Rhode Island Resource Management Guide

Designing a Resource Management and Conservation Strategy for Your Farm

United States Division of Agriculture - Natural Resurces Conservation Service (USDA-NRCS)

Rhode Island Resource Conservation and Development Council (RIRC&D)

Rhode Island Department of Environmental Management (RIDEM)

Rhode Island State Conservation Committee (RI SCC)

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FOR MORE INFORMATION OR TO REQUEST ADDITIONAL COPIES CONTACT:

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Natural Resources Conservation Service
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Introduction

Utilizing the natural resources on your property efficiently and sustainably can be challenging. Professionals and organizations such as conservation districts, State and Federal natural resource agencies, departments, and non-profit groups exist to assist landowners and agricultural producers with their land management needs. As a farm or forestland owner you have a connection to your land and you want to do all you can to care for it.

This Guide serves several purposes. It may function as a conservation plan for farmland designation for enrollment in Rhode Island's Farm, Forest, and Open Space Program. (See Appendix I for more information.) Through your Conservation District, professional assistance is available to complete this Guide and all necessary requirements of the conservation plan. Instructions for this process are incuded on pages 2 and 3 of this Guide, under Step 1: Conservation Plan Maps and in Appendix I.

Information you provide within this Guide may also be used as pre-planning tool for those interested in applying for Federal assistance programs applied through the USDA, Natural Resources Conservation Service. Information on assistance programs can be found in Appendix II of this Guide.

This document also serves as a self-assessment planning tool for conservation and resource management on your property without professional assistance. The information you will gather throughout this Guide will help you plan activities on your property and prioritize for conservation and sustainable use of your resources so that through your management activities you nurture your land and improve or maintain your resource conditions.

When planning conservation and resource use on your property, it is important to be aware of programs and information available to you. Within the Appendices of this Guide you will also find contacts, factsheets and other resources that will help connect you to people and information that you may find beneficial during your conservation planning activities.

Using the Rhode Island Resource Management Guide

This Guide is meant to walk you through the conservation planning process step by step, field by field, gathering information about your resource use and goals, and building on that information with each step. Instructions are provided at the beginning of each step in the process. Whether you are completing this workbook on your own or you are working with a professional planner, it will provide you with the information necessary to identify your goals, concerns and strategies, and to address them on your land.

Rhode Island Farm, Forest, and Open Space information and application are located in Appendix I of this Guide. Those developing a FFOS farmland conservation plan should start here. Then, proceed through the workbook planning pages from the beginning. Start at Step 1 and refer to Appedix III for information on Best Management Practices as needed.

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Appendix I: FARM FOREST AND OPEN SPACE PROGRAM

- Rhode Island Farm, Forest and Open Space Program
- FFOS Application
- FFOS Application CHECKLIST

Appendix II: Resources, Organizations, and Contact Information

Appendix III: USDA-NRCS Conservation Program Summary

Appendix IV: URI Cooperative Extension Small Acreage Livestock Series

Appendix V: Best Management Practices (BMPs)

Contact Information

Welcome to the Rhode Island Resource Management Guide. To get started, please fill out your contact information below.

First Name: Last Name:

Farm Name:

Address:

Mailing Address (If different than above):

Town: State RI Zip Code: Phone:

Email:

Total Acreage: Plat/Lot:

County:
- Bristol
- Kent
- Newport
- Providence
- Washington

Conservation District:
- Northern
- Southern
- Eastern

Place a check next to your reasons for using ths Guide:

- ☐ RI Farm, Forest and Open Space Conservation Plan
- ☐ Pre-application for USDA-NRCS Programs
- ☐ Self-assessment planning and record keeping

Step 1: Conservation Plan Maps

Designing a management strategy requires an inventory of property features and uses on a land use map*.

Below is an example that illustrates the types of features to include when developing a land use map of your property. The base image of the schematic below is a print out from the ***Web Soil Survey***, a free online natural resource information system. Web Soil Survey is available at: http://websoilsurvey.nrcs.usda.gov

To create your map, download an image of your property from the *Web Soil Survey* or another map source as your base. Then, outline the fields, include acreages, and label with your land use. Or, you can sketch a basic hand drawing of the property's main features on a separate page.

The map you create will also be your reference point for planning future activities, such as placement of fences or tree plantings. Keep the map as a record of your baseline, or starting point. As you implement changes, update your property map to indicate any added measures.

Using Web Soil Survey

http://websoilsurvey.nrcs.usda.gov

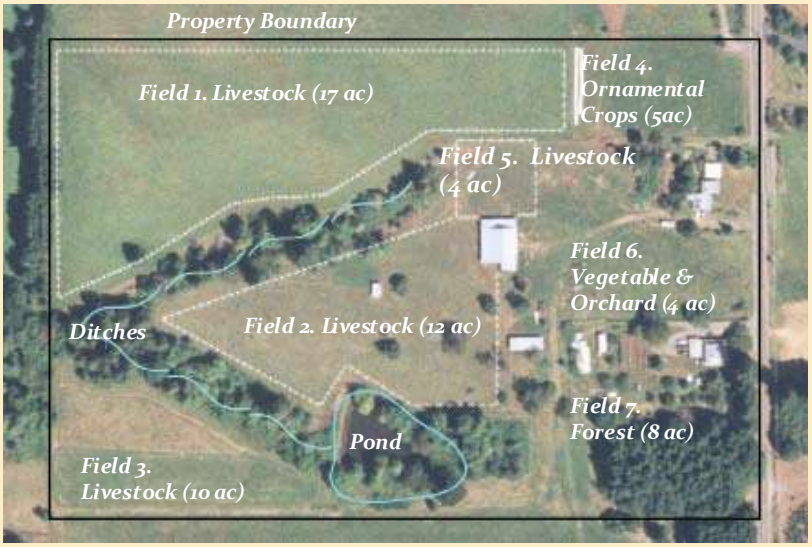
You can do much more than generate a map with *Web Soil Survey*. Go to the *Suitabilities and Limitations for Use* section under the *Soil Data Explorer* tab. The information available here includes:

Land Classification: Maps and reports for Farmland Classification to identify areas of prime farmland or Capability Class (a ranking of soil suitability for cropland).

Vegetative Productivity: Maps and reports of expected crop yields for a variety of crops, including hay and pasture.

Building Site Development: Maps and reports with information on soil limitations for home sites.

Soil Properties and Qualities: Information on depth to seasonal high water tables as well as flooding and ponding frequency.



Sample Map:

Site *Breezy Hills Farm*
Date *Sept. 2009*

*To enroll in the Farm, Forest and Open Space Program, you must provide a plat/lot map and a land use map with your application to your Conservation District. A professional will then meet with you to work through this guide together. This information will function as your conservation plan. Please label your land use map with field acreages and FFOS land use codes (see following page).

Note: Applications for "Farmland" designation under the Farm, Forest and Open Space (FFOS) Program in RI must include, at a minimum, the following maps and features required by the RI Department of Environmental Management. Data may be obtained from current Rhode Island Geographic Information System (RIGIS) data available at http://www.edc.uri.edu/RIGIS/data/. Plat/Lot data is available at your town hall. Contact your Conservation District for assistance with map preparation for FFOS. Find contact information in Appendix I.

FFOS Conservation Planning Process

1. Applicant Submissions to Conservation District:
FFOS Application, Land Use Map, Plat/Lot Map

2. A planner will meet with you and review this Resource Management Guide :

- Contact Information page
- Step 1: Review maps
- Step 2: Land Use Objectives & Concerns
- Step 3: Soils Table
- Step 4: Resource Inventory
- Step 5: Appropriate Management sections, depending on your goals.
- Step 6: Activity Table

Maps Must Include:

Land Use Map: showing property boundaries, field borders, field acreages, and labels using FFOS land use categories (see below).

Plat/Lot Map: showing your plat and lot location.

Soil Map: showing soil map unit names and soil limitations (soil capability classes and subclasses).

Resource Map: showing hydric soils, wetlands, rare/threatened/endangered species (RTE species), historic/cultural features (such as cellar holes, stone walls, artifacts), social and economic considerations (such as community wells or nearby schools).

Topographic Map

FFOS Land Use Categories

For "Farmland" designation under the Farm, Forest and Open Space Program, please use the following categories to label outlined areas of your property on your land use map, and to define land use in your fields throughout this guide.

Ornamental Crops:
including land devoted to floriculture, nursery and turf production, as well as land under greenhouses.

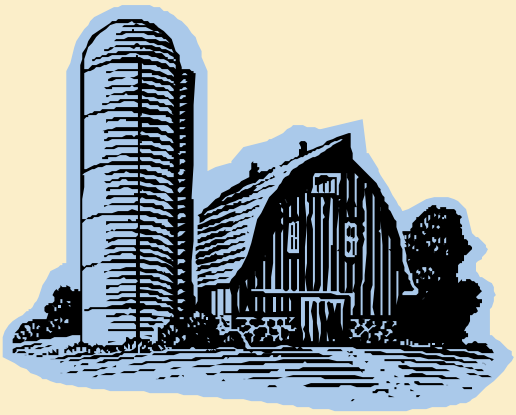
Vegetable and Orchards:
including small fruits, potatoes, cranberries and Christmas trees.

Dairy and Livestock:
including forage crops, hay, silage corn and grain, and aquaculture.

Forestland and Other

Map title block features must include:

1. Title identifying type of map
2. Name of the Conservation District, County, and State
3. Scale of map
4. Name of map author: "Data prepared by ____"



STEP 2: Land Use Objective and Concerns

The following questions will help you to identify resource concerns on your property and enable professionals to assist you with your "land management strategies", to protect and maintain and improve the natural resources on your property.

To begin, consider the goals you envision for your property and the obstacles to overcome to achieve this vision. You may want to improve resource conditions or maintain the land as it is. Whatever your goals, identifying the challenges you face and planning for specific outcomes will help you make good decisions now and in the future. This is the first step to a land management strategy that is right for you, your family and your property.

INSTRUCTIONS: Check the boxes next to the objectives that best describe your needs and the concerns that may inhibit these objectives (check all that apply). Then refer to the Best Management Practices (BMP's) on each topic you check. BMP guidence sheets are located in Appendix V of this workbook.

Objectives	Concerns	BMPs
☐ **Improve or maintain aesthetic beauty of the property and the quality of life for your family.**	☐ Current land use practices are not sustainable and the land has become degraded over time. ☐ Plant or animal pests cause damage to crops or property. ☐ Excess water from heavy rains causes damage to structures, roads, streambanks, livestock or cropland.	For guidence on this topic, refer to BMP factsheets 1-12 in Appendix V.
☐ **Keep healthy horses, cattle or other livestock on the property.**	☐ Livestock could benefit from improved diet or living conditions. ☐ Pastures are not able to recover to support healthy plant communities or pastures do not provide adequate forage for livestock. ☐ Livestock have access to streambanks or other wetlands and maintenance of these water bodies is difficult. ☐ Manure storage is inadequate, or manure may pose a hazard to animals, water sources or people. ☐ Livestock odors are offensive.	For guidence on this topic, refer to BMP factsheets 15-18, 27 and 31 in Appendix V.
☐ **Maintain healthy plant communities as natural landscapes, gardens or small acreage cropland, and/or forest land.**	☐ Plants have insufficient water for growth. ☐ Invasive or noxious weeds interfere with livestock, crops or other desired plants. ☐ Forest lands require management to promote healthy tree growth and wildlife ☐ Forest lands require management to prevent disease, infestation and wildfire.	For guidence on this topic, refer to BMP factsheets 3-5, 7, 13, 15, 16, 23, 25, 32 and 33 in Appendix V.

☐ **Maintain healthy soil to support plants and animals as well as natural water and nutrient cycles.**	☐ Poor soils on the property do not promote growth of healthy crops or plant communities. ☐ Plant communities do not provide suficcient ground cover at appropriate ☐ Soil erosion occurs on the property. ☐ Soils are compacted by heavy use, or water does not easily seep into the ground. ☐ There is not enough land available to spread animal waste.	For guidence on this topic, refer to BMP factsheets 3, 4, 6, 9-12, and 18 in Appendix V.
☐ **Protect the quality and quantity of water in local streams, groundwater sources and other water bodies.**	☐ Streambanks are not well vegetated and are eroding. ☐ Fertilizer and pesticide management could be improved to keep chemicals out of water bodies. ☐ Irrigation systems could be improved to optimize efficiency and conserve water in streams. ☐ Water bodies may benefit from more surrounding vegetation, or "buffer", to filter pollutants, sediment, and protect from erosion.	For guidence on this topic, refer to BMP factsheets 6, and 19-31 in Appendix V.
☐ **Provide healthy habitat for native wildlife.**	☐ Bridges, culverts, or dams exist on the property that may inhibit fish passage. ☐ A limited variety of plants exist to provide cover and nesting sites for desired species. ☐ Food and water sources are not available year round for wildlife to use. ☐ Clean, cool water is not always available to support fish species, migration, spawning and rearing. ☐ Irrigation intakes may disrupt or be harmful to fish and other aquatic species. ☐ Human activity, roadways/trails or domestic pets threaten wildlife or impair wildlife habitat.	For guidence on this topic, refer to BMP factsheets 9, 11-14, 19, 21, 24, 26, 27, 28, 30-33 in Appendix V.

☐ **Are there social or economic consideratons to address during planning on your property?**

☐ Community wells

☐ Schools

☐ Bordering neighbors

For guidence on this topic, refer to BMP factsheet 29 in Appendix V.

☐ **Are there cultural resources on your property that should be considered, such as stone walls, cellar holes, artifacts, historical cemeteries, etc?**

☐ **Land is currently enrolled in a conservation easement (i.e., RIDEM Forest Legacy Program, Farm Forest and Open Space Program, or Conservation Deed Restriction, etc.)**

Other resource goals or concerns you have that are not listed here:

Step 3: Soils

Your soils are the starting point for productive activities on your property. The types of soils you have will predict the success of growing crops, forest, pasturing livestock and other activities. You may need to manage your soils by adding soil ammendments, such as fertilizers, manure or compost. The amount of water you will need to use on crops also depends on the types of soils you have. For instance, sandier soils will dry out and drain faster than heavier clay soils.

Refer to a soil map to evaluate the soils on your property. A professional working with you on a conservation plan can create a soil map for you. To create one yourself, visit the Web Soil Survey mapping website at http://websoilsurvey.nrcs.usda.gov.

Using Web Soil Survey:

To generate a soils map of your property:

1. Begin by clicking the green button that says Start WSS.

2. Type in your addresss on the navigaton pane on the left side of the screen and click "View". Use the zoom tool to zoom in on a portion of the map (Note: a scale of 1:12000 is best for greater accuracy of interpretation of results. However you may want to view your map at a larger scale to better view property). An aerial photograph is displayed, and you should be able to see your property.

3. Draw an "Area of Interest" (AOI) polygon around the perimeter of your property or general area using the "AOI" button on the top of the viewpane. Click the button and click on the screen where you want to begin your polygon. Right click to create a vertex and double click when your polygon is complete. The acreage of your drawing will be shown in the table on the left portion of the screen.

4. Click on the "Soil Map" tab to see soil types within your AOI. A table is created showing these soil types. Click on the map unit names within the table to see the characteristics associated with each soil type on your property. Print this page to include with your soil map. Record your soil map unit symbols and relevant properties of these soils in the table below. Within the soil description is a land capability class you will find under "Interpretive groups". This describes soil limitations and refers to the suitability of soils for growing most field crops. Refer to the following page to interpret the class code.

5. To print your map, click on the "Shopping Cart" tab. This service is free of charge. Select the features you would like to print.

6. To further evaluate the potential of your soils and complete the table below, click on the "Soil Data Explorer" tab. View the drop down list next to " View Soil Information by Use". Select a land use type. The tabs on this page will help you to further evaluate your soils for that specific land use.

You may obtain a soil sample from your fields for testing to accurately determine the types of soils you have and the amounts of nutrients they contain. More information can be obtained from The University of Masachussetts website at http://www.umass.edu/soiltest, and is also referenced in Appendix II of this workbook.

In the following section, refer to your soil map and resource table to fill out the following soils table. You must analyze the soil characteristics and if/how they will support your planned activities. Given the soils you have, strategize the activities in your fields to best utilize soil characteristics.

Soils Table

Field	Land Use	Soil Map Unit*	Description	Limitations**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

* Use the predominant soil type covering 1/3 or more of a field.

**Use the codes below in the "Limitations" column of the table.

Soil Capability Classes and Subclasses

Capability classes in Rhode Island are designated by numbers 1 - 8. The numbers indicate progressively greater soil limitations and narrower choices for practical use. The classes are defined as follows:

Class 1: soils have few limitations that restrict their use.

Class 2: soils have moderate limitations tht reduce the choice of plants or that require moderate consrvation practices.

Class 3: soils have severe limitations that reduce the choice of plants, or that require special conservaton practices, or both.

Class 4: soils have severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class 5: soils sre not likely to erode but have other limitations, impractical to remove, that limit their use.

Class 6: soils have severe limitations that generally unsuitable for cultivation.

Class 7: soils have very severe limitations that make them unsuitable for cultivation.

Class 8: soils and landforms have limitations that nearly preclude their use for commercial crop production.

Subclasses are soil groups within one class. They re designated by adding a small letter, e, w, s, or c, to the class number, for example 2e.

The letter "e" shows that shows that the main limitation is is risk of erosion, unless close-growing plant cover is maintained.

"w" shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage.

"s" shows that the soil is limited mainly because it is shallow, droughty, or stony.

"c" is used only in some parts of the United States, and shows that the chief limitation is climate that is too cold or dry.

Step 4: Resource Inventory

Once you have mapped your property, take a moment to evaluate your land use. Refer to the Conservation Plan Maps created in Step 1 and the Resource Objectives and Concerns you completed in Step 2. These two steps will help you fill out the table below for each field or management unit on your property. The field numbers on your map should correspond to the numbered fields in the table below. Write in the land use objectives and concerns from Step 2 that apply to each field. This will identify your obectives and concerns for each specific land area you would like to address. Note that the "field" may be any tract of land on your property, not just crop fields, such as forest land or an area you want preserved for wildlife habitat.

Field	Acres	Land Use	Objectives	Concerns
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Livestock Inventory

If you have livestock on your property please complete the Livestock Inventory portion of Step 4: Resource Inventory. Please fill out the form in the following format:

If you have 50 beef cattle grazing on field 1, enter 50-1 in the "Beef Cattle" category.

