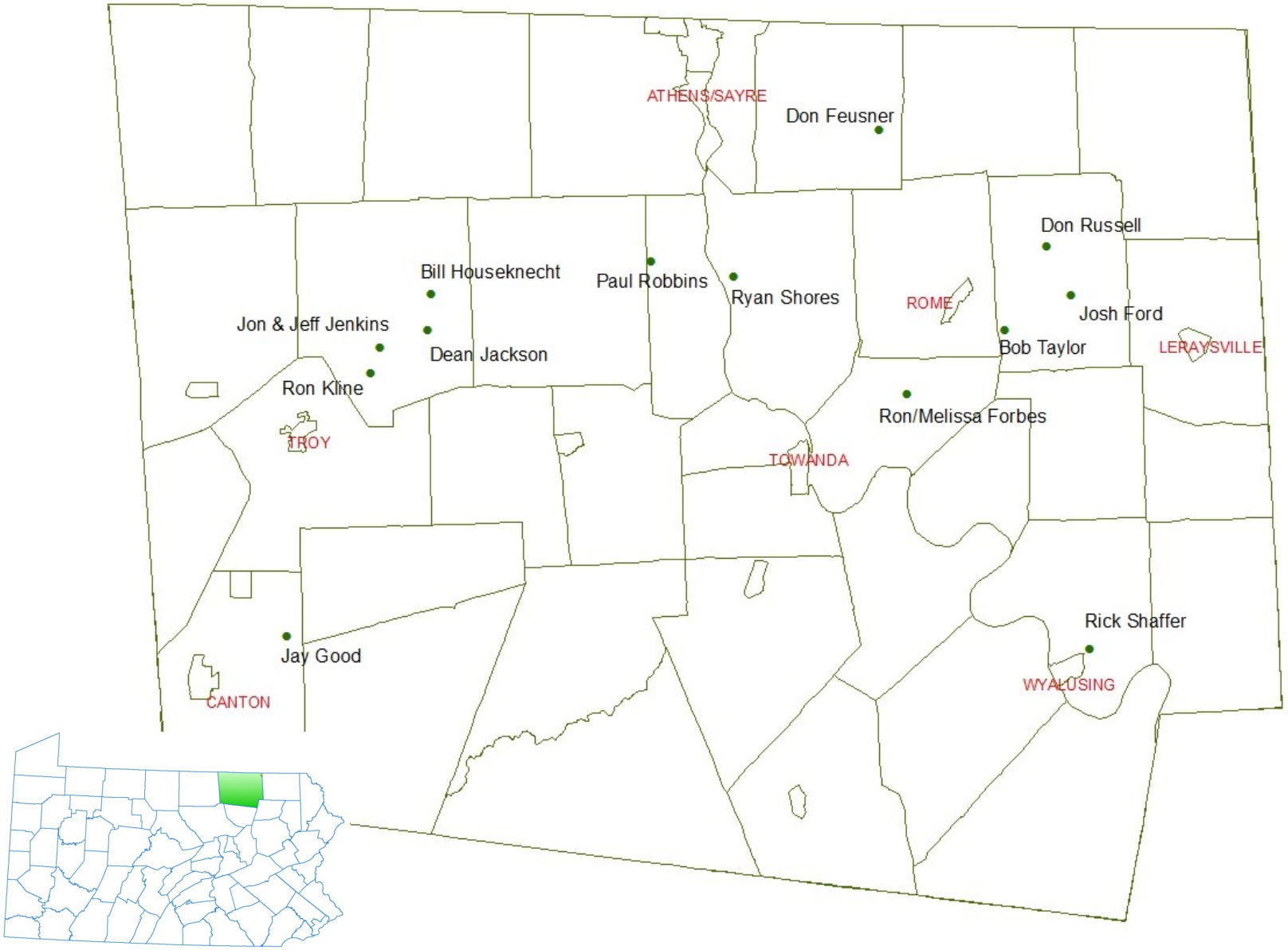
Top: An actively eroding gully shortly before stabilization

Middle: The project just after construction. Grass seed and mulch were spread immediately to protect the disturbed soil.

Bottom: The same location after vegetation had become established

Notes

BRADFORD COUNTY FARMER LOCATION MAP



BCCD

BRADFORD COUNTY CONSERVATION DISTRICT

Leading, educating, and empowering people to manage resources wisely

For Assistance, Contact:

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USDA-Natural Resources Conservation Service
200 Lake Road, Suite B
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(570) 265-6969 EXT 3
www.nrcs.usda.gov

The Bradford County Conservation District wishes to thank...

The farmers of Bradford County. Thank you for your dedication to producing excellent products while stewarding our natural resources. We are proud of you and the community we share!

The USDA-Natural Resources Conservation Service staff from Towanda to Harrisburg. We have partnered in conservation implementation for 60 years. It works. Possibilities abound. Thank you.

Photos on front and back covers: Mt. Glen Farm, Springfield Township, Bradford County, Pennsylvania