

Animal Concentration Areas Management

WHY BE CONCERNED?

When animals are confined outside of housing facilities, the risk to surface water and groundwater quality is significantly increased. Animal concentration areas specifically include barnyards, feedlots, loafing areas, exercise lots, or other similar animal confinement areas. Heavy use areas in pastures, such as cattle access ways, feeding areas, watering areas, and shade areas, are also considered animal concentration areas.

The areas hold common characteristics such as high concentration of livestock or poultry, large amounts of waste deposition, inability to maintain vegetation, and, frequently, close proximity to water. As the concentration of animals in these areas increases, the potential for sediment, bacteria, nitrogen, and phosphorus to enter surface water (and in some cases groundwater) also increases. Mud and manure in these areas are not only a source of pollutants but also of microbes that can cause animal health problems.

Animal concentration areas are very busy places that can be difficult to manage. Good management involves three basic principles. The first is to divert clean water flow (e.g., from upslope fields, pastures, driveways, and barn roofs) away from the animal concentration area. This will reduce the volume of contaminated runoff to manage. The second principle is to divert polluted runoff from the animal concentration area into a storage facility or treatment system where its effect on surface water or groundwater will be minimal. The third principle is to reduce the potential for contaminated runoff by managing the time the animals spend in the animal concentration area to minimize the traffic that can erode soil and create muddy conditions, and/or by stabilizing the animal concentration area surface.

The goal of Pennsylvania Farm•A•Syst is to help you protect groundwater and surface water—shared resources that are important to everyone.

HOW TO RANK GROUNDWATER AND SURFACE WATER PROTECTION USING THIS WORKSHEET

- You can select from a wide range of conditions and management practices that are related to potential surface water and groundwater contamination.
- You can rank the conditions and management practices on your operation according to how they might affect surface water or groundwater.
- Based on your overall ratings, you can determine which of your conditions or practices are reasonably safe and effective, and which might require modification to better protect surface water and groundwater.

HOW TO COMPLETE THE WORKSHEET

Follow the directions as listed on the next page. The evaluation should take 15 to 30 minutes for each evaluation site to complete and determine your ranking. Evaluate each animal concentration area on your farm. There are spaces provided to rank up to three sites. If you are unfamiliar with any of the terms used, refer to the glossary provided with this worksheet.

Information derived from the Farm•A•Syst worksheet is intended only to provide general information and recommendations to farmers regarding their own farmstead practices. It is not the intent of this educational program to keep records of individual results. However, they may be shared with others who will help you develop a resource management plan.

WORKSHEET #4: ANIMAL CONCENTRATION AREAS MANAGEMENT

Use a pencil, in case you want to change an answer later. For each feature listed on the left that applies to your farm, read across to the right and circle the statement that most closely describes conditions on your farm. Skip and leave blank any features that don't apply to your farm. Then look at the descrip-

tion you circled to find your "rank number" (4,3,2,1) and enter that number in the blank under "rank." Allow 15 to 30 minutes to complete the worksheet for each evaluation site and to determine the level of surface and groundwater protection you are providing.

ANIMAL CONCENTRATION AREAS (ACA) MANAGEMENT

	4 Best	3 Good	2 Fair	1 Poor	RANK (up to 3 sites)
LOCATION OF ANIMAL CONCENTRATION AREAS					Site Identification
					#1 #2 #3
1. Distance from drinking water well or spring	More than 300 feet.	200 to 300 feet.	50 to 200 feet.	Less than 50 feet.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
2. Position in relation to drinking water well or spring	Downslope of water supply system.	Across slope from water supply system with fine or medium textured (clay or loamy) soils.	Across slope from water supply system with coarse textured (sandy or gravelly) soils.	Upslope from water supply system.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
3. Distance upslope from a surface water body	More than 400 feet.	200 to 400 feet.	100 to 200 feet.	Less than 100 feet.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4. Soil drainage, texture, and permeability	Fine or medium textured soils (clay or loamy). Slow infiltration of rain water.	Medium textured soils (loamy). Medium to slow infiltration of rain water.	Medium to coarse textured soils (sandy loam to sandy). Rapid infiltration of rain water.	Coarse textured soils (sandy or gravelly) with very high permeability and infiltration of rain water.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
5. Soil depth to bedrock or seasonal high water table	More than 40 inches deep.	30 to 40 inches deep.	20 to 30 inches deep.	Less than 20 inches deep or rock outcrops present.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
CLEAN WATER AND RUNOFF MANAGEMENT					
6. Clean water management	All water from upslope areas, fields, impermeable surfaces, etc., is diverted away from the ACA.	Most clean surface water is diverted away from the ACA.	Some clean surface water is diverted away from the ACA.	All water from upslope areas, fields, impermeable surfaces, etc., runs through the ACA.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
7. Roof runoff	All water from roofs is diverted away from the ACA.	Most clean roof water is diverted away from the ACA.	Some clean roof water is diverted away from the ACA.	All water from roofs runs through the ACA.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
8. Runoff management	All runoff goes to a manure storage.	Runoff directed to a treatment system (wastewater treatment strip or constructed wetland).	Runoff flows overland toward surface water.	Runoff flows into a drainageway or surface water.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
9. Filter strips (between ACA and surface water)	More than 50 feet of permanent vegetative buffer strip in place.	20 to 50 feet of permanent vegetative buffer strip in place.	Less than 20 feet of any type of permanent vegetative buffer strip in place.	No permanent vegetative buffer strip in place.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