Beef Cattle:

Dairy:

Goats:

Hogs:

Horses:

Llamas/Alpacas:

Poultry:

Sheep:

Other:

Step 5: Managements

The following pages include management activities you may implement on your farm. Fill out any and all managements that pertain to your goals and objectives. These pages include:

-Cropland

-Pasture

- Livestock Yard Assessment

-Animal Waste

Animal Waste Application and General Management

Animal Waste Storage Assessment

-Forest

-Water Resources

-Wildlife Habitat

Cropland

Use this table to describe the types of crops you produce and management strategies you use. See below for a detailed description of the checkboxes within the table, then fill out the table accordingly. Check all that apply.

Field ID	Acres	Crop type	A) Rotation	B) Irrigation	C) Tillage	D) Residue mgt	E) Buffer	F) Fertilizer	G) Manure	H) Compost
1			☐	☐	☐	☐	☐	☐	☐	☐
2			☐	☐	☐	☐	☐	☐	☐	☐
3			☐	☐	☐	☐	☐	☐	☐	☐
4			☐	☐	☐	☐	☐	☐	☐	☐
5			☐	☐	☐	☐	☐	☐	☐	☐
6			☐	☐	☐	☐	☐	☐	☐	☐
7			☐	☐	☐	☐	☐	☐	☐	☐
8			☐	☐	☐	☐	☐	☐	☐	☐
9			☐	☐	☐	☐	☐	☐	☐	☐
10			☐	☐	☐	☐	☐	☐	☐	☐
11			☐	☐	☐	☐	☐	☐	☐	☐
12			☐	☐	☐	☐	☐	☐	☐	☐

The following statements describe the check boxes in the columns in the table above:

A) Crops are rotated in the field.

B) The field is irrigated.

C) Field is tilled with conventional equipment.

D) Crop residues are allowed to remain on the field after harvest, or cover crops are planted.

E) Vegetated conservation buffers (at least 10 feet in width) exist to intercept field runoff prior to entering streams, ditches, ponds, etc.

F) Field is fertilized with chemical fertilizer.

G) Manure is spread on the field.

H) Compost is spread on the field.

Pasture

Grazing management decisions have a significant influence on vegetation, soil, livestock and wildlife. Enhancement activities associated with grazing management can improve water, nutrient, mineral and energy cycling through more intensive management of livestock.

Increased management of grazing will enhance plant communities. Improved plant communities will improve soil and water quality, reduce erosion and enhance wildlife habitat.

Answer the questions below regarding your pastureland.

- ☐ **A current prescribed grazing plan is administered on the property.**
- ☐ **Livestock have access to streams, ponds or other wetlands, and may be damaging these features.**
- ☐ **Invasive weeds are a nuisance in pastures.**
- ☐ **Soils in pastures are eroding from livestock trails, feeding areas and/or watering areas.**
- ☐ **Grass and forage in pastures is not adequate enough to properly nourish livestock.**
- ☐ **Livestock are rotated among pastures to give plants time to recover.**
- ☐ **Grazing is timed to occur outside of the primary nesting or fawning seasons for wildlife species, or areas of pasture are set aside for wildlife.**
- ☐ **Pastures are seeded and/or legume species are managed in pastures to improve soil and forage quality, increase plant diversity, and provide an alternate source of nitrogen.**
- ☐ **Salt, mineral and supplemental feeding areas are rotated (away from water resources) at least once annually to encourage better livestock distribution.**
- ☐ **Pastures are fertilized.**

Livestock Yard Assessment

1. Distance from your Drinking Water Well

☐ More than 200 ft	☐ 100-200 ft	☐ Less than 200 ft

2. Distance from Surface Water

☐ More than 200 ft	☐ 100-200 ft	☐ Less than 100 ft

3. Distance from a Drainage Feature

☐ More than 200 ft	☐ 100-200 ft	☐ Less than 100 ft

4. Distance from Septic System

☐ More than 200 ft	☐ 100-200 ft	☐ Less than 100 ft

5. What is the soil texture within the livestock yard?

A. Silt Loam
B. Fine Sandy Loam
C. Sandy Loam/Loamy Sand

6. What is the soil drainage like in the yard?

A. Well-Drained	high water table 6 ft or more below surface
B. Moderately Well-Drained	high water table within 18-36 in
C. Excessively Drained/Poorly Drained	water table at or near surface

7. Do you have runoff inputs to the livestock yard? (i.e. stormwater runoff that flows directly through the livestock yard area)

A. No runoff flows through the yard
B. Some runoff flows into the yard
C. All runoff flows through the yard

8. What are the runoff outputs from yard (how much water leaves the yard)?

A. No runoff leaves the yard	1)the area is roofed	2)the floor is poured concrete
B. Some runoff leaves the yard	1)manure is contained and covered	2)runoff output flows to a vegetated area
C. All runoff leaves the yard	1)does not flow to a vegetated area	2)leaves property or flows into a water resource

9. Is your yard paved? If so, select the answer that best describes your livestock yard. If not, skip to question 10.

A. Yard is covered, and cleaned frequently
B. Yard is not covered, but cleaned once a week
C. Yard is not covered and not cleaned frequently

10. Do you have an earthen or gravel yard? If so, select the answer that best describes your livestock yard.

A. More than 75% of the yard is vegetated
B. Between 25-75% of the yard has vegetative cover
C. Less than 25% of the yard has vegetative cover

11. Do your animals have DIRECT access to a water resource? If so, please specify the type of water resource (i.e. lake, pond, stream, river, etc.):

Animal Waste Application and General Management

Managing the waste produced by your animals can have a dramatic effect on the quality of water that you and your family drink. Factors such as type and number of livestock, timing of animal waste applications, and soil characterisitics on your property impact how animal waste will effect your water quality. This worksheet can help you assess your operation and identify areas for improvement. In conjuction with this form, please fill out "Animal Waste Storage Assessment" and "Livesock Yard Assessment" as appropriate.

Directions: Select the statement that best describes your operation and the conditions on your land.

1. Do you currently implement some form of a nutrient management on your farm?

YES
NO

2. Do you test your soils at least once every 2-5 years?

YES
NO

3. Do you have knowledge of the nutrient content of your animal waste?

A. Book value is used to estimate nutrient value.
B. Animal waste analysis is done once a year.
C. No, I do not perform animal waste analysis.

4. Do you know or track the application rate of animal waste when applied to your fields?

YES
NO

5. What are the field conditions like when you apply animal waste?

A. I apply even in saturated or muddy conditions
B. In the late summer, fall, or winter
C. Only to growing crops/during the growing season

6. Please provide any additional information that may be pertinent:

Animal Waste Storage Assessment

1. Distance from your Drinking Water Well

☐ More than 200 ft ☐ 100-200 ft ☐ Less than 100 ft

2. Distance from Surface Water

☐ More than 200 ft ☐ 100-200 ft ☐ Less than 100 ft

3. Distance from a Drainage Feature

☐ More than 200 ft ☐ 100-200 ft ☐ Less than 100 ft

4. Distance from Septic System

☐ More than 200 ft ☐ 100-200 ft ☐ Less than 100 ft

5. What is the soil texture surrounding your storage area?

A. Silt Loam
B. Fine Sandy Loam
C. Sandy Loam/Loamy Sand

6. What is the soil drainage like within the storage area?

A. Well-Drained	high water table 6 ft or more below the surface
B. Moderatley Well-Drained	high water table within 18-36 in.
C. Excessively Drained/Poorly Drained	water table at or near surface

7. Do you have runoff inputs to the storage area? (i.e. stormwater runoff that flows directly through the storage area)

A. No runoff flows through the storage area
B. Some runoff flows into the storage area
C. All runoff flows through the storage area

8. Quantify the runoff outputs from the storage area:
(i.e. how much of the water that flows in flows out?)

A. No runoff leaves the storage area	1)the area is roofed	2)the floor is poured concrete
B. Some runoff leaves the storage area	1)animal waste is contained and covered	2)runoff output flows to vegetated area
C. All runoff leaves the storage area	1)does not flow to vegetated area	2)leaves property or flows into water resource

9. Do you cover your animal waste storage area?

A. Yes, my storage area is covered by a roof
B. I cover my animal waste with a plastic liner
C. I do not cover my animal waste

10. What kind of floor or barrier is there between the ground surface and the animal waste?

Poured Concrete
Concrete Blocks
Plastic Liner
Animal waste is stored in a Wooden Bin
The storage area does not have a barrier or floor
Other

Please provide any additional information that may be helpful in assessing your facility.
Additional considerations may include vegetated buffers around the facility, water tight design, runoff flows are known to flow directly in water resources or off the property, etc.

Forest Management

Forests have many functions. They are renewable resources for fuel and fiber, provide areas for recreation and wildlife habitat, and protect water quality. In this section, think about your goals for your forest land, and how it can best serve your needs. Also consider "the bigger picture". Your forest may contribute to the larger landscape and provide functions benefitting the surrounding community, such as a noise barrier or protecting drinking water quality for you and your neighbors. Keep these things in mind as you set your priorities for forest management.

Please answer the following questions about your forest land. Use your resource goals and concerns as a guide, and refer to your resource map to help you identify problems and opprortunities in forest management.

☐ **A current Forest Stewardship Plan is in place for the property.**

What is your forestry interest? Check all that apply.

☐ Wildlife habitat ☐ Cordwood ☐ Protection of water resources

☐ Recreation ☐ Forest stand improvement ☐ Aesthetics

☐ Timber production ☐ Forest health

Other interest: _____

☐ **The forest site currently managed, or it has been managed in the past.**

What are the dominant types of trees in your forest?

Deciduous hardwoods
Coniferous softwoods
Mixed hardwoods and softwoods
Wetland trees, shrubs & plants

What are the dominant tree species in your forest? Check those that apply.

For help identifying trees visit the Virginia Tech dendrology website:
www.cnr.vt.edu/dendro/dendrology/factsheets.cfm

Deciduous species:

☐ Oak ☐ Aspen ☐ Birch

☐ Maple ☐ Black Cherry ☐ Hickory

☐ Beech ☐ Ash ☐ Black Gum

Coniferous species:

☐ Pine ☐ Red Cedar

☐ Hemlock ☐ Spruce

☐ White Cedar

Other: _____

How would you characterize your tree stand? Trees are measured at DBH (diameter of a tree at breast height - a standard 4.5 feet above the ground)

Tree size:

Seedlings (0-2 in. DBH)
Saplings (2-4 in. DBH)
Poles (4-10 in. DBH)
Small sawtimber (10-14 in. DBH)
Large sawtimber (14 in. DBH & greater)

☐ **Symptoms of disease or insects are exhibited in the forest. If so, it is a good idea to note these patterns on your resource map.**

Are any of the following indicators of disease present? Check all that apply.

- ☐ Crown dieback
- ☐ Low crown density or small crowns
- ☐ Large broken branches
- ☐ Trees with no leaves
- ☐ Cracks in tree trunks
- ☐ Trees that are crooked or lean in one direction
- ☐ Indicators of decay (mushroom shelf, open wounds, wet, weeping spots on trunk or branches)

Are any of the following recreational features present in your forest? Check all that apply.

- ☐ Access roads or paths
- ☐ Small clearings or openings
- ☐ A field or meadow
- ☐ A scenic vista point or potential vista
- ☐ Large or unusual trees

☐ **There are rare, threatened, or endangered species on the site.**

Water Resources

There are many unique characteristics that make water resources valuable to landowners and the surrounding community. Streams, ponds, marshes, groundwater and others all provide a variety of functions and values that are important to us and our surrounding environment. They provide drinking water, areas for recreation, education and aesthetic beauty. They may also serve as valuable wildlife habitat and provide flood protection. It is important to protect the water resources on your property to preserve these functions and values for you, your family and the community.

Like any other resource on your property, you want to maintain the quality of water resources, and use them appropriately. In this section, please evaluate your water resources, how you use them, and how you could improve their functions and values to best suit your needs while maintaining or improving environmental quality. Please make sure all water reources are shown on your resource map.

Are any of the following water resources on your property? Check all that apply.

- ☐ Stream
- ☐ Swamp
- ☐ Areas subject to flooding or stormwater flow
- ☐ River
- ☐ Bog
- ☐ Vernal pool (sesonally flooded depressions)
- ☐ Pond
- ☐ Wet meadow
- Other type: _____

What is your primary water resoure objective?

- ☐ Aesthetics
- ☐ Wildlife
- ☐ Irrigation
- Other objective: _____
- ☐ Recreation
- ☐ Livestock watering
- ☐ Water quality

☐ **Flooding and stormwater from rain events is a concern.**

☐ **There is a minimum of 35 feet of permanent vegetation between streams/rivers and land use activity.**

☐ **Other wetlands on the property are protected by a vegetated buffer of at least 50 feet.**

List any concerns you have about water resources or water quality issues related to land use activities:

Wildlife Habitat Assessment

Wildlife are an integral part of our ecosystems. They shape and balance our landscape and can be a source of food, fiber and recreational enjoyment. Managing your property for wildlife can be rewarding, while providing beneficial habitat for Rhode Island's wildlife species as our state becomes increasingly fragmented with new development and infrastructure. Managing habitat is an effective tool for preserving our native wildlife and attracting preferred wildlife species.

Evaluate habitat quality and your wildlife objectives by answering the following questions:

Which wildlife species currently use your property? (Check all that apply):

- ☐ Squirrel
- ☐ Wild Turkey
- ☐ White-tailed deer
- ☐ Woodcock
- ☐ Hawks / raptors
- ☐ Raccoon
- ☐ Rabbit
- ☐ Fisher
- ☐ Grouse
- ☐ Songbirds
- ☐ Fox
- ☐ Beaver
- ☐ Waterfowl
- ☐ Owls

Check the potential habitat features that are present on your property:

- ☐ Downed trees or limbs
- ☐ Standing dead trees
- ☐ Live-cavity /den trees
- ☐ Mast producing trees (hickory, oak, beech, cherry)
- ☐ Apple trees
- ☐ Berry patches
- ☐ Grassy areas
- ☐ Edge habitat
- ☐ Wildlife food producing shrubs
- ☐ Briar patches or other thickets
- ☐ Evergreen cover (deer wintering areas, etc)
- ☐ Flowering plants / trees

Other special habitat features:

What type of habitat are you interested in creating on your property?

- ☐ Stream habitat
- ☐ Vernal Pool (seasonaly flooded areas)
- ☐ Emergent wetland (erect, rooted herbaceous plants, flooded part of the time)
- ☐ Forested wetland
- ☐ Fish passage
- ☐ Salt marsh
- ☐ Brackish marsh
- ☐ Freshwater tidal marsh
- ☐ Unfragmented forest land
- ☐ Seedling / sapling forest
- ☐ Fields
- ☐ Field border

Other habitat types:

☐ **Land has been previously managed for wildlife**

Total acres that will benefit from habitat restoration (if known):

Step 6: Activities

Use the table below to list farm activities as they occur on your property. Consider your land use objectives and concerns as well as resource use limitations and opportunities that you identified in Steps 1-3. Be sure to list Best Management Practices (BMPs) you will implement along with your planned activities. Refer to Appendix V of this workbook for BMP guidence. If you are working with a conservation planner, include their recommendations.

Planned Activities

Field ID	Objectives	Concerns	Planned Activity	Projected Start Date	BMPs	Additional Reccomendations
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

CHECKLIST: Farmland Conservation Plan

Step 1: Map Submissions (refer to page 3):

- ☐ Land Use Map† including: 1) property boundaries; 2) field boundaries and acreages; 3) fields labeled using FFOS land use categories
- ☐ Plat/Lot Map†
- ☐ Soil Map
- ☐ Resource Map
- ☐ Topographic Map*

☐ Step 2: Land Use Objectives and Concerns Form

☐ Step 3: Soils Table including soil capability classes and subclasses

☐ Step 4: Resource and/or Livestock Inventory Tables

Step 5: Managements (check all that apply)

- ☐ Cropland
- ☐ Pasture
- ☐ Animal Waste (check all that apply)
  - ☐ Animal Waste Application and General Management
  - ☐ Livestock Yard Assessment
  - ☐ Animal Waste Storage Assessment
- ☐ Forest
- ☐ Water Resources
- ☐ Wildlife Habitat

☐ Step 6: Activities Table*

YOUR LOCAL CONSERVATION DISTRICT NEEDS A COPY OF YOUR FINAL CONSERVATION PLAN. This is necessary to secure your enrollment in the FFOS program, so make sure that you hand-deliver or mail a copy of your final conservation plan to your local conservation district.

*These items will be provided by your agricultural consultant, or TSP. All other items can be worked on together with your consultant or independently, however, your consultant must review all supporting materials to check for accuracy.

†These items are to be included with your FFOS application package.

Appendix I: Rhode Island Farm, Forest and Open Space Program

Rhode Island's farms, forests and open spaces provide many benefits to citizens. Local farms ensure a readily available source of food close to metropolitan areas, while forestland and open space are key natural resources that provide recreational areas and contribute to the welfare and happiness of the state's inhabitants. Due to economic pressures to convert these lands to development or another more profitable land use, Rhode Island's farms, forests and open spaces are rapidly disappearing. The Farm, Forest and Open Space Act helps citizens conserve these lands for themselves and future generations.

The information in this Guide may be used to meet the requirements of a Conservation Plan for farmland designation under the Farm, Forest and Open Space Program. Once you compete the sections that are relevant to your farm and your goals, this document will be reviewed and signed by your Conservation District and RIDEM officials. The contents of the Plan and conservation practices you choose to implement must also be reviewed and verified on your farm to qualify for the program. This may require a consultation with your Conservation District official or an agricultural consultant.

For more information on The Farm, Forest and Open Space Program, visit the Rhode Island Department of Environmental Management website at: http://www.dem.ri.gov/programs/bnatres/agricult/farmers.htm

For more information about a Farmland Conservation Plan, and the contents of this Guide, contact the Northern Rhode Island Conservation District office, at 401-949-1480, or visit: http://www.nricd.org

"Farmland" Eligibility Requirements and Enrollment Responsibilities Under

The Farm, Forest and Open Space Program

From Rules and Regulations for Enforcement of the Farm, Forest and Open Space Act, Chapter 44-27 and sections 44-5-39 through 41 of the Rhode Island General Laws of 1956, as amended.
http://www.dem.ri.gov/pubs/regs/regs/agric/ffosimp.pdf

Eligibility:

"*Farmland*" means any tract(s) of land, exclusive of house site, that meets any one of the following conditions and which has a current U.S. Department of Agriculture conservation plan, either applied for or in force within the past 10 years;

- Land which is actively devoted to "agricultural or horticultural use" as set forth in "agricultural operations."
- Land which constitutes a "farm unit" which means land owned by the farmer, including woodland and wetlands, at least (5) acres of which are actively devoted to agricultural and horticultural use and which have produced an annual gross income from the sale of its farm products of a least $2500.00 in one of the two preceding years.
- Land that is actively devoted to agricultural and horticultural use by a "Subsistence Farmer" who derives his or her primary means of sustenance from the consumption of agricultural products grown on their land. Non-farm related income must be low enough to make them eligible for assistance under Title 20 Programs.
- Land which meets the qualifications for payments with the Federal Government for conservation set aside, or it has a combination of income, crop and acreage which in the Director's opinion qualifies this land for inclusion as a farm.

August 26, 2002

Responsibilities:

RULE 6: Applcation for designation of farmland.

A) An owner of land may file a written application with the director for its designation by the director as farmland. When the application is made and after a filing fee of ten dollars ($10.00) is paid, the director shall examine the land. If the director determines that the land is farmland, then the director shall issue a certificate to the owner of the land, and shall file one copy of the certificate in the officeof the assessor of the city or town in which the land is located.

B) An owner of the land designated as farmland by the director may also apply to the assessor of the city or town where the land is located for its classification as farmland on any assessment list maintained by the city or town. Pursuant to R.I.G.L. 44-27-3(c) (1), such an application must be filed with the assessor of the city or town not earlier than thirty (30) days before nor later than thirty (30) days after the date of the assessment, except that in years of revaluation the application must be filed no later than thirty (30) days after written notice of revaluation or in its absence after receipt of the tax bill. The director's designation of that land as farmland must be valid as of a date at or prior to the date of the assessment. Pursuant to R.I.G.L. 44-27-3(d), the application must be made on a form prescribed by the assessor and include a descrption of the land and date of issuance of the director's certificate of designation.

C) Application to the director for designation as farmland shall be made upon forms prescribed by the director and shall include a description of the land and any other information that may be required to aid the director in determining whether the land qualifies for that designation and meets the minimum criteria established in Appendix A (Application For Designation of Farm or Forestland). For continuing eligibility, the property is subject to re-inspection by the director every 5 years or at the request of the tax assessor subject to the management reccomendations prescribed by the plan and approved by the director.

D) Pursuant to 44-27-2(1) (iii), farmland shall be taxed according to agricultural use based upon the following for (4) categories:

Ornamental Crops: including land devoted to floriculture, nursery and turf production, as well as land under greenhouses.

Vegetable and Orchards: including small fruits, potatoes, cranberries, and Christmas trees.

Dairy and Livestock: including forage crops, hay, silage corn and grain, and aquaculture.

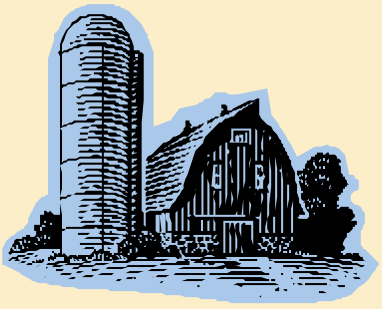
Forest and Wasteland: which is part of the farm property.

E) Reccomended values for farmland will be periodically determined by the Farm, Forest and Open Space Land Value Subcommittee.

CHECKLIST: Farm Forest and Open Space Application

Review the checklist below to make sure you have the materials necessary to complete your Farm Forest and Open Space Application.

- ☐ Farm Forest and Open Space Application with $10.00 check made out to RI DEM
- ☐ Plat/Lot Map of your Property*
- ☐ Land Use Map with:
  1) Property boundaries
  2) Field boundaries with estimated acreage per field
  3) Fields labeled using FFOS land use categories*†
- ☐ Agricultural consultant fee $300**



Once you have consolidated the above materials and delivered your application to RI DEM via your Conservation District, your Farm Forest and Open Space Application is complete. In order to ensure your long-term enrollment in the program you must fulfill the requirements to complete a conservation plan. You can do this with assistance from an agricultural consultant, or Technical Service Provider (TSP). Please contact your local Conservation District for assistance; refer to Appendix 2 for contact information.

*Refer to pp. 2-3 "Conservation Plan Maps" for mapping information and directions.

† These maps maybe consolidated into one map or multiple maps.

**This fee covers farms with up to 50 acres of land. If you have more than 50 acres of farm land you may incur additional fees. Contact your local Conservation District for more information.

Appendix II: Resources and Contacts

The following resources are available to assist the farmer or landowner with conservation and resource protection at home and on the farm. Follow the links to check out information on federal, state, local, and not-for-profit programs and news, as well as helpful information on raising crops, livestock, managing water quality and maintaining healthy watersheds.

Eastern Rhode Island Conservation District (ERICD)

ERICD serves Newport and Bristol Counties. Please contact ERICD at 401.624.7490.

ERICD · 2490 Main Rd · Tiverton, RI 02878

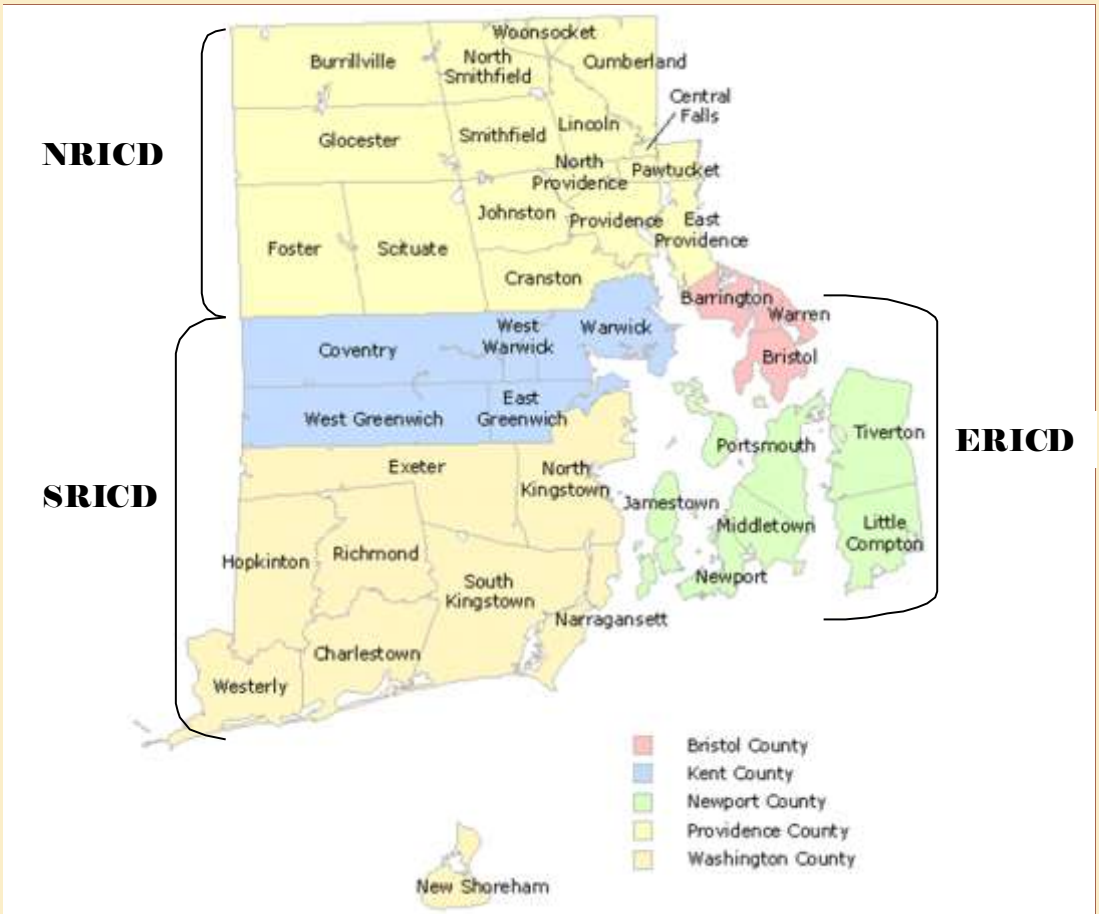
Northern Rhode Island Conservation District (NRICD) *www.nricd.org*

NRICD serves Providence County. Please contact NRICD at 401.949.1480 or visit their website.

NRICD · 17 Smith Ave · Greenville, RI 02828

Southern Rhode Island Conservation District (SRICD)

SRICD serves Kent and Washington Counties. Please contact SRICD at 401.949.1480.



Note: Image is courtesy of RI Department of Labor and Training *www.dlt.ri.gov/lmi/images/county.gif*

Farm Fresh RI *www.farmfreshri.com*

Farm Fresh Rhode Island is growing a local food system that values the environment, health and quality of life of RI farmers and eaters. This organization works to preserve RI farmland, build healthier communities, increase access to fresher/tastier food, and improve working relationships between RI farms, producers, and markets. To contact Farm Fresh RI, visit their website, or send a letter to the address below:

Farm Fresh RI · 1005 Main St #1220 · Pawtucket, RI 02860

Farm Service Agency *www.fsa.usda.gov*

The Farm Service Agency (FSA) is equitably serving all farmers, ranchers, and agricultural partners through the delivery of effective, efficient agricultural programs for all Americans. To learn more about what FSA has to offer RI farmers visit their website. You can also contact them at 401.828.9232.

RI Farm Service Agency · 60 Quaker Lane Suite 40 · Warwick, RI 02886

National Sustainable Agriculture Information Service *http://attra.ncat.org*

ATTRA - National Sustainable Agriculture Information Service is managed by the National Center for Appropriate Technology (NCAT) and is funded under a grant from the United States Department of Agriculture's Rural Business-Cooperative Service. It provides information and other technical assistance to farmers, ranchers, Extension agents, educators, and others involved in sustainable agriculture in the United States. (ATTRA was formerly known as the "Appropriate Technology Transfer for Rural Areas" project.)

ATTRA - National Sustainable Agriculture Information Service · P.O. Box 3657 · Fayetteville, AR 72702

New England Small Farm Institute *http://growingnewfarmers.org*

New England Small Farm Institute (NESFI) is a land-based, non-profit organization. It was founded in 1978 by a local citizens' action group—Women in Agriculture, Food Policy and Land Use Reform—to encourage more sustainable regional agriculture, Our mission is to promote small farm development by providing information and training for aspiring, beginning and transitioning farmers. We maintain an extensive resource collection; produce publications; develop and offer innovative, farmer-guided programs; and advocate for policies that encourage sustainable small-scale agriculture. We seek collaborative program-delivery partnerships with service providers—associates, on-farm mentors, organizations and agencies—throughout the Northeast and nationwide.

New England Small Farm Institute • 275 Jackson St • Belchertown, MA 01007

Pest Resources Online New England *www.pronewengland.org*

PRONewEngland is your website connection to pest management information for New England. The goals for PRONewEngland are to **enhance public understanding** of pest management practices in New England; **improve public access to pest information** by providing access to comprehensive content useful to answer pest questions asked by New England residents; **increase stakeholder participation** in assessing regional pest management needs, providing a coordinated New England perspective to federal regulatory agencies; and to **represent New England in national regulatory decisions,** documenting pest management practices, challenges, and opportunities in New England, and responding to EPA and USDA queries.

RI Department of Environmental Management *www.dem.ri.gov*

The RI Department of Environmental Management (RI DEM) is committed to preserving the quality of Rhode Island's environment, maintaining the health and safety of its residents, and protecting the natural systems upon which life depends. They offer assistance to individuals, business and municipalities, conduct research, find solutions, and enforce laws created to protect the environment. RI DEM offers many services. Please visit their website for more information. You can also contact them at 401.222.6800.

RI DEM Headquarters · 235 Promenade St · Providence, RI 02908

RI Resource and Conservation Development Council *www.ircd.org*

The Resource and Conservation Development Council (RI RC&D) program is designed to encourage and improve the capability of volunteer, locally elected, and civic leaders in designated RC&D areas to plan and carry out projects for resource conservation and community development. RC&D projects relate to the following four areas: 1) Land Conservation; 2) Community Development; 3) Land Management; and 4) Water Management. RC&D can be contacted at 401.822.8877.

RI RC&D · 60 Quaker Lane Suite 45 · Warwick, RI 02886

RI Rivers Council *www.ririvers.org*

The RI Rivers Council was created by statute to coordinate, oversee, and review efforts to improve and preserve the quality of the state's rivers and other water bodies and to develop plans to increase river use. The council is not a regulatory body; its functions are planning, coordination and empowerment. Visit their website or contact them at 401.222.1450 to learn more.

RI Rivers Council · 235 Promenade St · Providence, RI 02908

RI Rural Development Council *www.ruralri.org*

RI Rural Development Council (RI RDC) provides resources for economic development, sustainability, and marketing efforts of rural business in Rhode Island. The council works to preserve and enhance the quality of live in Rhode Island's rural communities, leveraging the resources of Federal, State, local, private, and non-profit efforts to effectively disseminate information and open productive collaborations among those interested in improving the quality of life in rural Rhode Island. To learn more about what RDC is doing in Rhode Island, visit their website. You can also contact them at 401.667.0071.

RI Rural Development Council · 35 Belver Ave, Suite 117 · North Kingstown, RI 02852

Sustainable Agriculture at URI *http://cels.uri.edu/sustainableag*

The purpose of Sustainable Agriculture @ URI is to assist Rhode Island farmers in their ongoing efforts at sustainability. We offer a variety of technical supports through on-site visits, sample analysis, internet resources, and telephone communication. When we don't have the answer, we connect farmers with the people/facilities that do. This website is a small part of meeting that goal -- allowing RI farmers to quickly and easily find answers to common questions.

UMASS Soil & Plant Tissue Testing Laboratory *http://www.umass.edu/plsoils/soiltest/*

The Soil and Plant Tissue Testing Laboratory is located on the campus of the University of Massachusetts at Amherst. Testing services are available to all. Our function is to provide test results and recommendations that lead to the wise and economical use of soils and soil amendments.

URI Cooperative Extension *www.uri.edu/ce*

Cooperative Extension (CE) helps people to improve their lives and communities by extending University-based research for the benefit of families, farms and the environment. This website is a great resource for information about your activities can impact and/or improve the quality of your environment. Visit their website for more information. URI CE can be contacted at 401.874.2900.

USDA-Natural Resources Conservation Service *www.ri.nrcs.usda.gov*

The Natural Resources Conservation Service (NRCS) is a federal agency that works hand-in-hand with the people of Rhode Island to improve and protect their soil, water, and other natural resources. Private landowners can apply for NRCS conservation programs which provide funding to make improvements to their properties natural resources. Please visit Appendix II for more information on NRCS programs or visit their website. You can also contact them at 401.828.1300.

USDA-NRCS RI State Office · 60 Quaker Lane · Warwick, RI 02886

Resource Mapping Websites

RI Critical Resource Atlas *http://www.edc.uri.edu/riatlas*

The goal of this project is to use Geographic Information System (GIS) technology and the Internet to create and distribute maps of the critical natural resources for every town and watershed in Rhode Island. The maps are designed to assist land use managers in planning and development activities, and are easily interpretable for use by the general public. Maps are available in two sizes (8.5" x 11" and 20" x 20") and can be viewed on the screen or downloaded in GIF format (by right clicking while viewing the map) to the user's computer for incorporation into text documents or presentations.

RIDEM Geographic Data Viewer *http://www.dem.ri.gov/maps/*

Over the last 20 years, as a partner in the RI Geographic Information System (RIGIS), DEM has participated in the creation of a library of environmental resource mapping layers. These include protected openspace lands, coastal and freshwater wetlands, ground and surface water protection areas, wildlife habitat, nesting sites, and many others. Using GIS, these layers have been combined with additional map layers created by RIGIS participants (roads, political boundaries, aerial photography, geologic maps) to create numerous maps and applications for DEM staff, planners, consultants and the public. Follow the links to access maps, web-browser applications, RIGIS Data and other GIS Sites. Create customized maps of your area of interest!

Web Soil Survey *http://websoilsurvey.nrcs.usda.gov*

Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information.

Appendix III: USDA-NRCS Assistance Programs

Introduction

The U.S. Department of Agriculture (USDA) and Natural Resource Conservation Service (NRCS) offer landowners financial, technical, and educational assistance to implement conservation practices on privately owned land. Using this help, farmers and ranchers apply practices that reduce soil erosion, improve water quality, and enhance forest land, wetlands, grazing lands, and wildlife habitat. Incentives offered by USDA promote sustainable agricultural practices, which protect and conserve valuable farmland for future generations. USDA assistance also helps individuals and communities restore natural resources after floods, fires, or other natural disasters.

Find more information on these programs at the Rhode Island NRCS website under "Fact Sheets" :

http://www.ri.nrcs.usda.gov/programs/factsheets/

Agricultural Management Assistance

In Rhode Island, Agricultural Management Assistance (AMA) provides cost-share payments to agricultural producers to voluntarily address issues such as water management, and wildlife controls by incorporating conservation into their farming operations. Producers may construct or improve irrigation systems, develop or improve water supply through wells or ponds, install fencing to protect crops or livestock from wildlife damage, and mitigate risk through production diversification or resource conservation practices, including soil erosion control, integrated pest management, or transition to organic farming.

Conservation of Private Grazing Land Program

The Conservation of Private Grazing Land Program (CPGL) is a voluntary program that helps owners and managers of private grazing land address natural resource concerns while enhancing the economic and social stability of grazing land enterprises and the rural communities that depend on them.

Conservation Security Program

The Conservation Security Program (CSP) is a voluntary program that provides financial and technical assistance for the conservation, protection, and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes on Tribal and private lands. The program provides payments for producers who practice good stewardship on their agricultural lands and incentives for those who want to do more. CSP assistance was authorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill).

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) is a voluntary conservation program that promotes agricultural production and environmental quality as compatible National goals. Through EQIP, farmers may receive financial and technical help to install or implement structural and management conservation practices on eligible agricultural land.

Farm and Ranch Lands Protection Program

The Farm and Ranch Lands Protection Program (FRPP) is a voluntary program that helps farmers and ranchers keep their land in agriculture. The program provides matching funds to State, Tribal, or local governments and non-governmental organizations with existing farmland protection programs to purchase conservation easements or other interests in land.

Wildlife Habitat Incentives Program

The Wildlife Habitat Incentives Program (WHIP) is a voluntary program that encourages creation of high quality wildlife habitats that support wildlife populations of National, State, Tribal, and local significance. Through WHIP, NRCS provides technical and financial assistance to landowners and others to develop upland, wetland, riparian, and aquatic habitat areas on their property.