	4 Best	3 Good	2 Fair	1 Poor	RANK (up to 3 sites)
MANAGEMENT AND CONDITION OF THE ACA					Site Identification #1 #2 #3
10. Surface	Paved surface. No cracks.	Paved with some cracks or compacted stone surface.	Stabilized earthen surface.	Earthen surface, not compacted or stabilized.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
11. Animal access to earthen areas	Animals have access to earthen area only when it is dry.	Animals occasionally have access to earthen area in wet conditions.	Animals frequently have access to earthen area in wet conditions.	Animals have access to earthen area at all times regardless of weather and ground conditions.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
12. Cleaning and scraping practices	Scraped daily, stored or spread on fields according to a nutrient management plan.	Scraped once per week, stored and spread on fields according to a nutrient management plan.	Scraped once per month and stored or spread on fields.	Scraped less than once per month and spread on fields.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
13. Solids management	All solids go to a manure storage.	Curbed paved surface that collects all solids.	Uncurbed, paved surface that collects most solids.	Unpaved with no collection of solids.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
14. Stocking rate (square feet per animal)¹	All manure and runoff are directed to a manure storage.	Low to medium density of animals.	Medium density of animals.	High density of animals.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
15. Gully erosion	No gully erosion evident.	Few areas with ephemeral gully erosion.	Many areas with ephemeral gully erosion. Some more serious gullies developing. ²	Gully erosion evident in many areas. Gullies cannot be easily crossed with equipment. ²	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
16. Livestock access to stream or drainageway³	Livestock do not have access to the stream or drainageway.	Livestock have access to the stream or drainageway only at properly designed stream crossing sites. ³	Livestock have access to a portion of the stream or drainageway. ⁴	Livestock have access to entire stream or drainageway. ⁴	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
17. Best management practices	Site- and operation-specific best management practices fully implemented. ⁵	Most best management practices implemented.	Some best management practices implemented.	No implementation of best management practices.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Site Identification #1 _____ #2 _____ #3 _____					
<p>1. For more detailed information and numbers in square feet per animal (sf/a) that define “low,” “medium,” or “high” densities depending on the animal, refer to the following section on “Estimating Animal Density in an ACA.”</p> <p>2. These conditions may indicate the presence of critical runoff problem areas as defined in the Pennsylvania Nutrient Management Law, Act 38 Regulations, Chapter 83, subchapter D; § 83.201. Definitions, and § 83.321. Stormwater runoff control.</p> <p>3. Please note that drainpipe outlets, constructed cattle crossings, and channel alterations require Title 25 Pennsylvania Code Chapter 105 (Dam Safety and Waterway Management) permits. Check with the USDA Natural Resources Conservation Service, your local Conservation District, or Pennsylvania Department of Environmental Protection (DEP) for more information.</p> <p>4. With potential impact of livestock on the stream, consider evaluating these conditions using <i>Pennsylvania Farm•A•Syst Worksheet 6, Stream & Drainageway Management</i>.</p> <p>5. Practices would meet the requirements of the <i>Pennsylvania Technical Guide</i> and an approved nutrient management plan for Pennsylvania’s Nutrient Management Law, Act 38 Regulations, Chapter 83, subchapter D.</p>					
Total Use this total to calculate overall performance ranking.					<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

HOW TO USE THESE RANKINGS

- Step 1:** Now that each feature has been ranked, add all these rankings together and put that value in the “Total” box at the end of the worksheet. Transfer that number to the box below.
- Step 2:** Divide the value in the “Total” box by the number of features ranked.
- Step 3:** Repeat for the remaining sites. Calculate the average ranking for all sites combined.