Wetlands Reserve Program

The Wetlands Reserve Program (WRP) is a voluntary program that provides technical and financial assistance to eligible landowners to address wetland, wildlife habitat, soil, water, and related natural resource concerns on private lands in an environmentally beneficial and cost-effective manner. The program provides an opportunity for landowners to receive financial incentives to enhance wetlands in exchange for retiring marginal land from agriculture.

Please check any USDA Programs you may be interested in below:

☐ AMA ☐ CSP ☐ FRPP ☐ WRP

☐ CPGL ☐ EQIP ☐ WHIP

Appendix IV: URI Cooperative Extension: Livestock on Small Acreages

Livestock on Small Acreages Factsheet Series:

1. Livestock on Small Acreages
2. Livestock Yards and Manure Storage Areas on Small Acreages
3. Livestock Pastures, Fencing and Watering on Small Acreages
4. Assessing Your Risks to Water Resources

healthy landscapes

clean water starts at home

www.uri.edu/ce/healthylandscapes

Livestock on Small Acreages

Protecting Water Resources and Health

Holly K. Burdett
W. Michael Sullivan

Fact sheet 1, Small Acreage Livestock Series, April 2005

Many small acreage livestock owners live within or close to high density residential areas. Unlike rural properties that are spacious and buffered by woodlands and fields, residential properties usually consist of smaller lots in close proximity to water resources such as ponds, streams, drinking water wells, storm drains and ditches. The amount of land per animal is typically very small, which often creates problems with manure storage, handling and utilization. As rain and snowmelt travel over the land surface and soak down into the groundwater, it can carry pollutants associated with livestock manure and related activities. These pollutants can harm nearby water resources including your own drinking water well or your neighbor's.

What are the concerns?

Livestock manure. As with human and pet waste, livestock manure contains pathogens and nutrients. They can degrade water resources making them unsafe and undesirable for drinking, swimming, boating, fishing, shell fishing, scenic value, and aquatic life. Bacteria and other pathogens such as viruses and parasites can cause disease. Livestock are especially at risk for continuous parasite infestations when manure, livestock yards and pastures are improperly managed. Nutrients, primarily nitrogen and phosphorus, cause a decline in surface water quality by promoting the growth of algae and weeds. In addition, nitrate-nitrogen is a drinking water contaminant that can cause methemoglobinemia (Blue Baby Syndrome) in infants as well as animals of all ages. Elevated nitrate-nitrogen levels can also cause reproductive problems in humans and animals. Federal Drinking Water Standards allow for a maximum of 10 milligrams per liter (mg/l) of nitrate-nitrogen in drinking water, however, levels as low as 5 mg/l can affect animal health.

Photo courtesy of USDA NRCS

Do you know?

- One average 1,000 pound horse generates 8-10 tons of manure each year. This contains the same amount of nutrients generated by 13 people or four households, annually.

- It takes one to two acres of land to support:
  - One 1,000 pound horse or cow
  - Or 5 to 10 sheep or goats
  - Or 2 to 5 pigs

- Properly managed manure storage areas, livestock yards, pastures and eliminating direct animal access to surface waters protects nearby water resources, including your own drinking water well. It also protects the health of your family and animals. Proper management is the key to minimizing risks and adverse impacts.

- A properly managed pasture provides feed through the months of April to October. It needs to have rest periods during that time to allow for vegetative re-growth. Is your pasture really just a large livestock yard?

Refer to fact sheet 4 and our self-assessment worksheets 1 and 2 to evaluate your own livestock management activities.

A sound livestock management program will protect nearby water resources, human and animal health from pollutants associated with your livestock.

What are some solutions?
Some basic components of a sound livestock management program should include:

- Proper manure management – storage, handling and utilization
- Proper livestock yard management
- Proper pasture management
- Alternative watering sources -- limiting direct animal access to water resources (streams, ponds, wetlands, wells, etc.)

Making the connection between animal numbers and the land needed to support them. The number of animals that can be supported by the land is based on many factors including the ability to provide feed (pasture, hay or other forage crop), safe manure handling and utilization, and animal access to pastures, water and livestock yards. For planning purposes, a general rule of thumb is that it takes one to two acres of land to support one animal unit or 1,000 pounds of live animal weight. This is often referred to as a stocking rate.

Many small acreage livestock owners do not have the corresponding land, resources and equipment to raise all of the necessary feed and safely handle and utilize of all the manure produced. **This results in the need to transport the surplus manure and nutrients to another location that can safely handle and utilize the manure. Even if land is ample, improperly managed manure storage areas, livestock yards, pastures and direct animal access to water resources may result in pollution and health risks.**

Livestock yards. Livestock yards are typically used for animal feeding, handling, exercise and loafing. They are often referred to as corrals, pens, feedlots, etc. They are not to be confused with a properly managed pasture that supplies part or all of an animal's forage requirements. Livestock yards are usually located near a barn or homestead and are usually relatively small in area compared to the number of animals occupying them. Livestock yards tend to be occupied

Understanding the relationship between livestock weight and land resources

How much an animal weighs directly relates to the amount of feed it requires and the amount of manure it generates. It is the basis for determining the amount of land that can support a certain number of animals. This is often referred to as a stocking rate.

- One animal unit = 1,000 pounds of live animal weight.
- One to two acres of land is needed to support one animal unit.
- Even if land is ample, improperly managed manure storage areas, livestock yards, pastures and direct animal access to water resources can result pollution and health risks.
- One average horse usually weighs about 1,000 pounds and equals one animal unit. This horse will generate 45 to 50 pounds of manure (0.75 to 0.8 cubic feet) per day, not including bedding or feed waste.

Livestock weight varies depending on the type, breed, gender, age, and what you are raising them for such as: food, fiber, working, breeding, pleasure, etc.

Some Average Livestock Weights
Horse, 1,000 to 1,250 lbs.
Pony 500 to 650 lbs.
Dairy Cow, Holstein – 1,400 lbs.
Dairy Cow, Jersey – 1,000 lbs.
Breeding age dairy heifer (15 months) – 750 lbs.
Dairy young stock 150 to 500 lbs.
Beef cow – 1,000 lbs.
Beef steer finished – 1,250 lbs.
Beef young stock – 450 to 750 lbs.
Sheep or goats 100 to 125 lbs.
Ewe with lamb – 200 lbs.
Growing pig – 65 lbs.
Finishing pig – 150 to 275 lbs.
Sow – 275 to 500 lbs.
Sow with litter – 375 to 600 lbs.
Boar – 350 to 800 lbs.

Information taken from USDA Natural Resources Conservation Service Animal Waste Management Field Handbook; Livestock Waste Facilities Handbook; and other sources.

daily for many hours at a time and are also sources of concentrated animal waste. They are often wet and muddy for much of the year and a potential source of continuous parasite infestation for your livestock. They can pose both animal health and water quality risks. Refer to our Self-assessment Worksheet 1 *Livestock Yards and Access: Assessing Your Risks* for a minimum recommended area per animal for sizing a livestock yard. This minimum livestock yard area should not be confused with the total land area needed to support one animal unit or 1,000 pounds of live weight (a stocking rate).

Improperly managed manure storage areas, livestock yards, pastures and direct animal access to water resources. In addition to being sources of livestock manure and associated pollutants, these areas can also be sources of soil erosion, sedimentation and surface runoff. When sediments reach a surface water body, they may destroy aquatic habitats, smother feeding and breeding grounds, clog fish gills, and make the water cloudy or turbid. Sediments can also have certain pollutants attached to them, including pathogens, phosphorus, and some chemicals such as pesticides. Surface runoff will carry various pollutants and sediments to nearby surface waters, storm drains and drinking water wells, degrading water quality. Rain and snowmelt can also soak into the groundwater carrying various pollutants from these areas, which especially increases the risk to private wells on or near the property.

Pastures. When properly managed, a typical pasture in the Northeast consists of perennial cool season grasses, legumes (such as white clover), and forbs (broadleaved plants such as chicory) that are nutritious and desirable to the grazing animals. They provide some or all of an animal's forage requirements during the grazing season which typically occurs through the months of April to October. Pastures need to have rest periods during that time to allow for vegetative re-growth. Many livestock owners confuse pastures with livestock yards. A properly managed livestock yard is actually an important part of good pasture management, because it provides the animals with an outdoor loafing and exercise area when pastures are in need of rest and vegetative re-growth.

Pastures that are over-grazed and improperly managed can contain sparse vegetation, bare spots, and an abundance of undesirable weeds (such as thistle, milkweed, burdock, etc). The desirable pasture plants will have a very low residue height (one inch or less) which weakens the roots and allows for the bare spots, weed invasions and increased surface runoff and soil erosion.

Depending on the type of animals grazed, the type of soils, and the condition of the pasture, one to two acres of properly managed pasture can support one average mature horse or cow during the grazing season. Under proper management, the desirable pasture vegetation is healthy and vigorous which reduces risks of soil erosion and surface runoff. This healthy vegetation also recycles the manure and nutrients being deposited, minimizing risks to surrounding water resources.

Direct animal access to water resources. Many small acreage livestock owners rely on streams or ponds to provide animals with easy access to drinking water. Allowing animals to graze right up to and/or access a water body or wetland will have serious adverse impacts on water quality. Animals will trample vegetation along the shoreline, causing erosion, sedimentation and bank instability. The water body will receive direct surface runoff from surrounding areas and manure deposits, both of which are high in pollutants. Livestock may also have uncontrolled, regular access to the vicinity of a drinking water well due to limited space or poor planning.

Protecting nearby water resources from livestock waste and activities depends on natural site conditions along with your management practices, often referred to as Best Management Practices (BMPs).

Your actions can make a difference

Protecting and improving our water resources and health requires each of us to take action. To become a responsible livestock owner and land steward, learn about, plan for and carry out the steps that best suit your operation while protecting the health of your family, animals and the environment.

What are some solutions?

- Proper manure management – storage, handling and utilization
- Proper livestock yard management
- Proper pasture management
- Alternative watering sources -- limiting direct animal access to water resource areas (streams, ponds, wetlands, wells, etc.)

Refer to our additional fact sheets and self-assessment worksheets for more information. Available on-line, www.uri.edu/ce/healthylandscapes

- ☑ Fact sheet 2: *Livestock Yards and Manure Storage Areas on Small Acreages: Protecting Water Resources and Health*
- ☑ Fact sheet 3: *Livestock Pastures, Fencing, and Watering on Small Acreages: Protecting Water Resources and Health*
- ☑ Fact sheet 4: *Livestock on Small Acreages: Assessing Your Risks to Water Resources*
- ☑ Self-assessment worksheet 1: *Livestock Yards and Access: Assessing Your Risks*
- ☑ Self-assessment worksheet 2: *Livestock Manure Storage: Assessing Your Risks*

For More Information and Assistance

University of Rhode Island Cooperative Extension Home*A*Syst Program, (401) 874-5398, www.uri.edu/ce/wq; for more information on private well protection and residential pollution prevention topics. For more information on sustainable landscaping and pet waste management, see our website www.uri.edu/ce/healthylandscapes.

USDA Natural Resources Conservation Service and your local Conservation District, (401) 828-1300, www.ri.nrcs.usda.gov; for technical information on livestock manure management, pasture management and renovation, soil erosion and runoff control, and soil maps.

Your local government: check for local ordinances and other laws that may apply to raising livestock in your area.

The information in this fact sheet is partially adapted from the following resources:

Bonnie E. Lamb and W. Michael Sullivan. 1993. Horse-Keeping on Small Acreage: Protecting Groundwater and Surface Water. University of Rhode Island College of Resource Development, Department of Natural Resources Science, Cooperative Extension

Good Neighbor Guide For Horse-Keeping: Manure Management. 1990. University of New Hampshire, Cooperative Extension.

Schmidt, J.L. and B.F. Wolfley. 1992. Protecting Groundwater: Managing Livestock On Small Acreage. Washington State University, Cooperative Extension. Publication Number EB1713.

The USDA Natural Resources Conservation Service Agricultural Waste Management Field Handbook and Livestock Waste Facilities Handbook.

Holly K. Burdett is a Research Associate with the University of Rhode Island Cooperative Extension Home*A*Syst Program, Department of Natural Resources Science, and Dr. W. Michael Sullivan is a Professor of Agronomy, Department of Plant Sciences, College of the Environment and Life Sciences, University of Rhode Island. This fact sheet was prepared April 2005.

Special thanks to the staff at the USDA Natural Resources Conservation Service, Warwick, RI for review of this fact sheet.

Healthy Landscapes is a project of the University of Rhode Island Cooperative Extension and the Town of North Kingstown, Rhode Island. It is funded by the USDA CSREES, National Integrated Water Quality Program. Cooperative Extension in Rhode Island provides equal opportunities in programs and employment without regard to race, sex, color, national origin, sex or preference, creed or disability. This is contribution number 4093 of the College of the Environment and Life Sciences, University of Rhode Island.

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www.uri.edu/ce/healthylandscapes

Livestock Yards and Manure Storage Areas on Small Acreages

Protecting Water Resources and Health

Holly K. Burdett
W. Michael Sullivan

Fact sheet 2, Small Acreage
Livestock Series, April 2005

Many small acreage livestock owners live within or close to high density residential areas. Unlike rural properties that are spacious and buffered by woodlands and fields, residential properties usually consist of smaller lots in close proximity to water resources such as ponds, streams, drinking water wells, storm drains and ditches. The amount of land per animal is typically very small, which often creates problems with manure storage, handling and utilization. As rain and snowmelt travel over the land surface and soak down into the groundwater, it can carry pollutants associated with livestock manure and related activities. These pollutants can harm nearby water resources including your own drinking water well or your neighbor's.

What are some solutions?

Some basic components of a sound livestock management program should include:

- Proper manure management – storage, handling and utilization
- Proper livestock yard management
- Proper pasture management
- Alternative watering sources -- limiting direct animal access to water resources (streams, ponds, wetlands, wells, etc.)

This fact sheet, the second in a series of 4, provides specific tips and resources for the proper management of manure and livestock yards. Refer to fact sheet 3 *Livestock Pastures, Fencing, and Watering on Small Acreages: Protecting Water Resources and Health* for specific tips and resources on those topics.

Manure Management

The Goal: Minimize the loss and transport of nutrients, pathogens and sediments from livestock manure to nearby water resources.

The most important factors in achieving this goal include: minimizing the exposure of manure to rain and snow, reducing excessive manure loading to livestock yards and land resources, and safely utilizing the manure on gardens and farmland using sound practices.

Precipitation and runoff that flow through manure piles, compost sites and livestock yards will carry pollutants to nearby water resources. Manure piles and compost sites also generate leachate or liquids that contain high concentrations of nutrients and pathogens as the manure decomposes.

Livestock yards are typically used for animal feeding, handling, exercise and loafing. They are not to be confused with a properly managed pasture that supplies part or all of an animal's forage requirements. They are usually located near a barn or homestead and are usually relatively small in area compared to the number of animals occupying them. Livestock yards tend to be occupied daily for many hours at a time and are also sources of concentrated animal waste. They are often wet and muddy for much of the year and a potential source of continuous parasite infestation for your livestock. They can pose both animal health and water quality risks. Refer to Self-assessment worksheet 1 *Livestock Yards and Access: Assessing Your Risks* for a minimum recommended area per animal for sizing a livestock yard. This minimum livestock yard area should not be confused with the total land area needed to support one animal unit or 1,000 pounds of live weight (a stocking rate).

Manure, bedding and feed waste that is collected from barns and livestock yards should be temporarily stored until it can be safely utilized as a valuable natural fertilizer on gardens and farmland. It is important to

identify whether you have a surplus of manure and nutrients compared to the land available. Start with the general rule of thumb that it takes about one to two acres of land to support one animal unit or 1,000 pounds of live animal weight. Soil testing is the primary way to determine if the land you have available is in need of supplemental nutrients and in what amount. If you have a surplus of manure and nutrients, you will need to arrange for it to be transported to another location that can safely handle and utilize it.

Here are some manure storage and livestock yard management tips:

- Store manure in roofed or covered areas protected from the weather. For small volumes, dumpsters may be an option. Tarpaulins or plastic liners may provide adequate cover if they are weighted down against the wind.
- Roof part or all of a livestock yard to prevent exposure to rain and snow. This set-up may serve as a combined livestock yard and manure storage area.
- Store manure on a poured concrete surface or impermeable liner to prevent concentrated leachate from entering groundwater. This is especially important if: 1) you do not have a covered storage area, 2) the soils on your property are sandy with rapid drainage, or 3) there is a seasonal high water table. Contact the USDA Natural Resources Conservation Service for local soil map information.
- Provide enough storage area for the manure, bedding and feed waste generated. For example, the annual production of manure and bedding from one horse requires about 144 square feet (12' by 12') of confined storage with a manure accumulation depth of 3-5 feet.
- Do not locate manure storage areas and livestock yards within 100 feet of a drinking water well or near surface water resources and storm drains. Be sure to check with all Federal, state and local laws that apply to activities occurring near a surface water or wetland.
- Keep "clean" water from entering the manure storage areas and livestock yards. Divert roof runoff and other surface runoff to a well-vegetated area that is not prone to erosion. Roof gutter downspout extensions, surface or underground pipe, crushed stone and gentle grassed swales may need to be installed.
- Locate manure storage areas for practical loading and unloading. When using equipment such as a front-end loader tractor, manure storage areas with a corner push-up wall can be useful. Earthen, wooden or pre-cast concrete block walls can also help with containment and diverting "clean" water from entering the manure storage area.
- Direct runoff that travels off of manure storage areas and livestock yards to level or gently sloping, well-vegetated areas such as grasslands and woodlands. The runoff from these areas should not travel towards water resource areas, drinking water wells, driveways, paved areas or flow directly off of the property. A gently sloping grassed swale or plot of grass may need to be installed to capture, settle and filter the runoff as needed. Installing a vegetative buffer of tall, coarse grasses around the outer perimeter of a livestock yard may be another alternative. Grasses could include tall fescue, reed canary grass and perennial ryegrass. If existing pastureland surrounds the livestock yard, consider leaving a buffer area where livestock do not graze as frequently, allowing the grass to grow longer between mowing and grazing events. Depending on the size of the livestock yard and volume of runoff, sediments may accumulate in the grassed areas and need to be removed periodically to allow for even, steady flow. A settling area, which will require regular cleaning, may need to be installed to trap sediments before dispersing the runoff to vegetated areas.
- Avoid locating a manure storage area or livestock yard upslope of a drinking water well, storm drain or water body. If land constraints do not allow for this, it is very important that the manure and livestock yards be covered and contained, reducing or eliminating runoff from these areas.

Additional tips for managing livestock yards:

- Establish more than one livestock yard to rotate between every two to four weeks. This helps alleviate mud and excessive manure loading.

- When raising cattle, pigs, sheep or goats and the animal concentrations are high, one way to reduce wet, muddy conditions is to install a poured concrete pad surface within the yard. This is common for outside feeding areas, sometimes known as a feedlot. A concrete curb helps to direct surface runoff to a designated area where a settling basin and vegetated filter strip can be installed to handle the runoff. Installing a corner wall is useful for pushing up and stacking manure with a front-end loader tractor. Scrape and clean the concrete pad at least one time per week. Roughing the concrete into grooves during construction can help counteract the potential for slipping during wet and frozen conditions. Roofing all or part of the concrete pad provides both shelter and water quality protection.

An earthen yard is generally preferred for foot health and animal loafing and is best saved for dry conditions. Where needed, a combination concrete pad and earthen yard can provide flexibility with outside access during various weather conditions. Solid waste accumulations should be removed from earthen yards as frequently as possible. Here are some additional management tips for an earthen yard:

- Limit animal access during wet, muddy conditions. Confine the animals to the barn or roofed areas. This will increase manure collection and storage needs.
- Haul in some sand and gravel to create a mound or "dry spot" for animal loafing. Be sure that you do not create drainage problems, such as low spots where water collects and ponds. Geo-textile fabric can be used in conjunction with sand to enhance earthen livestock yards. This option requires proper engineering and maintenance. View the Ohio State University Fact Sheet *Using Geotextile Fabric in Livestock Operations* at http://ohioline.osu.edu/aex-fact/0304.html or contact the USDA Natural Resources Conservation Service for more information.
- Periodically spread wood chips to help counteract muddy conditions.

Here are some tips for safe manure utilization:

If you have a surplus of manure and nutrients being generated on your property:

- Develop a network of neighbors and gardeners who need the manure for their gardens.
- Locate farms, nurseries and composting operations that would use the manure. The RI Resource Conservation and Development Council maintains a list of Certified Composting Facilities that will take manure, www.rircd.org.
- Compost the manure, by itself or along with other materials such as leaves and grass clippings to improve its desirability for use by others. Proper composting will destroy the weed seeds in raw manure. Composting methods can be simple or sophisticated depending on the volume of material and the desired end product. Most composting methods will include the use of constructed bins or pads for larger windrows to allow for necessary periodic turning and aerating of the materials. On-farm composting publications can be located at the Natural Resource, Agriculture and Engineering Service at www.nraes.org. Contact RI DEM Division of Agriculture for information on agricultural compost certification.

If you do spread manure on your own land, apply only enough to meet plant nutrient needs. Applying too much of it at the wrong time of year increases pollution risks. It is important to keep records of all manure applications to your land.

- Soil testing will help you determine how much manure to apply and when to apply it. Apply manure to fields and gardens only when a soil test indicates a need. When manure is applied to land on a regular basis, phosphorus levels can build up to a high level in the soil. In this case, manure or compost should not be applied to these areas. Instead, it should be applied to other fields and gardens where a soil test indicates a need for phosphorus. Soil tests can be sent to any land grant university soil testing lab such as the University of Connecticut or University of Massachusetts, as well as a reputable private soil testing lab. When sending the soil test, it is important to fill out the entire order form and note the following information:

1) The type of crop(s) that will have the manure applied. Examples include grass pasture, mixed grass-legume hay field, vegetable garden, corn field, nursery field stock, etc.
2) It is also important to indicate what type of manure you are applying (horse, cow, sheep, etc.) and for how many years you have been doing so—or will this be the first time you are applying the manure to this field or garden. If you have been applying manure, provide an estimate of the rate at which you have been applying it in pounds per 1,000 square feet or tons per acre. Remember, keep records!

- For annual gardens and crops, turn the manure into the soil immediately after spreading to reduce nutrient losses. Manure can also be spread thinly and evenly over grasslands immediately after hay cuttings or mowing. If applying to pastureland, it is important to spread the manure thinly and evenly about one month before grazing.
- Avoid spreading manure during winter months and on frozen, snow-covered and muddy ground. Late fall through mid-Spring is a key period where properly managed manure storage areas are needed.

Your actions can make a difference

Protecting and improving the quality of our water resources requires each of us to take action. To become a responsible livestock owner and land steward, learn about, plan for and carry out the steps that best suit your operation while protecting the health of your family, animals and the environment.

For More Information and Assistance

University of Rhode Island Cooperative Extension Home*A*Syst Program, (401) 874-5398, www.uri.edu/ce/wq; for more information on private well protection and residential pollution prevention topics.

USDA Natural Resources Conservation Service (401) 828-1300, www.ri.nrcs.usda.gov; for technical information on livestock manure management, pasture management and renovation, soil erosion and runoff control, and soil maps.

Rhode Island Resource Conservation and Development Council, Inc., (401) 822-8877, www.rircd.org, for a list of Certified Composting Facilities that will take manure.

UCONN Soil testing lab, (860) 486-4274
www.canr.uconn.edu/plsci/stlab.htm
UMASS Soil testing lab, (413) 545-2311
www.umass.edu/plsoils/soiltest

Natural Resource, Agriculture and Engineering Service, Cooperative Extension, (607) 255-7654, www.nraes.org, for on-farm composting publications.

Rhode Island Department of Environmental Management, Office of Water Resources, (401) 222-3961, www.dem.ri.gov, for information on state laws pertaining to activities within or near a water resource.
Division of Agriculture, (401) 222-2781, for information on agricultural compost certification.
RI Coastal Resources Management Council, (401) 783-3370, www.crmc.ri.gov, for information on state laws pertaining to activities within or near a coastal water resource.

The information in this fact sheet is partially adapted from the following resources:

Bonnie E. Lamb and W. Michael Sullivan. 1993. Horse-Keeping on Small Acreage: Protecting Groundwater and Surface Water. University of Rhode Island College of Resource Development, Department of Natural Resources Science, Cooperative Extension

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Livestock Pastures, Fencing and Watering on Small Acreages

Protecting Water Resources and Health

Holly K. Burdett
W. Michael Sullivan

Fact sheet 3, Small Acreage Livestock Series, April 2005

Many small acreage livestock owners live within or close to high density residential areas. Unlike rural properties that are spacious and buffered by woodlands and fields, residential properties usually consist of smaller lots in close proximity to water resources such as ponds, streams, drinking water wells, storm drains and ditches. The amount of land per animal is typically very small, which often creates problems with manure storage, handling and utilization. As rain and snowmelt travel over the land surface and soak down into the groundwater, it can carry pollutants associated with livestock manure and related activities. These pollutants can harm nearby water resources including your own drinking water well or your neighbor's.

What are some solutions?

Some basic components of a sound livestock management program should include:

- Proper manure management – storage, handling and utilization
- Proper livestock yard management
- Proper pasture management
- Alternative watering sources -- limiting direct animal access to water resources (streams, ponds, wetlands, wells, etc.)

This fact sheet, the third in a series of 4, provides specific tips and resources for the proper management of pastures as well as fencing and watering techniques that eliminate direct animal access to water resources. Refer to fact sheet 2 *Livestock Yards and Manure Storage Areas on Small Acreages: Protecting Water Resources and Health* for specific tips and resources on those topics.

Pasture Management

When properly managed, a typical pasture in the Northeast consists of perennial cool season grasses, legumes (such as white clover), and forbs (broadleaved plants such as chicory) that are nutritious and desirable to the grazing animals. They provide some or all of an animals forage requirements during the grazing season which typically occurs through the months of April to October. Pastures need to have rest periods during that time to allow for vegetative re-growth. Many livestock owners confuse pastures with livestock yards. A properly managed livestock yard is actually an important part of good pasture management, because it provides the animals with outdoor loafing and exercise when pastures are in need of rest and vegetative re-growth.

Pastures that are over-grazed and improperly managed can contain sparse vegetation, bare spots, and an abundance of undesirable weeds (such as thistle, milkweed, burdock, etc.) The desirable pasture plants will have a very low residue height (one inch or less) which weakens the roots and allows for the bare spots, weed invasions and increased surface runoff and soil erosion.

Depending on the type of animals grazed, the type of soils, and the condition of the pasture, one to two acres of properly managed pasture can support one average mature horse or cow during the grazing season. Under proper management, the desirable pasture vegetation is healthy and vigorous which reduces risks of soil erosion and surface runoff. This healthy vegetation also recycles the manure and nutrients being deposited, minimizing risks to surrounding water resources.

Direct animal access to water resources

Many small acreage livestock owners rely on streams or ponds to provide animals with easy access to drinking water. Allowing animals to graze right up to and/or access a water body or wetland will have

serious adverse impacts on water quality. Animals can trample vegetation along the shoreline, causing erosion, sedimentation and bank instability. The water body will receive direct surface runoff from surrounding areas and manure deposits, both of which are high in pollutants. Livestock may also have uncontrolled, regular access to the vicinity of a drinking water well due to limited space or poor planning.

Here are some pasture management tips:

- Generally, pasture vegetation should begin to be grazed at a height of 6 to 8 inches down to a residue height of 3 to 4 inches. Move the animals to allow for re-growth to the 6 to 8 inch height. These grazing heights optimize nutritional value and palatability for the animals as well as pasture re-growth and plant health.
- Adjustments to these grazing heights may be necessary depending on forage species and type of livestock. Sheep may do better to begin grazing at a height of 4 to 6 inches. Horses prefer to graze pastures that are taller and higher in fiber.
- Portable electric fencing options allow for the flexible subdivision of pastures into smaller paddocks to balance forage supply with forage demand for a given time period. Pasture paddocks should be sized as needed to provide the number of animals being grazed with anywhere from one to no more than seven days of grazing at a time.

Portable electranet fencing provides these sheep with two full days of grazing at a time. Gilbert Stuart Road Demonstration Site, North Kingstown, RI.

- If you do have adequate pastureland, subdividing the area into paddocks that the animals graze for no more than seven days at a time is crucial for optimizing pasture productivity and health. Otherwise, animals will start to re-graze the tender new shoots that are trying to re-grow, leaving less desirable forage to head out and go so seed, slowing down its growth and becoming less nutritious. This can actually lead to a situation where some of the area is being over-grazed and some of the area is being under-grazed at the same time.
- If you have limited pastureland, the goal will be to reduce over-grazing and allow pasture vegetation to have periods of time when it can rest and re-grow. The pasture will not be a primary source of feed in this case. Allowing for some re-growth is especially important during hot, dry summer months when pasture recovery can take as much as 36 to 40 days or more, depending on rainfall, compared to a 14 to 20 day recovery time in May and early June. Consider splitting up the pasture into two or more paddocks that the animals can rotate between at least every two to four weeks. If this is not feasible, you may need to consider removing them from the pasture for a few weeks at a time and keeping them in a properly managed livestock yard, “sacrifice paddock” or the barn. You may also consider limiting the time they spend on the pasture to just a couple of hours each day.
- If you do have adequate pastureland, understand that you may have excess forage during the spring—you may have trouble keeping up with pasture growth depending on how many animals you have and whether you can mow some of the area for hay production.
- Contact the USDA Natural Resources Conservation Service for more information on rotational grazing systems.

Other pasture management tips:

- To promote uniform and vigorous growth, clip or mow pastures periodically (two or three times each season). This helps to stimulate new growth in areas that have grown tall and gone to seed.
- Scatter and disperse manure clumps by dragging pastures with a chain-link or flexible tine drag. This

reduces areas of rejected forage and helps to control parasites.

- Lime and fertilize pastures according to soil test results. Maintaining an optimum soil pH through liming is important for desirable cool-season grasses and legumes. Maintaining a stable nutrient balance in the soil is also important. Excess nutrients can cause animal health as well as water quality problems, so supplement with fertilizer only when a soil test indicates a nutrient deficiency.
- Through proper grazing and nutrient management, desirable forage species (cool-season grasses, legumes, forbs, etc.) tend to persist and dominate. Pastures can often be renovated without the need to plow up and reseed the area, but it may take a few years to achieve desired results. For more information on pasture forage species and pasture renovation techniques, contact the USDA Natural Resources Conservation Service. You may also wish to visit the Penn State Agronomy Fact sheet series website at www.agronomy.psu.edu/Extension/Facts/AgFacts.htm

What about fencing and watering?

Fencing and watering are key components to good pasture management and protecting water resources from direct animal access. To provide animals with clean drinking water and eliminate direct access to surface waters, portable watering troughs with automatic float valves are commonly used. The water may be piped to the trough through various pumping or gravity methods depending on the water source.

Here are some fencing and watering tips:

- Use secure permanent or semi-permanent fencing to protect streams, ponds and wetlands from animal access. Where possible, maintain a minimum 10 foot strip of vegetation between the fencing and water's edge.
- When using a stream or pond as a watering source, consider pumping the water to a holding tank or watering trough that is located within a pasture or livestock yard. Hydraulic ram pumps use the energy of flowing water (such as a stream) to lift water to an elevated storage tank or other discharge point. Nose-operated demand pumps use animal power and may be an option for adult cattle in areas where low lifts of water are needed. Depending on the topography, a storage tank can be located at a high point on the property allowing for gravity feed to watering tubs.
- If livestock must access a stream for crossing, or when alternative watering options are not immediately feasible, consider fencing a vegetative buffer strip for the majority of the shoreline edge, and minimizing the livestock access area. The access area may need to be protected with crushed stone or other erosion control techniques. Check with all laws that may apply. The USDA Natural Resources Conservation Service has planning information on livestock access and crossings.
- Avoid allowing animals to graze or access areas within 100 feet of a drinking water well.
- Livestock watering and fencing supplies have come a long way. The importance of shoreline buffers along with a renewed interest in rotational or management intensive grazing systems has created a demand for innovative, effective, and efficient fencing and watering products. Electric fencing can consist of permanent (usually for perimeter, feedlot, shoreline fencing), semi-permanent (usually consisting of steel posts) and portable varieties (step-in posts and polywire or electranet fencing), and it is widely used for efficient grazing systems. Electric fence chargers are very important. They must be properly installed and grounded and provide a charge (joules or volts) that the type and number of animals will respect. AC (alternating current), battery and solar powered chargers are widely available.

A solar panel is being used to compliment and prolong the life of a dry cell battery powered electric fence charger. Gilbert Stuart Road Demonstration Site, North Kingstown, RI.

Your actions can make a difference
Protecting and improving the quality of our water resources requires each of us to take action. To become a responsible livestock owner and land steward, learn about, plan for and carry out the steps that best suit your operation while protecting the health of your family, animals and the environment.

For More Information and Assistance:
University of Rhode Island Cooperative Extension Home*A*Syst Program, (401) 874-5398, www.uri.edu/ce/wq; for more information on private well protection and residential pollution prevention topics. For more information on sustainable landscaping and pet waste management, see our website www.uri.edu/ce/healthylandscapes

USDA Natural Resources Conservation Service and your local Conservation District,
(401) 828-1300, www.ri.nrcs.usda.gov; for technical information on livestock manure management, pasture management and renovation, soil erosion and stormwater runoff control, and soil maps.

UCONN Soil testing lab, (860) 486-4274
www.canr.uconn.edu/plsci/stlab.htm
UMASS Soil testing lab, (413) 545-2311
www.umass.edu/plsoils/soiltest

Penn State Agronomy Fact Sheets on various crop and soil science topics including various pasture and hay forages, and weed management in pastures, www.agronomy.psu.edu/Extension/Facts/AgFacts.htm

University of Vermont Center for Sustainable Agriculture, Pasture Network Program, www.uvm.edu/~susagctr

Visit local farm and garden supply stores for fencing or watering supplies or do an internet search on livestock watering, portable electric fencing, and permanent livestock fencing.

Visit local farms that practice sound pasture management to share innovative ideas, information and resources

Information contained in this fact sheet is partially adapted from the following sources:

Bonnie E. Lamb and W. Michael Sullivan. 1993. Horse-Keeping on Small Acreage: Protecting Groundwater and Surface Water. University of Rhode Island College of Resource Development, Department of Natural Resources Science, Cooperative Extension

Darrell L. Emmick and Dr. Danny G. Fox. 1993. Prescribed Grazing management to Improve Pasture Productivity in New York, USDA Soil Conservation Service and Cornell University Department of Animal Science.

Bill Murphy. 1987. Greener Pastures on Your Side of the Fence: Better Farming with Voisin Management Intensive Grazing, Third Edition.

Elements of a Successful Horse Grazing System, Gwyneth Harris, Vermont Pasture Network Coordinator, University of Vermont Center for Sustainable Agriculture

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Special thanks to the staff at the USDA Natural Resources Conservation Service, Warwick, RI for review of this fact sheet.

Healthy Landscapes is a project of the University of Rhode Island Cooperative Extension and the Town of North Kingstown, Rhode Island. It is funded by the USDA CSREES, National Integrated Water Quality Program. Cooperative Extension in Rhode Island provides equal opportunities in programs and employment without regard to race, sex, color, national origin, sex or preference, creed or disability. This is contribution number 4095 of the College of the Environment and Life Sciences, University of Rhode Island.

healthy landscapes

clean water starts at home

www.uri.edu/ce/healthylandscapes

Livestock on Small Acreages

Assessing Your Risks to Water Resources

Holly K. Burdett
W. Michael Sullivan

Fact sheet 4, Small Acreage
Livestock Series, April 2005

Many small acreage livestock owners live within or close to high density residential areas. Unlike rural properties that are spacious and buffered by woodlands and fields, residential properties usually consist of smaller lots in close proximity to water resources such as ponds, streams, drinking water wells, storm drains and ditches. The amount of land per animal is typically very small, which often creates problems with manure storage, handling and utilization. As rain and snowmelt travel over the land surface and soak down into the groundwater, it can carry pollutants associated with livestock manure and related activities. These pollutants can harm nearby water resources including your own drinking water well or your neighbor's.

Assessing your risks using the Self-assessment Worksheets 1 and 2

- The following information and worksheets will take you step by step through various factors that affect the risk a livestock yard and manure storage area might pose to water resources. It also considers whether your animals have direct access to a surface water body.
- It will help you identify and determine the relative risk of your situation and practices as being "Low", "Medium", or "High" to potentially impacting water quality. Keep in mind that these ratings are relative. A water quality problem could exist even though your relative rating results in a "Low" risk. Likewise, a "High" risk rating does not necessarily mean there is a water quality problem.
- It will help you determine which factors or practices might benefit from some changes and how to reduce potential risk.
- The self-assessment worksheets have been designed for small acreage, non-commercial properties in Rhode Island that raise livestock and may not qualify for traditional agricultural program assistance or experience the same set of conditions as larger, commercial livestock farms. The worksheets have been adapted from Farm*A*Syst Program materials from various states. If you own or operate a commercial livestock farm or wish to determine if you are eligible for agricultural program assistance, contact the USDA Natural Resources Conservation Service, Warwick, Rhode Island at (401) 828-1300 for technical assistance with livestock waste management, risk assessment and program eligibility.