_____	divided by _____	equals _____
(total of rankings)	(# of features ranked)	(average ranking)*
*carry your answer out to one decimal place		

- Step 4:** Evaluate the overall management practices and site conditions:
- 3.6–4.0 = best management
 - 2.6–3.5 = good management
 - 1.6–2.5 = fair management
 - 1.0–1.5 = poor management

This ranking gives an idea of how animal concentration areas conditions and management practices **as a whole** might affect both surface water and groundwater quality. This ranking should serve only as a **very general guide, not a precise diagnosis**. Since it represents an **averaging** of many individual rankings, it can mask any **individual** rankings (such as 1s and 2s) that should be of concern.

- Step 5:** Look over the rankings for individual features of each site:

Best (4s): the current ideal

Good (3s): provides reasonable surface and groundwater protection

Fair (2s): inadequate protection in many circumstances

Poor (1s): poses a high risk of polluting surface water or groundwater

Regardless of the overall ranking, any individual rankings of “1” should receive immediate attention. Some concerns can be taken care of right away; others could be major or costly projects, requiring planning and prioritizing before taking action.

- Step 6:** Consider how to modify farm management practices or site conditions to better protect water quality. For more information, contact the **local conservation district, Penn State Cooperative Extension office, or the USDA Natural Resources Conservation Service** for ideas, suggestions, or guidance.

ESTIMATING ANIMAL DENSITY IN AN ANIMAL CONCENTRATION AREA

The definitions of “low,” “medium,” and “high” can be used to complete Feature #14, Stocking Rate (square feet per animal).¹

Concentration of Animals on Animal Concentration Area²

	“Low” ³	“Medium” ³	“High” ³
Dairy cows	Paved surface (>75 sf/a) ¹ Earthen surface (>700 sf/a) Each of three vegetated paddocks (>2,400 sf/a)	Paved surface (>50 sf/a) Earthen surface (>400–500 sf/a) Each of three vegetated paddocks (>1,800 sf/a)	Paved surface (<50 sf/a) Earthen surface (<400 sf/a) Each of three vegetated paddocks (<1200 sf/a)
Dairy replacements	Paved surface (>50 sf/a) Earthen surface (>400 sf/a) Each of three vegetated paddocks (>1,400 sf/a)	Paved surface (>30 sf/a) Earthen surface (>200–400 sf/a) Each of three vegetated paddocks (>1,000 sf/a)	Paved surface (<20 sf/a) Earthen surface (<200 sf/a) Each of three vegetated paddocks (<1,000 sf/a)
Beef feeders	Paved surface (>60 sf/a) Earthen surface (>600 sf/a) Earthen surface with mounds (>400 sf/a) Each of three vegetated paddocks (>1,800 sf/a)	Paved surface (>40–60 sf/a) Earthen surface (400 sf/a) Earthen surface with mounds (>200 sf/a) Each of three vegetated paddocks (>1,200 sf/a)	Paved surface (<40 sf/a) Earthen surface (<400 sf/a) Earthen surface with mounds (<200 sf/a) Each of three vegetated paddocks (<1,200 sf/a)
Beef cows/heifers	Paved surface (>75 sf/a) Earthen surface (>650 sf/a) Each of three vegetated paddocks (>2,400 sf/a)	Paved surface (>50 sf/a) Earthen surface (>400 sf/a) Each of three vegetated paddocks (>1,800 sf/a)	Paved surface (<50 sf/a) Earthen surface (<300 sf/a) Each of three vegetated paddocks (<1,800 sf/a)
Sheep/ewes	Paved surface (>20 sf/a) Earthen surface (>40 sf/a)	Paved surface (<15 sf/a) Earthen surface (<25 sf/a)	Earthen surface (<10 sf/a)
Feeder lambs	Paved surface (>10 sf/a) Earthen surface (>25 sf/a)	Paved surface (>5 sf/a) Earthen surface (>10 sf/a)	Earthen surface (<10 sf/a)
Hogs/sows	Paved surface with shed (>30 sf/a)	Earthen surface with shed (<15 sf/a)	Earthen surface with shed (<10 sf/a)
Horses	Earthen surface with no pasture (>2,500 sf/a)	Earthen surface with no pasture (>1,500 sf/a)	Earthen surface with no pasture (<1,000 sf/a)

1. Square feet per animal is abbreviated “sf/a.”
2. Animal concentrations derived from Midwest Plan Service publications and other sources.
3. > indicates “greater than” and < indicates “less than.”

GLOSSARY

Animal concentration areas: A livestock confinement area outside of housing facilities including barnyards, feedlots, loafing areas, exercise lots, or other similar animal confinement areas that will not maintain a growing crop. Also included are significant heavy use areas in a pasture system such as cattle access ways, feeding areas, watering areas, and shade areas.