Understanding and completing the worksheets

Follow the directions at the top of page one of each of the assessment worksheets. The following provides a summary of the factors and categories listed on the assessment worksheets and why they are important. These summaries may help provide you with background information needed to fill out the worksheet.

<u>Location</u>

This factor describes where a livestock yard or manure storage area is situated in relation to various water resources or a septic system used to treat household wastewater. Please note that the distances listed in this assessment worksheet provide a general range for determining potential risk to a water resource. The other factors that follow also affect risk to water quality.

These distances do not directly correspond with specific setback distances that are now required by various Federal, state, and local laws for work or activities within or near to these water resources, except where noted. If you plan to do any <u>new</u> work or activities in close proximity to a water resource, be sure to check with all laws that may apply. Contact

the Rhode Island Department of Environmental Management Office of Water Resources at (401) 222-3961, www.dem.ri.gov and your local town hall for more information. If you live near a coastal water resource, contact the Rhode Island Coastal Resources Management Council at (401) 783-3370, www.crmc.ri.gov.

Septic systems handle human waste, which is also a source of nutrients and pathogens. The concern with having a livestock yard or manure storage area near a septic system include potential damage to the system from hoof action and compaction, as well as the nutrients and pathogens that could be added, which greatly increases the risk of groundwater pollution. For more information on proper septic system operation and maintenance contact the URI Cooperative Extension Onsite Wastewater Training Center at (401) 874-5950, www.uri.edu/ce/wq.

Site Characteristics

This factor describes soil texture and drainage – natural site conditions. Soil texture describes how fine or coarse a soil may be. Finer, deeper soils tend to provide more groundwater protection for they can slowly filter out more potential pollutants such as pathogens and nutrients. Soils with a seasonal high water table, coarse soils with rapid drainage, or soils with shallow bedrock pose a greater risk of potential groundwater contamination. Soils with finer texture and medium to slow drainage are more prone to surface runoff, which can also be a concern when the livestock yard or manure storage area is near a surface water resource or storm drain. Livestock yards tend to be compacted due to heavy foot traffic and runoff can tend to be more of a concern.

We ask that you answer these questions about the original/surrounding soils even if the livestock yard is paved or the floor of a manure storage/compost site is paved or lined. Not only can paved and lined areas deteriorate, crack, or experience problems due to the underlying soil type, but other factors listed under the design and management category are also affected by the surrounding soil type.

Determining soil type by field method

One way to determine your soil type is to dig a hole in a representative area within or near the livestock yard or manure storage area. If a livestock yard contains a lot of manure/mud, you may want to find an area just outside the yard. For determining soil texture, rub some of the soil from the upper six to 12 inches (often called the topsoil layer) and compare the feel and sound with that listed in the worksheets.

For determining soil drainage and location of the high water table, you may have to rely on your knowledge of the area. Do you have problems with a wet basement, surface ponding, or septic system failure during wet periods? If you dig a hole during late fall through mid-spring, try to dig down at least 36 inches below the surface to determine if standing water is present at or above that depth.

For determining soil depth, you want to dig down at least 30 inches. You are looking for the depth of the finer soil texture layers before it changes to a much different texture (usually coarse sand, gravel or in some cases bedrock) or color or both. For example, at a depth of approximately 25 inches below the surface, you may notice a drastic difference from a light brown sandy loam to very light yellowish brown gravelly sand. The soil depth in this case is about 25 inches. In some cases, you may not see this drastic change within a depth of 30 inches, so you would check off the column indicating a soil depth of more than 30 inches.

Using maps to determine soil type

Another way to determine your soil type is to obtain a Soil Survey Map of Rhode Island from the USDA Natural Resources Conservation Service at (401) 828-1300, www.ri.nrcs.usda.gov, for the area covering your property. It will provide a typical description and many characteristics of the soil type. You can also obtain a very general, much less detailed soils map on-line at the Rhode Island Digital Atlas, www.edc.uri.edu/riatlas. Keep in mind that maps may not show small variations. It is important that you verify the map information with what you know about your property. For example, if you know that you have slow drainage and seasonal high water table on your property, and the soil map indicates dry, well-drained

soils for the general area, you are best to follow the directions for the field method listed above.

Design and Management

These factors are very important because design and management of a livestock yard and manure storage area is usually what can be effectively changed to greatly reduce risks to water resources and animal health. A primary manure management goal is to prevent rain and snow from mixing with animal waste. Another important management factor considers the handling of runoff that does mix with animal waste -- what happens to that runoff and where does it go? This runoff can contain sediments, nutrients and pathogens. Manure storage and compost areas can also generate leachate containing nutrients and pathogens that can move into groundwater.

The worksheet for Livestock Yard Management also considers whether your animals have direct access to a surface water body or drinking water well anywhere on the property, not just the area of the livestock yard. For example, your animals may have direct access to a stream or pond when out on pasture.

Concentration of Animals

This category is included in the worksheet for Livestock Yards Management. The area needed per animal for minimizing the risk of surface and groundwater contamination (due to a high concentration of manure and waste) depends on the type of yard surface. Most small acreage farms have an earthen yard. Paved yards usually consist of a poured concrete pad and are typically used when raising cattle and pigs. The poured concrete surface area needed is much less than that required for an earthen yard, so it can be useful when space is limited or in combination with an earthen yard – the earthen yard being used during dry weather conditions to prevent mud. The concrete area needed is a balance between animal traffic and resting area. The minimum area per animal recommended for sizing a livestock yard should not be confused with the total land area needed to support one animal unit or 1,000 pounds of live weight (a stocking rate).

For More Information and assistance

Refer to our additional fact sheets, available on-line, www.uri.edu/ce/healthylandscapes:

- ☑ Fact sheet 1: *Livestock on Small Acreages: Protecting Water Resources and Health*
- ☑ Fact sheet 2: *Livestock Yards and Manure Storage Areas on Small Acreages: Protecting Water Resources and Health*
- ☑ Fact sheet 3: *Livestock Pastures, Fencing, and Watering on Small Acreages: Protecting Water Resources and Health*

University of Rhode Island Cooperative Extension Home*A*Syst Program, (401) 874-5398, www.uri.edu/ce/wq; for more information on private well protection and residential pollution prevention topics. For more information on sustainable landscaping and pet waste management, see our website www.uri.edu/ce/healthylandscapes

USDA Natural Resources Conservation Service and your local Conservation District, (401) 828-1300, www.ri.nrcs.usda.gov; for technical information on livestock manure management, pasture management and renovation, soil erosion and runoff control, and soil maps.

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Appendix V: Best Management Practices (BMPs)

The Best Management Practices in this section will help you to plan sustainable practices on your farm. These BMPs are referenced in Step 2: Land Use Objectives and Concerns. In Step 2, you will select BMPs that you can implement on your farm that will help you conserve your resources. These practices will be referenced again in Step 6: Activities.

Improved resource quality is one benefit you will recieve by regularly implementing Best Management practices on your land. You may also benefit from improved production and aesthetic quality of your land. Be mindful of Best Manegement Practices when planning future activities, and how these activities will fit in with your resource goals and overall vision for your land.

Best Management Practices
(see full descriptions in this Appendix V)

1. Contour Farming
2. Contour Stripcropping
3. Cover Crop
4. Crop Residue Management
5. Crop Rotation
6. Nutrient Management
7. Pest Management
8. Terrace
9. Conservation Cover
10. Critical Area Planting
12. Field Border
13. Tree Planting
14. Forest Management
15. Windbreak
16. Grazing Management
17. Range & Pasture Planting
18. Stockwater Systems
19. Waste Storage
20. Diversion
21. Filter Strip
22. Grade Control Structure
23. Grassed Waterway
24. Irrigation & Water Management
25. Riparian Forest Buffer
26. Spring Development
27. Stream Habitat Protection & Fish Passage
28. Streambank Protection
29. Water & Sediment Control Basin
30. Well Protection
31. Wetland Enhancement
32. Wetland Restoration
33. Wildlife Food Plot
34. Wildlife Upland Habitat

Contour Farming

Farming in nearly level rows around a hill, as opposed to farming up and down the hill.

How it works

Crop row ridges built by tilling and planting on the contour create hundreds of small dams. These ridges or dams slow water flow and increase infiltration, which reduces erosion.

How it helps

- Can reduce soil erosion by as much as 50% from uphill/downhill farming
- Promotes better water quality by reducing sediment and runoff
- Increases water infiltration

Planning ahead

- Will more than one key contour line be needed because of steep or irregular slopes?
- Are terraces or stripcropping needed for steeper slopes?
- Are field borders needed to replace end rows in the contouring system to control sheet and rill erosion?

Technical notes

- Contour farming is most effective on slopes between 2% and 10%.
- Establish a key line around the hill by using a hand level or contour gauge.
- Contour key line grade should not exceed 2%, except within 100 feet of an outlet. In that case, the grade can be a 3% slope.
- Perform all tillage and planting operations parallel to the key contour line.
- Contouring is less effective in preventing soil erosion on steeper or longer slopes.
- Replace end rows with field borders to reduce erosion.

Maintenance

- Prevent gully erosion with grassed waterways in areas where runoff is concentrated.
  Contoured rows should enter the grassed areas of waterways on the level, but should direct water into the grass.
- To avoid laying out new key contour lines every year, establish a narrow, permanent strip of grass along each key contour line.

Contour Stripcropping

Crop rotation and contour farming combined in strips of Row crops planted on the contour and alternated with strips of forages or small grains.

How it works

Plantings are arranged so that strips of small grains or forages are alternated with strips of row crops. Not more than half of a field can be planted to row crops. Forages or small grains slow runoff, increase infiltration, trap sediment, and provide surface cover. Ridges formed by contoured rows slow water flow and reduce erosion. Rotating the strips from grain to legumes allows nutrient-needy crops to benefit from nitrogen added to the soil by legumes. This combines the beneficial effects of contouring and crop rotation.

How it helps

- Can protect growing crops from wind damage
- Reduces soil erosion and protects water quality
- May reduce fertilizer costs
- May include energy crops as forage plantings

Planning ahead

- Do you have a use for hay?
- Does your crop rotation allow for alternating row crops with small grains and forages?
- Will herbicide carryover be a problem?

Technical notes

- Row crops need to run parallel to each other and as close to the contour as possible. A 10% variance is allowed.
- Strip widths are based on 10-year storm event values and slope length, with strips and row crops of equal width.
- Correction strips that vary in width may be needed.
- Where contours are too sharp to keep machinery aligned, establish turn strips on ridge points wide enough to maneuver equipment.
- Strip widths may be adjusted downward to accommodate your equipment width for even rounds.
- Stripcropping is not as effective if crop strips become too wide, especially on steep slopes.

Maintenance

- Keep strip widths consistent from year to year.
- If hay crop fails or is winter-killed, a conservation planner may be able to help you make adjustments in the rotation schedule. Provides unrestricted movement for aquatic species, sediment and wood throughout the stream.

Cover Crop

Grasses, legumes, forbs and other herbaceous plants established for seasonal cover and conservation.

How it works

Seasonal plantings of crops and grasses, like annual ryegrass, cereal rye, oats and winter wheat protect the ground from wind and water erosion during times when land is not adequately protected against soil erosion.

How it helps

- Reduces soil erosion from wind and water
- Adds organic matter to the soil, traps nutrients, and improves soil tilth
- Reduces weed competition
- Provides supplemental forage
- Increases biodiversity

Planning ahead

- Are adequate conservation measures installed above or near the cover crop to help prevent soil erosion?

Technical notes

- Cover crops are most often recommended when low or fragile residue producing crops, such as wheat, are grown on erodible land.
- Many crops can be used for cover crops. Cereal rye, barley and oats are common.
- Avoid cover crops that attract potentially damaging insects.
- Kill cover crops in the spring. Mowing or herbicide application is acceptable. Tillage is not recommended because it will bury residue. Terminating your cover crop at the right time can maximize moisture available for the next crop.

Maintenance

- Control weeds in cover crops.
- A cover crop is a short-term practice and is not expected to last after initial establishment.

Crop Residue Management

Leaving last season's crop residues on the soil surface by limiting tillage; includes no till, mulch till and ridge till.

How it works

Leaving last season's crop residues on the surface after harvest and before and during the next planting provides cover for the soil at critical times of year. The residue is left on the surface by reducing tillage operations. Pieces of crop residue shield soil particles from rain and wind until crops produce a protective canopy.

How it helps

- Prevents soil erosion and protects water quality
- Improves soil tilth and adds organic matter to the soil as it decomposes
- Reduces soil compaction with fewer trips and less tillage
- Saves fuel, labor and time with reduced field operations
- Sequesters carbon in the soil

Planning ahead

- Will your crop produce enough residue?
- Is crop residue management part of a planned system of conservation measures?
- Do you have the needed equipment?

Technical notes

- Planning for residue cover begins at harvest. Ensure ample residues are spread evenly over the field by the combine.
- Reduce the number of unnecessary tillage passes. Every pass buries more residue.
- Use straight points and sweeps on chisel plows instead of twisted points. Twisted points can bury 20% more residue.
- Set tillage tools to work at shallower levels.
- Do not burn residues.

Measuring crop residues

Estimate residue levels by using a line that has 50 or 100 equally divided marks. After planting, stretch the line diagonally across the cropped area. Count the number of marks that have residue under the leading edge when looking from directly above the mark. Walk the entire length of the rope. The total number of marks with residue under them is the percent residue cover. (If the line has only 50 marks instead of 100, multiply your count by two.) Repeat three to five times in a representative area to determine percent of average residues.

Crop Rotation

Changing the crops grown in a field, usually season by season.

How it works

Crops are changed season by season in a planned sequence. This improves soil health and provides crop benefits over the length of the rotation. Examples of this practice might entail: a broccoli - winter wheat - sweet corn rotation; a wheat - fallow - alfalfa - potato rotation; a grass seed - small grain rotation; or other combinations depending on a variety of factors.

How it helps

- Reduces fertilizer needs; alfalfa and other legumes replace nitrogen removed by wheat and other grain crops
- Reduces pesticide costs and field operations by naturally breaking the cycles of weeds, insects and diseases
- Protects water quality by preventing excess nutrients or chemicals from entering water supplies
- Reduces soil erosion by wind and water by adding crops like hay or small grains
- Increases soil organic matter
- Adds diversity to an operation
- Provides food and cover for wildlife

Planning ahead

- Do you have a need for other crops?

Technical notes

- Crops must be suited to your soils and climate.
- Design crop rotations to meet the residue needs of your crop residue management plans.
- Rotations that include small grains or hay provide better erosion control.
- Small grains and hay can always be used to replace any row crop or low residue crop to gain better erosion control.
- For crop rotations that include hay, the rotation can be lengthened by maintaining the existing hay stand for additional years.

Maintenance

- Switch crops to maintain perennials in the rotation, if necessary.
- Consider herbicide carryover to avoid crop failures.

Nutrient Management

Applying the correct amount and form of plant nutrients for optimum crop yield and minimum impact on water quality; includes manure testing and waste utilization.

How it works

Crop nutrients are determined after taking a soil test, setting realistic yield goals, and taking credit for contributions from previous years' crops and manure applications. Nutrients are then applied at the proper rate and time by the proper application method. Nutrient sources include animal wastes, commercial fertilizers, and compost. These steps reduce the potential for nutrients to go unused and run off or infiltrate into water supplies.

How it helps

- Protects water quality by preventing over-application of commercial fertilizers and animal manure
- Correct manure application on all fields can improve soil tilth and organic matter
- Reduces the need for additional applications, reducing input costs and energy

Planning ahead

- Have you tested soil and manure for nutrient levels?
- Are organic wastes available for you to use?
- Are yield goals realistic?
- Are proper soil conservation measures installed?
- Have you accounted for nitrogen credits produced by legume crops?

Technical notes

- Choose the best application method. Use broadcast, starter, or surface band injection.
- Use nutrient application rates based on recommendations from the most current New England Cooperative Extension System crop management guides.
- Refrain from applying commercial nitrogen in the fall, except when nitrogen is associated with phosphorous application.
- Avoid applying manure on frozen, saturated or snow-covered ground if possible.

Maintenance

- Test soils once every 3 years or according to New England Cooperative Extension recommendations.
- Analyze manure and other organic waste for nutrient content before field application.
- Establish a winter cover crop if there is a possibility of nitrogen leaching because of poor crop yield.

Pest Management

A customized system to reduce crop and environmental damage with environmentally sensitive strategies of prevention, avoidance, monitoring, and suppression to manage plant pests.

How it works

Producers use environmentally sensitive strategies such as scouting to identify, monitor, avoid and/or suppress insects, weeds and diseases.

How it helps

- Enhances the quality and quantity of products
- Minimizes negative effects of pest control on soil, water, air, plants, animals and humans
- Prevents over-treatment with custom applications for specific pests on specific areas of a field
- Lowers costs and energy inputs by reducing the number of passes over a field and/or the amount of pesticides applied

Planning ahead

- What are the risks for leaching and runoff for the pesticides you use on your soils?
- Did you establish filter strips along streams?
- Did you consider pest control alternatives?
- Did you use records of crops and pest control for reference?
- Did you rotate crops to reduce the chance of pest problems?

Technical notes

- Complete a pesticide risk assessment of potential environmental damage from leaching or runoff. Refer to this information when selecting a pesticide, and consider using additional practices or measures to offset potential risks.
- Wear protective clothing when applying pesticides.
- Mix and load pesticides in an area that will not contaminate water supplies. Prevent back-siphoning.
- Triple rinse containers before disposal. Burn paper bags.
- Apply pesticides during periods of minimal potential for drift or runoff.
- Use the lowest application rate practical and rotate pesticides.
- Use spot treatment or banding when possible in areas of concentrated pest populations.
- Use proper erosion control.

Maintenance

- Continue scouting to best identify pests and control methods.
- Keep records to track costs and chemical applications.
- Calibrate spray equipment.

Terrace

An earthen embankment around a hillside that stops water flow and stores or guides water safely off a field.

How it works

Terraces break long slopes into shorter ones. They usually follow a contour. As water makes its way down a hill, terraces serve as small dams to intercept water and guide it to an outlet. Two basic types of terraces are storage terraces and gradient terraces. Storage terraces collect and store water until it can infiltrate into the ground or be released through a stable outlet. Gradient terraces are designed as a channel to slow runoff water and carry it to a stable outlet like a grassed waterway.

How it helps

- Improves ability to farm slopes
- Reduces soil erosion
- Conveys runoff water to grassed waterways or other practices that filter chemicals and nutrients from runoff water
- Provides cover for small birds and animals

Planning ahead

- Will other conservation practices be used in conjunction with terraces to prevent sedimentation?

Technical notes

- Fertilize and seed according to NRCS recommendations.
- The slope should be designed according to NRCS standards.
- Terraces should be parallel to one another, if possible.
- Curves should be long and gentle enough to accommodate machinery.
- Level terraces with an appropriate horizontal spacing.
- Terraces should be designed to control peak runoffs.
- Chisel to loosen compacted soil on parts that will be farmed.

Maintenance

- Avoid farming too close to intakes.
- Remove sediment build-up in the channel to maintain the required water-holding capacity.
- Repair sections that have eroded or have excessive settlement.
- Fill settled/eroded areas of tile trench.
- Repair/replace damaged intakes.
- Remove sediment build-up and trash from around intakes.
- Control rodents or burrowing animals, weeds, brush and trees.
- Reseed and fertilize as needed.

Conservation Cover

Establishing and maintaining permanent vegetative cover.

How it works

Plantings are used on lands needing permanent vegetative cover to prevent soil erosion, reduce the risk of chemical runoff, and provide other benefits. Conservation cover may include grasses, forbs, legumes, trees and shrubs. In orchards, vineyards, berries and nurseries, this practice can provide full cover in alleyways. Conservation cover may also be used to provide wildlife habitat, conserve and stabilize archeological sites, or sequester carbon.

How it helps

- Reduces soil erosion and sedimentation
- Improves water quality
- Improves air quality
- Enhances wildlife habitat
- Improves soil quality
- Help to manage plant pests

Planning ahead

- Are selected plans adapted to the area's soil, ecology and climate?
- Will selected plants provide adequate cover to reduce wind and water erosion?

Technical notes

- Try to use native species that are appropriate for the identified resource concerns and objectives.
- Site preparation should adequately eliminate weeds.
- Refer to a conservation planner for recommended species, seeding rates and timing, and establishment procedures.

Maintenance

- Maintenance activities, such as mowing, may be needed to reduce weed competition.
- If wildlife habitat is an objective, maintenance practices and activities should not disturb cover during the reproductive period for the desired species.
- Spraying or other control of noxious weeds should be confined to 'spot' spraying to protect plants that benefit native pollinators and other wildlife.

Critical Area Planting

Plantings of grass or other vegetation to protect a badly eroding area from soil erosion.

How it works

Permanent vegetation is established in small areas of excessive erosion and on sites that limit use of other practices. The vegetation provides surface cover to stabilize the area and decrease erosion by wind and water. The practice restores degraded sites not stabilized by other methods.

How it helps

- Reduces soil erosion
- Protects water quality by reducing sediment, nutrient and chemical runoff
- Protects areas such as dams, terrace backslopes, or gullied areas when vegetation may be difficult to establish (protection benefits may occur offsite)
- Provides small areas of nesting cover for birds and small animals

Planning ahead

- Can the area be stabilized with other conservation methods?
- Will protection provided by the planting be adequate?
- Does selected vegetation provide cover at the right time?
- Are proper soil conservation practices installed above the area?
- Do you want wildlife cover?

Technical notes

- Use recommended species and follow proper seeding rates and timing.
- Follow seedbed preparation and mulching guidelines.
- If gullies are present, treat them to allow equipment operation and to ensure seedbed preparation.
- Apply lime and fertilizer, if needed, to the top three inches of soil before planting.
- Protect the area from erosion with annual grasses until permanent cover is established.
- Severely eroded areas may need a nurse crop like oats seeded at the same time to protect the young planting as it becomes established. Mow high to avoid clipping the permanent seeding.

Maintenance

- Allow no grazing the year after planting and prevent overgrazing after permanent cover is established. Fence if needed.
- Permanently exclude livestock from extremely steep slopes.

Field Border

Strips of permanent vegetation at the edge of a field used in place of end rows.

How it works

Strips of permanent vegetation are established on the outside edges of a field. Permanent vegetation replaces crop end rows that would be planted uphill and downhill and be highly erosive. Field borders are often used with contour farming, terraces, and contour stripcropping systems.

How it helps

- Reduces sheet and rill erosion by slowing the flow of water
- Filters runoff to improve water quality
- May be harvested in some cases and are easier to turn equipment on than some end rows
- Provides cover for small birds and animals

Planning ahead

- Will the field border be wide enough to turn your equipment?

Technical notes

- Border widths are specific to the purpose and location.
- Borders need to be seeded or left in place when a hay field is plowed.
- Establish borders with locally-adapted grass, legumes and/or shrub species.

Maintenance

- Delay mowing field borders until after **July 15** to allow time for young nesting birds to leave their nests.
- Replant and fertilize as necessary to maintain desired cover.
- Shut off farm chemical sprayers when turning sprayer equipment on a field border, and insist custom chemical applicators do the same.

Tree Planting

Establishment of trees in areas adapted to woodlands.

How it works

A variety of desired tree species, either seedling or seeds, are planted mechanically or by hand in understocked woodlands or open fields. Tree species are matched with soil types and selected to prevent soil erosion, increase income, or boost productivity of existing woodlands.

How it helps

- Increases profits
- Protects soil from rill and sheet erosion
- Protects water quality by filtering excess nutrients and chemicals from surface runoff
- Increases infiltration rates
- Provides long-term wildlife habitat

Planning ahead

- Is the soil suitable for producing wood crops?
- Is the soil suitable for the selected tree species?
- Is there a market for the species to be planted?
- Is the land needed for crops or livestock?

Technical notes

- The fall before planting, remove brush, grass or other vegetation where trees will be planted; if the soil is compacted, break up compaction layer.
- Plant trees during the dormant season. If soil is frozen, plant immediately after the ground thaws.
- Plant tree seedlings within seven days of arrival.
- Keep roots moist during planting.
- Place the root crown at ground surface or one inch below.
- Remove all air pockets when planting seedlings.
- The hole prepared for the seedling should have enough room for the roots to spread out completely.

Maintenance

- Mow vegetative growth around trees until they are three to four feet high.
- Use herbicides to control competing vegetation.
- Check periodically for rodent, disease or insect damage.
- Replant, if necessary, to achieve a desired stand.

Forest Management

Activities to improve the quality and quantity of forest stock and to maintain ground cover for soil and water conservation.

How it works

Existing forest land or other suitable land is dedicated to timber production. Optimum tree populations are determined by the types of tree, growth rate, and adaptability to the soils. Existing or newly planted trees are thinned, pruned or harvested to maintain desired production. Twigs, limbs and other debris are managed to minimize fire danger, maintain ground cover, reduce soil erosion, and provide wildlife habitat. As trees mature, they are harvested and replacements are established.

How it helps

- Adds income to an operation
- Reduces soil erosion
- Improves water quality
- Provides wildlife habitat
- Adds beauty to the land
- Sequesters carbon in the soil

Planning ahead

- Do you want this land for livestock, woodland or both?
- Will the trees you are growing be marketable?
- Can the soil support the type of trees and product you want?

Technical notes

- Grow trees that are suitable to your soils.
- If grazed by livestock, properly use vegetation.
- Cut undesirable trees and shrubs that are competing with desired species for sunlight and moisture.
- Thin trees, hardwoods or conifers to proper spacing recommendations based on tree size and potential growth.
- Plan harvest operations to minimize damage to remaining trees, the soil and roads.

Maintenance

- Control weeds, brush and competing plants by mowing, spraying or cutting.
- Mow vegetative growth around new plantings until trees are three to four feet high.

Periodically check for rodent, insect or disease damage.

Windbreak

Rows of trees and shrubs that protect areas from wind and provide food and cover for wildlife.

How it works

Multiple rows of coniferous trees or a combination of coniferous and deciduous trees are planted to protect a farmstead or feedlot from wind and snow. One or two rows of shrubs are also often planted. The established windbreak slows wind on the downwind side of the windbreak for a distance of 10 times the height of the trees. The tree rows also act as a snow fence, trapping snow within the windbreak. Field windbreaks can also be planted to reduce wind speed in open fields.

How it helps

- Reduces soil erosion, conserves energy, reduces heating bills, and beautifies a farmstead
- Can serve as a sound barrier
- Reduces chemical drift, protecting air quality
- Provides wildlife food and cover
- Helps to improve livestock weight gains by protecting animals from wind and snow

Planning ahead

- Will the mature windbreak cast shadows over driveways or roads, prolonging icy conditions?
- Have you planned enough space for summer air circulation, travel lanes or gardens?
- Will trees and shrubs in the windbreak attract the desired wildlife species?
- Will the position of the mature windbreak cause a visibility hazard for drivers or divert snow where it is not wanted?

Technical notes

- **Preferred planting time is fall or early winter.**
- Plant trees on the windward side of the area to be protected; extend rows 50 feet beyond that area.
- Do not plant where trees will cast a shadow and prolong icy road conditions.
- Keep planting 20 to 30 feet away from phone or utility lines.
- Plant according to spacing recommendations for selected species.

Maintenance

- Control competing vegetation with tillage or herbicides before planting and for the first three years after planting.
- Fence livestock out.
- Inspect regularly for damage.

Grazing Management

Management of grazing operations to maximize production and improve grazing lands; includes grazing rotations, fencing, forage plantings, livestock water, and management of herd size.

How it works

Grazing land is divided into two or more units with fencing. Livestock are moved on a schedule from unit to unit based on forage availability and livestock and plant needs.

How it helps

- Improves vegetative cover, reducing erosion and improving water quality
- Increases harvest efficiency and helps ensure adequate forage throughout the grazing season
- Increases forage quality and production, increasing feed efficiency and profits
- Helps to evenly distribute manure nutrients

Planning ahead

- Is there enough water of good quality available in all pastures to meet livestock needs?
- Is the mix of grass and legumes adequate for the soil types?
- Will forage meet the nutrient needs of your livestock?
- Are there management alternatives for periods of low forage production?

Technical notes

- Plan your rotation so the same units will not be grazed the same time year after year.
- Plan rest periods so each grazed unit will have adequate time to recover during the growing season to promote plant vigor.
- All livestock must be removed from grazed units while pastures are being rested.

Maintenance

- Keep fencing secure.
- Some pastures may need to be mowed or hayed during heavy growth periods.
- Remove pasture water systems during winter if necessary, and reinstall them in the spring.
- If herd size changes dramatically, update rotation schedule and grazing units as needed.
- Apply fertilizer and nutrients according to soil tests.

Range and Pasture Planting

Planting grass and legumes to reduce soil erosion and improve production.

How it works

Drill or broadcast adapted grass or legumes into a low-producing pasture or a steep, eroding cropland field.

How it helps

- Slows water flow to reduce soil erosion
- Protects water quality by filtering runoff water and increasing infiltration
- Provides cover and habitat for wildlife
- Adds organic matter to the soil

Planning ahead

- Are selected species suited to your soil types?
- Have you chosen species that will help you reduce the use of pesticides and herbicides?
- Have you chosen species that will meet the needs of your livestock?

Technical notes

- Selected grass and legumes should be compatible with the planned management.
- Add legumes to improve forage quality and extend the grazing season.
- Prepare the seedbed prior to planting to ensure good seed to soil contact.
- Drill seed uniformly to a depth of ¼ to ½ inch.
- Leave residues and till on the contour.
- If erosion is a problem, leave at least 30% residue cover after planting.
- Use NRCS recommendations to plant a nurse crop on steeper soils or where weeds are a problem to get a good stand.

Maintenance

- Wait until pasture is well established before grazing.
- Mow weeds when they reach a height of six to eight inches. Control persistent weeds with herbicides.
- Fertilize as needed.

Stockwater Systems

Systems used to provide suitable water to livestock or wildlife at selected locations to improve grazing management and protect streams, ponds, and water supplies.

How it works

Stockwater systems include a suitable clean water source, delivery system, and watering facilities for providing adequate water to livestock and wildlife. Water sources may be developed and piped to watering facilities at locations for improved livestock distribution.

How it helps

- Improves livestock health and production
- Allows for better grazing management with planned placement of water for livestock
- Provides clean water at accessible locations
- Provides for improvement in upland and riparian vegetation and protection of streambanks
- Provides for development of water where it is naturally unavailable

Planning ahead

- What watering facilities are needed to make the best use of available pasture and rangeland?
- What water sources are available and is the water of sufficient quality for livestock?
- Is power required for pumping?
- Is water storage needed?

Technical notes

- Inventory available water sources including streams, springs, wells and ponds.
- Inventory range and pasture productivity, health and needs.
- Place watering facilities to enhance livestock distribution.
- Manage livestock in areas where vegetation and streambanks need protection.
- Include escape ramps in tanks and troughs for birds and wildlife.

Maintenance

- Keep tanks and troughs clean of debris and sediment.
- Maintain all facilities and valves in good working order.
- Drain tanks and water lines in the winter where freezing temperatures can cause damage.

Waste Storage

Structure built as part of a Comprehensive Nutrient Management Plan to protect water bodies from nutrient-laden runoff; stores animal waste until conditions are appropriate for field application.

How it works

The type of waste storage structure depends upon the operation. Options include earthen storage ponds, above or below ground tanks, pit under a confinement facility, or a sheltered concrete slab area. Waste can be scraped and hauled or pumped, pushed or flushed into the structure. The purpose is to safely contain wastes and keep nutrient loss and pollution of downstream water bodies to a minimum by preventing runoff. Waste storage is temporary; operators must plan to empty structures regularly.

How it helps

- Protects water quality by preventing nutrient-laden runoff (from feedlots or hard surfaces)
- Cuts fertilizer costs and reduces nutrient losses
- Provides for field application of nutrients when conditions allow

Planning ahead

- Is the structure planned for the proper location considering the landscape, potential odor problems, visibility, aesthetic value and compatibility with existing farm buildings?
- Will the structure store manure in a form you have the equipment to handle?
- Are there buffer zones of vegetation around the structure to filter any runoff and to improve appearance?
- Is the structure the right size to handle the amount of manure during the storage period?

Technical notes

- Storage period is determined by manure use schedule.
- Storage volume should accommodate accumulated wastes and any runoff from the drainage area of the facility.
- Runoff from land surrounding livestock facilities should be diverted from storage structures.
- Structures should be fenced for livestock and human safety.
- Ramps built for equipment should meet safety standards.

Maintenance

- Remove waste regularly.
- Watch for leaks, seepage and damaged fences and repair immediately.
- Develop an Emergency Action Plan of proper actions and notifications if the structure fails.

Diversion

Diversion of surface water for agriculture through low impact, habitat friendly methods; an integral part of an irrigation system designed to conserve soil and water resources.

How it works

With a diversion, landowners with water rights transfer surface water to irrigation systems using environmentally sensitive and sustainable methods. The practice generally consists of an in-stream structure of rock, gravel or large wood that diverts water while meeting fish passage considerations. This practice is used to mitigate push-up dams or other structures that span the channel and restrict fish passage.

How it helps

- Conveys water for on-farm use
- Accommodates fish passage and allows migration
- Reduces annual operation and maintenance
- Provides unrestricted movement for aquatic species, sediment and wood throughout the stream

Planning ahead

- Have you worked with the local watermaster to identify your water right?
- Will a stream crossing be needed for livestock?
- What fish species do you have in your stream?
- Will a fish screen be required?

Technical notes

- The size of the irrigation diversion will depend on stream hydrology and the landowner's water right.
- Hydraulic analysis will likely be required.
- Ask your conservation planner for design and construction specifications.
- The landowner must obtain any necessary easements or permits.
- Are Endangered Species Act (ESA) considerations or special permits required?

Maintenance

- Keep headgates clear of sediment and debris.
- Maintain good vegetative cover on all slopes and water courses.
- Control livestock access to adjacent streambanks and keep fences repaired.
- Maintain erosion control measures around the structure, headgate and ditch.

Filter Strip

A strip of herbaceous vegetation that filters runoff and removes contaminants before they reach water bodies or water sources, such as wells.

How it works

Strips of herbaceous vegetation slow water flow and cause contaminants like sediment, chemicals and nutrients to collect in vegetation. Collected nutrients and chemicals are used by vegetation before they enter water bodies.

How it helps

- Prevents contaminants from entering water bodies to protect water quality
- Reduces soil erosion
- Provides cover for small birds and animals
- Moves agricultural operations farther from a stream

Planning ahead

- Are adequate soil conservation measures installed above filter strips?
- Are plants adapted to your soil types?
- Have you selected the correct species of vegetation for the control you need? For example, are you establishing the filter strip to control runoff from a feedlot or to filter runoff from cropland?

Technical notes

- Filter strips are most effective on slopes of 5% or less.
- Filter strips should be at least 20 feet wide unless location and design indicate a wider filter strip is needed.
- Do not use filter strips as a roadway.
- Filter strips will be less effective under snow or during frozen conditions.
- Avoid drift when applying herbicides on surrounding cropland. Controlled grazing may be allowed on dry, firm filter strips.

Maintenance

- Repair rills and small channels to prevent concentrated flow through the strip.
- Control grazing if livestock have access to filter strips.
- Control undesirable weed species, especially state noxious weeds.
- Inspect the filter strip after storm events. Repair gullies, remove unevenly deposited sediment, and reseed if necessary.
- Periodically regrade when deposition jeopardizes function; re-establish strip if needed.

Grade Control Structure

Earthen, wooden, concrete or other structure built within a natural or man made channel to prevent gully development and bed erosion while improving water quality and habitat conditions.

How it works

A grade control structure is used to stabilize a stream, grassed waterway, or gully to reduce channel bed erosion. This practice is used at sites where the flow velocity or the concentration of water in a channel or gully requires a structure to stabilize the grade or to prevent head cuts from Migrating upstream.

How it helps

- Stabilizes the grade and controls erosion in natural or artificial channels
- Prevents gully head cut formation and channel bed erosion by lowering water in a controlled manner
- Enhances environmental quality and reduces pollution hazards
- Manages channel flow line for non-erosion benefits, including fish passage, water table control, and reduced turbidity

Planning ahead

- Are ESA considerations or special permits required?
- Are adequate conservation practices installed above the structure to prevent sedimentation?
- Is the planned location in the proper place to achieve the level of control you want?