Best management practices: Practices designed to control erosion and runoff, manage nutrients, and address other public health and safety issues associated with agricultural operations.

Constructed wetland: A wastewater treatment system consisting of one or more shallow impoundments planted with wetland vegetation designed to retain and treat wastewater through biological processes.

Direct discharges: Any flows of stormwater contaminated with manure to surface waters without prior filtration or other treatment, such as grassed filter strips.

Drainageway: A part of the landscape, usually vegetated, where surface water occasionally collects and moves from an upslope area.

Ephemeral gully: Well-defined converging channels in the soil that result from water runoff. Ephemeral gully channels are deeper than rills, can be crossed by field equipment with some difficulty, and/or can be repaired with common field operations.

Exercise lot: A grassy or impermeable area intended to give the animals a place to move around, but is not intended as a source of forage.

Feedlot: An area where feed and water are provided for livestock.

Filter strip: A strip or area of permanent herbaceous vegetation situated between cropland, grazing land, or disturbed land and environmentally sensitive areas.

Groundwater: Water beneath the earth's surface that supplies wells, springs, and base flow to streams.

Gully erosion: Soil detachment and movement causing converging channels in the soil as a result of water runoff. They are well-developed converging channels that form in the soil as a result of water runoff and cannot be crossed by farm equipment. Gullies are deeper and more pronounced than ephemeral gullies. Field equipment alone cannot be used to repair the damage. Once gullies form, they generally continue to grow longer, deeper, and wider.

Normal climatic conditions: Includes rain events up to a 25-year, 24-hour storm event but does not address a major flood event.

Pastures: Crop areas managed for forage production that are harvested by livestock or livestock and haying.

Pennsylvania Nutrient Management Law, Act 38 Regulations: The regulations supporting Pennsylvania's nutrient

management law that provides for the management of nutrients on certain agricultural operations to abate non-point-source pollution.

Pennsylvania Technical Guide: Publication of the USDA Natural Resource Conservation Service (NRCS) providing the standards and specifications used by technical specialists to plan and apply best management practices.

Runoff control system: A combination of management practices that can be used together to prevent water pollution from livestock yard runoff. Practices may include diversion of runoff from the yard, roof runoff systems, yard shaping, settling basins, upslope diversions, and filter strips or buffer areas.

Soil drainage (natural): The frequency and length of time when the soil is free of excessive water. For example, water drains quickly through well-drained soils. In poorly drained soils the root zone is water logged for long periods of time unless some form of artificial drainage is installed.

Soil permeability: The ability of air and water to move through the most restrictive layer of the soil or the immediately underlying layers.

Soil texture: The relative proportion of sand, silt, and clay in the soil.

Surface water: Water at the earth's surface, such as ponds, lakes, streams, ditches, and so forth.

Treatment systems: See "constructed wetland" and "wastewater treatment strip."

Upslope/downslope: Refers to the position of the animal concentration area in relation to the direction of water flow.

Vegetative cover: Grass or a mixture of grass and other vegetation covering the soil surface that is effective in protecting the surface from runoff.

Wastewater treatment strip: A sloping grass area used to filter runoff from an animal concentration area. Runoff is distributed uniformly across the high end of the strip and allowed to flow down the slope, or is irrigated with sprinkler heads. Nutrients and suspended material remaining in the runoff water are filtered through the grass, absorbed by the soil, and ultimately taken up by the plants. To maximize effectiveness of the wastewater treatment strip, the vegetation should be removed through grazing or harvesting. Waste-water treatment strips must be designed and sized to match the characteristics and wastewater flow of the animal concentration area.

Waterway: A grass or rock-lined channel to collect water and direct clean water flow to a safe outlet to reduce erosion. Helps avoid large amounts of water running through a field or barnyard, which would carry sediments and manure with it.

ACKNOWLEDGMENTS

The Pennsylvania Farm•A•Syst package contains the following materials:

- Farm Evaluation System
- Introduction
- Preliminary Screening Quiz
- Farmstead Map
- Overall Farmstead Ranking
- A Sample Post-Evaluation Survey
- Program Packet Folder
- Worksheet #1—Water Well Condition and Construction
- Worksheet #2—Pesticides and Fertilizer Storage and Handling
- Worksheet #3—Household Waste Treatment System
- Worksheet #4—Animal Concentration Areas Management
- Worksheet #5—Milkhouse Waste Management
- Worksheet #6—Stream and Drainageway Management
- Worksheet #7—Petroleum Storage and Handling
- Worksheet #8—Silage Storage Management
- Worksheet #9—Animal Waste Storage and Management
- Worksheet #10—Animal Waste Land Application Management
- Worksheet #11—Soil Conservation Management

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