Technical notes

- Ask your conservation planner for design and construction specifications.
- The landowner must obtain any necessary easements or permits.

Maintenance

- Avoid operating farm equipment too close to the structure.
- Maintain good vegetative cover on all slopes and water courses.
- Control livestock access to the structure.
- Remove debris accumulation at the structure and immediately upstream or downstream.
- Keep burrowing animals off earthen structures.
- Keep outlets free of debris.

Grassed Waterway

Grass established in a shaped drainageway to prevent gullies from forming.

How it works

A natural or constructed drainageway is graded and shaped to form a smooth, concave channel. This area is seeded to suitable vegetation. Runoff water that flows down the drainageway flows across the grass rather than tearing away soil and forming a gully. An outlet is often installed at the base of the drainageway to stabilize the waterway.

How it helps

- Conveys runoff from terraces, diversions, or other concentrations without causing erosion or flooding
- Protects drainageways from gully erosion
- Filters chemicals and nutrients from runoff water
- Provides cover for small birds and animals

Planning ahead

- Is major land reshaping needed?
- Is there a proper outlet for surface runoff at the bottom of the waterway?
- Are soil conservation measures installed to prevent siltation?
- Will tile drainage be necessary?

Technical notes

- A waterway should be deep enough and wide enough to carry peak runoffs.
- Plant at recommended times and rates; follow site preparation recommendations.
- Nurse crops, temporary cover or mulching may be needed until permanent cover is established.

Maintenance

- Maintain the shape and depth of the channel and the stability of the outlet.
- Lift implements out of the ground and shut off spray equipment when crossing.
- Do not use waterways as roads.
- Fertilize as needed.
- Mow prior to the rainy season to maintain desired vegetation. Consider nesting seasons for native wildlife before mowing.
- Maintain the width of the area when tilling surrounding fields.
- Avoid planting end rows along the waterway. This prevents a new gully from forming on the outside edges and allows runoff to reach the waterway.
- Inspect the waterway and outlet yearly and/or prior to the rainy season.

Irrigation and Water Management

Efficient irrigation systems combined with effective irrigation water management to achieve production and conservation goals.

How it works

Irrigation systems are designed to apply water uniformly to a wide variety of crops under a wide range of conditions. Associated irrigation water management plans are developed for effective and efficient system operation throughout the irrigation season.

How it helps

- Improves crop production and quality
- Improves control and efficiency of water use, especially when water supplies are limited
- Lowers energy requirements for pumps
- Reduces soil erosion on irrigated fields
- Improves control of water
- Reduces standing water
- Increases income and/or lowers production costs

Planning ahead

- What type of irrigation system is best for the operation, soils, and field layout?
- What crops are gown and what are their water requirements?
- Is an energy source available if pumping is required, and what are the associated energy costs?
- How much labor is available for irrigation system operation?
- What is the water supply, and is it sufficient?
- How can the irrigation system and your water be best managed within your farming or ranching operation?

Technical notes

- Design the irrigation system to meet operational goals.
- Identify any limiting factors, such as water supply, soil depth and slope, system cost, and operational costs.
- Consider alternative irrigation systems and layouts and select the best fit for the operation.
- Develop a workable irrigation water management plan to assure effective system operation.

Maintenance

- Manage the system to assure that irrigated crops receive the right amount of water at the right time.
- Monitor the operation of the irrigation system to assure that it is performing as designed.
- Repair/replace components that become worn or defective.

Riparian Forest Buffer

An area next to a body of water that is vegetated with plant species that protect and enhance the stream, pond, etc.

How it works

A riparian forest buffer is an area directly adjacent to a stream, river or lake that can include trees, shrubs, grass, and/or grasslike plants and forbs. The riparian area can be either native vegetation or managed improved vegetated species with harvestable crops. Buffers are designed or managed for multiple benefits.

How it helps

- Creates shade to lower water temperature
- Provides leaves, twigs, stems, and logs for aquatic organisms, fish cover, etc.
- Provides habitat for multiple wildlife species
- Protects soil from scour erosion
- Reduces downstream flooding
- Protects water quality by filtering shallow groundwater flow

Planning ahead

- Is the current riparian area functioning correctly?
- Is the soil suitable for the selected vegetation?
- Is soil erosion occurring up-gradient of the buffer?
- Are pesticides entering the riparian zone?
- Is animal waste entering the riparian zone?
- What wildlife species use the riparian zone?

Technical notes

- Remove unwanted vegetation the fall before planting.
- Plant trees and shrubs during the dormant season.
- Keep competing vegetation away from newly planted species for at least two years.
- Use only those pesticides approved for use near water.
- Protect trees and shrubs from wildlife damage, if necessary.
- Create a clean weed-free site when planting grass or forb seeds.
- Mow frequently any weeds that compete with seeded grass and forbs.

Maintenance

- Control competing vegetation.
- Exclude livestock grazing.
- Inspect for wildlife and rodent damage.
- Replant, if necessary, to achieve desired conditions.
- Inspect after high water flows.

Spring Development

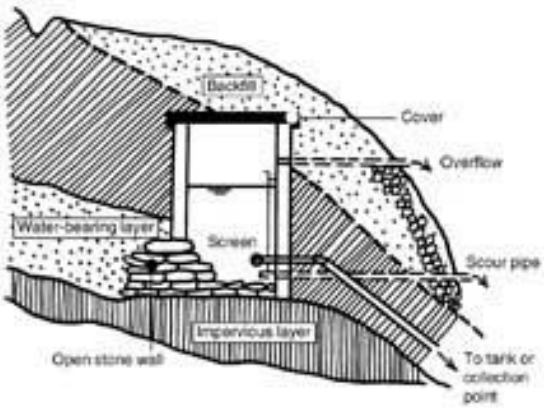

Image courtesy of Rod Shaw, WEDC, Loughborough University,

Enhancing a spring for use as a water supply for a farmstead or for livestock.

How it works

By installing a spring box, pipelines, and other components, it is possible to increase the flow of water from a natural spring. Required materials are usually readily available and may include culvert pipe, PVC pipe, concrete mix, local rock and gravel, and a small backhoe. An important consideration is the proper handling of and distance of potential contaminants from a well or other water source. For instance, mixing pesticides or washing or disposing containers near a well can easily contaminate drinking water.

How it helps

- Can provide an excellent and plentiful source of clean water
- Provides an inexpensive water source with readily available materials, minimal excavation, and inexpensive landscaping, as compared to wells or cisterns
- Does not require pumps or electricity unless you have to pump uphill
- May improve efficiency and reduce production costs
- Protects water from contaminants

Planning ahead

- Do you understand the geological setting and area that supplies the spring?
- Are erosion control and livestock exclusion necessary?
- Have you inventoried operations near the spring?
- Where is the spring in relation to feedlots and chemical handling facilities?

Technical notes

- Assess contamination risks and make necessary changes.
- Avoid activities that may contribute to contamination, both in and around the spring.
- Apply pesticides on days with minimal wind to prevent chemical drift into the area.

Maintenance

- Keep an emergency chemical spill kit handy.
- Maintain filter strips and fencing that protect the spring area.
- Maintain infrastructure, which may include a concrete spring box or headwall, fencing, pipelines, etc.

Stream Habitat Protection & Fish Passage

Adding or creating stream habitat components to improve habitat for aquatic species and removing stream barriers that block their movement.

How it works

Most stream habitat work strives to restore habitat components, such as pools, riffles, large wood or side channels that are missing. This includes adding habitat elements to a stream, removing passage barriers, or creating habitat elements to promote stream health and function as well as providing habitat for aquatic species.

How it helps

- Provides unrestricted movement for aquatic species, sediment and wood through the system
- Reduces streambank erosion
- Improves nutrient exchange and increases foraging capabilities of aquatic species by slowing stream flows
- Provides cover, resting areas during migration, and spawning and feeding habitat for aquatics
  Adds beauty and value to an operation

Planning ahead

- What fish species do you have in your stream?
- Is there an adequate supply of materials on your property?
- Is there adequate habitat available upstream?
- Could invasive aquatic species move into areas occupied by native species?
- Will stream flows be redirected and erode a neighbor's bank?
- Are ESA considerations or special permits required?

Technical notes

- Obtain any necessary permits.
- Protective vegetative cover should be established on exposed surfaces.
- Keep livestock from the area until the vegetation is established, and then livestock can go into the area but only according to a grazing plan.
- Stream work will require expertise from biologists and engineers to prevent damage to downstream landowners.

Maintenance

- You may need to plant riparian vegetation on exposed soils until a good stand is established.
- Fish passage structures may require inspection and/or cleaning, depending upon the type used at your site.
- Use weed management to maintain desirable plant and animal species.

Streambank Protection

Protection of streams and property by reducing bank erosion and enhancing aquatic habitat with bioengineering and establishment of vegetation.

How it works

Vegetation is planted or bioengineering measures are installed along the edges of a stream to buffer against heavy stream flows and reduce erosion. Fencing prevents cattle from trampling banks, destroying vegetation, and stirring up sediment in the streambed. A buffer zone of vegetation along the bank filters runoff, absorbs excess nutrients and chemicals, and provides increased habitat and diversity for aquatic organisms.

How it helps

- Reduces erosion with structural elements (such as large wood and possibly some rock) and grass, shrubs, trees and other cover along streambanks
- Improves water quality by reducing amounts of nutrients, chemicals, animal waste, and sediment entering streams
- Provides cover and habitat complexity for aquatic organisms, birds and small animals

Planning ahead

- Are ESA considerations or special permits required?
- Have you limited livestock access to the stream and/or planned to install an off-stream water system for livestock?
- Will a stream crossing be needed for livestock?

Technical notes

- Manage livestock access to the stream and riparian areas.
- Smooth streambanks to provide an adequate seedbed for vegetation.
- The area of vegetation along streambanks should be at least 15 to 25 feet wide. A wider buffer will provide greater storm protection.
- Ask your conservation planner for design and construction specifications.
- The landowner must obtain any necessary easements or permits.

Maintenance

- Maintain good vegetative cover on all slopes and water courses.
- Control livestock access to the streambank.
- Keep fences repaired.
- Avoid damaging buffer zones with herbicides from surrounding cropland.

Water and Sediment Control Basin

A short earthen dam built across a drainageway where a terrace is impractical; usually part of a terrace system.

How it works

This is an embankment built across a depressional area of concentrated water runoff. It traps sediment and water running off farmland above the structure, preventing it from reaching farmland and water bodies below.

How it helps

- Improves ability to farm on sloping lands
- Improves water quality by trapping sediment on uplands and preventing it from reaching water bodies
- Reduces gully erosion by controlling water flow within a drainage area
- May provide cover for small birds and animals

Planning ahead

- Will basins be part of an existing terrace system?
- Is the site too steep for the basin to work properly or be economically feasible?
- Can adequate outlets be provided?

Technical notes

- Install a tile or infiltration outlet adequate for high runoffs.
- The uncontrolled area draining into the basin must not exceed 50 acres.
- Build the basin large enough to control peak runoffs and sediment loads without overtopping.
- Use fill material free of sod, roots, frozen materials and stones larger than six inches in diameter. It should have correct moisture content for compaction.
- Spacing for water and sediment control basins depends on the land slope, tillage and management system.
- Plan structures so that failure will not result in loss of life, interruption of public utilities, or damage to homes, commercial buildings, highways or railroads.

Maintenance

- Inspect spillway and outlet yearly.
- Remove accumulated sediment and debris on a regular basis.
- Reseed and fertilize as needed to maintain vegetative cover.
- Check the basin after each large storm and make repairs.

Well Protection

Consideration of farming practices that may impact your well and groundwater quality.

How it works

To protect a well, take an inventory of farming practices like the mixing of pesticides and the washing and disposal of containers. Assess the risk of contamination from these activities and make the necessary changes. Making sure that the well is properly sealed from surface contamination by runoff will further protect your groundwater resources.

How it helps

- Protects groundwater from contaminants

Planning ahead

- Are soil conservation practices needed to divert runoff from the well area?
- Are necessary erosion control measures in place?
- Have you inventoried operations near the farmstead well?
- Have you properly closed and sealed all abandoned wells near the farmstead?
- Where is your well in relation to feedlots and the spraying, storage, and mixing of pesticides and herbicides?

Technical notes

- Mix farm chemicals and rinse containers a minimum of 100 feet from a well.
- Apply pesticides on days with minimal wind to prevent chemical drift into farmsteads.
- When filling a sprayer tank, use a device in the hose to be sure chemicals will not siphon back into the well.

Maintenance

- Keep an emergency chemical spill kit handy.
- Maintain any filter strips surrounding the farmstead or wellhead.
- Repair wellhead casing as needed.
- Repair cracks in concrete pads used for chemical mixing and loading or container washing.

Wetland Enhancement

Marsh type area with saturated soils and water loving plants that provides habitat for many species of wildlife.

How it works

Natural wetlands — **swamps, bogs, sloughs, potholes and marshes** — occur in every state in the Nation and vary widely in size, shape and type. A wetland may have standing water year-round, while a seasonal wetland may hold surface water for only part of the year.

How it helps

- Removes nutrients, pesticides and bacteria from surface water
- Filters and collects sediment from runoff water
- Slows and stores runoff water, reducing soil erosion and downstream flooding
- Recharges groundwater supplies by releasing water slowly into the ground
- Provides breeding, nesting and feeding habitat for birds and waterfowl as well as habitat for terrestrial vertebrates, fish and shellfish, and plant communities
- Adds beauty and value to a farm

Planning ahead

- Wildlife and recreation may be enhanced by adding habitat for adjoining uplands and/or goose nests, wood duck boxes, and other protection for waterfowl.

Technical notes

- Protective vegetative cover should be established on exposed surfaces.
- The landowner is responsible for obtaining necessary permits.
- Keep livestock from the area, unless it is included in a planned grazing management plan.
- Provide fish passage into and out of the wetland.

Maintenance

- You may need to plant wetland vegetation until a good stand is established.
- Use weed management to maintain desirable plant and animal species.
- Wetlands need to be managed to retain or develop desired conditions. This may include soil management, native plantings, and/or micro-topography modifications.
- Keep intakes clean and outlets free of debris.
- Inspect pipe structures and repair any damages.
- You may need to install and/or remove boards controlling the water levels each year.

Wetland Restoration

Installation or removal of practices in drained or degraded wetlands to restore water levels, hydric soil conditions, and wetland plants and to improve habitat.

How it works

Most wetland restoration work strives to rehabilitate degraded wetlands. This includes managing the hydrology or plant community to promote wetland functions and values, such as wildlife habitat and water quality and quantity. This includes vegetation plantings and structures for water control. This may also include removal of other items, such as dikes and tile drains.

How it helps

- Filters nutrients and sediment before water enters streams or infiltrates into ground water
- Reduces soil erosion and downstream flooding by slowing overland water flows and storing excess water
- Provides habitat for waterfowl and many other plant, animal and insect species
- Adds beauty and value to a farm

Planning ahead

- Will the soil hold water?
- Is the water supply adequate?
- Is there adequate upland wildlife habitat available?
- What wildlife do you want?
- Will plugging drains or breaking tile lines disrupt other areas?

Technical notes

- Remove trees and brush from embankments and the vegetative spillway area.
- Protective vegetative cover should be established on exposed surfaces.
- Obtain any necessary permits.
- Keep livestock from the area, unless it is included in a grazing management plan.
- Provide fish passage into and out of the wetland.

Maintenance

- You may need to plant some wetland vegetation until a good stand is established.
- Wetlands need to be managed to retain or develop desired conditions. This may include soil management, native plantings, and/or micro-topography modifications.
- Keep burrowing animals out of earthen structures.
- Keep intakes clean and outlets free of debris.
- You may need to install and/or remove boards controlling the water levels each year.
- Inspect pipe structures and repair any damages.

Wildlife Food Plot

Establishment of a variety of plants that furnish food for wildlife.

How it works

Food plots may be established either within an existing crop field or in a separate location. You may simply leave rows of grain standing after harvest to provide food for wildlife over the winter. Another option is to plant a small plot elsewhere. These plots help wildlife throughout the winter when food supplies are in short supply.

How it helps

- Helps to maintain wildlife populations
- Provides food for wildlife when other food sources may be inaccessible due to heavy snow or ice

Planning ahead

- Will the crop you plan to plant or leave standing in the field attract the wildlife you want?
- Is there adequate cover and water near the food plot to support wildlife?
- Are you endangering wildlife by placing food too close to high traffic areas?

Technical notes

- Planting dates vary, depending on the crop and climate.
- Food plots should be planted on the least erosive areas of the selected field.
- Plots on slopes steeper than 5% must be planted on the contour.
- A plot can be planted on the same area each year, as long as soil loss does not exceed acceptable limits.
- Acceptable crops may include corn, oats, barley, wheat, and sunflowers.
- Reduced tillage or no-till planting is encouraged.

Maintenance

- Manage livestock use of the area.
- Do not use herbicides unless noxious weeds persist. If herbicides are needed, spot spray. Avoid using herbicides that would endanger adjacent seedlings.

Wildlife Upland Habitat

Creation, maintenance or improvement of food and cover for upland wildlife.

How it works

Planting trees, shrubs and other vegetation that provide or maintain cover and food will attract wildlife. The type of habitat provided will determine types and numbers of wildlife attracted.

How it helps

- Reduces soil erosion, adds organic matter to the soil, filters runoff, and increases infiltration by adding ground cover
- Provides food and cover for wildlife
- Can add value to a farmstead

Planning ahead

- Will your planned habitat attract the types of wildlife you want?
- Is a particular piece of land better suited for upland habitat than for livestock or crops?
- Do you plan to allow hunting?
- Are there endangered or threatened species in your area that you could help protect?
- How close do you want the habitat area to your farmstead?

Technical notes

- Plant the wildlife area with vegetative cover of grass, trees or shrubs.
- Manage livestock use of the area.
- To attract a specific wildlife species, choose cover and habitat appropriate for that species.
- Create a diverse habitat to attract a wider variety of wildlife.
- Consult with an NRCS or other local wildlife biologist for recommended wildlife populations for the area.
- Include a food plot if possible.
- Encourage shrub growth between woodlands and grasslands.
- Include bird houses and feeding stations in habitat areas.
- Plant fruit and nut bearing trees or shrubs to the windward side of a woodland habitat area.

Maintenance

- Prescribed burning may be helpful to regenerate growth or eliminate undesirable species.
- Use weed management to maintain desirable plant and animal species.
- Replant vegetation and trees if habitat area is damaged by disease or poor weather.